transport

Department:
Transport
REPUBLIC OF SOUTH AFRICA

National Transport Master Plan

NATMAP
2050

You pay for good transport whether you've got it or not

KWAZULU NATAL PROVINCE

PHASE 3: FORWARD PLANNING

Draft Version 2: December 2009

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

Road Maps

Rail Maps

Airport Maps

None

Port Maps

None

GLOSSARY OF TERMS

AADT	Average Annual Daily Traffic
AADTT	Annual average Daily Truck Traffic
ACSA	Airports Company South Africa
ADT	Average Daily Traffic
AGOA	African Growth and Opportunity
AGISA	Accelerated & Shared Growth Initiative for SA
AIDS	Acquire Immunodeficiency Syndrome
AMPS	Annual All Media Products Survey
ARTS	Refuse Transfer Station at Athlone
ASGISA	Accelerated and Shared Growth Initiative
ATNS	Air Traffic and Navigation Services Company
AVR	Abnormal Vehicle Register System
AVTUR	Aviation/Turbine Fuel
BBBEE	Broad Based Black Economic Empowerment
BEE	Black Economic Empowerment
BMR	Bureau of Market Research
BMS	Bridge Management System
BRT	Complete Lansdowne Corridor
BSP	Background and Strategy Paper
CARNS	Community Access Needs Roads Study
CBD	Central Business District
CBPWP	Community - Based Public Works Programme
CD	Chief Director
CFO	Chief Financial Officer
CIBD	Construction Industry Development Board
CMIP	Consolidated Municipal Infrastructure Programme
COCT	City of Cape Town
COTO	Committee of Transport Officials
CPPK	Cost per passenger kilometre
CPK	Central Processing Facility
CPs	Minor roads
CPTR	Current Public Transport Record
CSIR	Council of Scientific and Industrial Research
CTC	Centralised Train Control
CTIA	Cape Town International Airport
DBSA	Development Bank of South Africa
DBT	Dry Bulk Terminal
DDG	Deputy Director General
DEAT	Department of Environmental Affairs and Tourism
DG	Director General
DLTS	Driving License Testing System
DJP	Durban to Johannesburg Pipeline
DNA	District Management Area
DOT	Department of Transport
DPLG	Department of Provisional and Local Government
DPWRT	Department of Public Works, Roads and Transport
DRs	Divisional roads
DWAF	Department of Water Affairs and Forestry
ECDC	Eastern Cape Development Co-orporation
EEI	Economic Employment & Investment Cluster
ELMET	East London Metropolitan Area
EPWP	Expended Public Works Programme

ESRI	Environmental Systems Research Institute
EU	European Union
FDI	Foreign Direct Investment
FES	Financial and Economic Support
FET	Further Education and Training
FFC	Finance & Fiscal Commission
FIFA	International Federation of Association of Football
FOHOD	Forum of Heads of Department
FTP	File Transfer Protocol
FTPD	Freight Transport Policy Development
FSPG	Free State Provincial Government
gJ	Gigajoules
GDP	Gross Domestic Product
GDPTRW	Gauteng Department of Public Transport, Roads and Works
GEMS	Government Employee Medical Scheme
GIS	Geographic Information System
GM	General Manager
GTL	Gas-to-liquid
GVA	Gross Value Add
HCDS	Human Capital Development Strategy
HDI	Human Development Index
HGVs	Heavy Goods Vehicles
HIV	Human Immunodeficiency Virus
HOD	Head of Department
HR	Human Resources
HVs	Heavy Vehicles
HWM	High Water Mark
IA	Implementing Authority
IASC	International Air Services Council
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ICT	Information and Commercialization Technologies
IDIP	Infrastructure Delivery Improvement Programme
IDP	Integrated Development Plan
IDP	Integrated Development Planning
IDT	Independent Development Trust
IDZ	Industrial Development Zone
IEA	Infrastructure Enhancement Allocation
ILRP	Integrated Law Reform Project
IMF	International Monetary Fund
IMT	Intermediate Means of Transport
IN	Inland Network
IP&C	Infrastructure Planning and Coordination
ISRDP	Integrated and Sustainable Rural Development Programme
ISRDS	Integrated Sustainable Rural Development Strategy
IS	Information Systems
IT	Information Technology
ITMS	Inter Technology Manage System
ITP	Integrated Transport Plan
ITS	Intelligent Transport Systems
JIA	Johannesburg International Airport
Km	Kilometres
KMIA	Kruger Mpumalanga International Airport
KPI	Key Performance Indicators

KZN	KwaZulu-Natal
LDO	Local Development Objectives
LDV	Light Delivery Vehicle (Bakkie)
LED	Local Economic Development
LEDs	Local Economic Development Strategies
LRTB	Local Road Transportation Board
LTL	Less-than-truck load
LTP	Land Transport Promotion
LTPS	Land Transport Permit System
MEC	Member of Executive Council
MEC	Member of the Executive Committee
MEDS	Microeconomic Development Strategy
MELD	Mdantsane East London Development
MGJ	Million Gigajoules
MINCOM	Ministerial Committee of Provincial Transport Ministers
MINMEC	Ministers and Members of the Executive Council
MIS	Management Information System
MML	Minimum Living Level
MPCC	Multi-Purpose Community Centres
MPT	Multi-purpose Terminal
MRs	Main roads
MSA	Moving South Africa
MTA	Metropolitan Transport Area
MTAs	Metropolitan Transport Areas
MTEF	Medium Term Expenditure Framework
MTT	Marine Tanker Terminal
NAAMSA	National Association of Automobile Manufacturers of South Africa
NAMPO	National Maize Product Organization
Natcor	Natal Corridor
NATIS	National Traffic Information System
NATMAP	National Transport Master Plan
NATMAP	National Roads Masterplan
NATMAP	National Land Us / Transport Master Plan
NDA	National Development Agency
NDoT	National Department of Transport
NEPAD	New Partnership for Africa's Development
NHTS	National Household Travel Survey
NLTSF	National Land Transport Strategic Frameworks
NLTTA	National Land Transport Transition Act
NMT	Non-motorized Transport
NMPP	New Multi-Products Pipeline
NPA	National Ports Authority
NRTDS	National Rural Transport and Development Strategy
NSDP	National Spatial Development Perspective
NSG	National Standards and Guidelines
NTTT	National Taxi Task Team
O-D	Original Destination
OEMs	Original Equipment Manufacturers
OLAS	Operating License Administration System
OLB	Operating Licence Board
OLS	Operating License Strategy
Orex	Operations and Spoornet
ORTIA	Oliver Tambo International Airport
PA	Planning Authority

PE	Port Elizabeth
PEMET	Port Elizabeth Metropolitan Area
PFMA	Public Finance Management Act
PFMA	Provisional Finance Management Act
PGDS	Provincial Growth and Development Strategy
PGWC	Provincial Government Western Cape
PIG	Provincial Infrastructure Grant
PIMSS	Planning and Implementation Management Support System
PLTF	Provincial Land Transport Framework
PMS	Pavement Management System
PMU	Project Management Unit
PPP	Public Private Partnership
PPECB	Perishable Products Export Control Board
PROVTECH	Provincial form with Technical / Official representatives from all local municipalities in the Province
PSDF	Provincial Spatial Development Framework
PTOE	Public Transport Operating Entity
PTP	Public Transport Plan
PTPD	Passenger Transport Policy Development
PTPD	Passenger Transport Policy Development (Monitoring & Evaluation)
RAU	Rand Afrikaans University
RBCT	Richards Bay Coal Terminal
RDA	Rural Development Agency
RIDS	Regional Industrial Development Strategy
RIM	Road Infrastructure Management
RNIS	Road Network Information System
RO	Rail Operations
RSA	Republic of South Africa
RTA	Rural Transport Authority
RTI	Rural Transport Infrastructure
RTO	Ratio Train Order
RTS	Rural Transport Services
SBM	Single Buoy Mooring
SA	South African
SAARF	South African Advertising Research Foundation
SACAA	South African Civil Aviation Authority
SADC	South African Development Community
SAMSA	South African maritime Safety Authority
SANRAL	South African National Roads Agency
SARCC	South African Rail Commuter Corporation
SATAWU	South African Transport and Allied Workers
SC	Steering Committee
SCM	Supply Chain Management
SCS	Social Capital Strategy
SDF	Spatial Union Development Framework
SDIP	Sustainable Development Implementation Plan
SDIs	Spatial Development Initiatives
SFF	Strategic Fuel Fund
SHSS	Sustainable Human Settlements Strategy
SIP	Strategic Infrastructure Plan
SMF	Supervising and Monitoring Firm
SMME	Small Medium Micro Enterprise
SOW	Scope of Work
SP	Safety Promotions
SSATP	Sub-Sahara African Transport Programme

SSS	Scarce Skills Strategy
StatsSA	Statistics South Africa
TA	Transport Authority
TETA	Transport Education Training Authority
TFR	Transnet Freight Rail
TIA	Traffic Impact Assessment
ToR	Terms of Reference
TPR	Transport Planning Requirement
TRs	Trunk roads
UDF	Urban Development Framework
UK	United Kingdom
UMET	Umtata Metropolitan Area
UNISA's	University of South Africa
USA	United States of America
V/C	Volume Capacity
VLCC	Very Large Crude Carriers
WC	Western Cape
WCDTPW	Western Cape Department of Transport and Public Works

1. INTRODUCTION

1.1 BACKGROUND

The main purpose of the Transport Master Plan (NATMAP 2050) is to motivate a prioritized program of interventions to upgrade the transport system in South Africa. Its goal is to develop a dynamic; long term and sustainable land use/multi-modal transportation systems framework, for the development of networks, infrastructure facilities, interchange termini facilities and service delivery.

The Department of Transport (DoT) appointed SSI Consortium to develop provincial master plans for KwaZulu-Natal (KZN) and Western Cape (WC) provinces, which are coordinated with the master plans of the other provinces. The Aurecon and Ingerop Consortia were appointed to develop master plans for the other provinces. The DoT's academic advisers, named the Consolidation Working Group (CWG), were appointed to integrate all the provincial master plans into a single national transport master plan.

Three of the four main Phases of the Project have been concluded, i.e. the Inventory, Analysis and Forward Planning phases, i.e. Phases 1, 2 and 3.

1.2 PURPOSE OF REPORT

This report addresses Phase 3 of the NATMAP project dealing with the Forward Planning for the KZN Province, and it is the fourth report produced in the project. The previous reports were the Inception, Inventory and Analysis reports. This is Version 2 of the draft Phase 3 report for the KZN. The report is only a draft at this stage, but has been updated based on comments received from the Phase 3 Round Table Conference and feedback from stakeholders within KZN.

Apart from the provincial reports, there are also three reports produced at national level on the following aspects for Phase 3:

- Financial, Institutional, Legislation and Management (FILM);
- Model Development and Projections of Passenger and Freight Transport and
- Energy and Environment

1.3 OBJECTIVES OF THE PROJECT

The Terms of Reference (TOR) states the goal of the National Transport Master Plan 2005-2050 is to develop a dynamic; long term and sustainable land use/multi modal transportation systems framework for the development of networks, infrastructure facilities, interchange and termini facilities and service delivery strategies for the RSA. The framework and strategies need to:

- Be demand responsive to national/provincial/district and /or any socio-economic growth strategy, and/or any sectoral integrated spatial development plan and

- Have a coordinated implementation schedule and/or action agenda for the whole country and/or specific national and provincial spatial development corridors and regions until 2050.

In other words the objective is to prepare a physical development plan, sometimes referred to as a Master Plan, as the framework by which RSA's future state-of-the-art multi-modal transportation systems planning, implementation, maintenance, operations, investments, and monitoring decisions are to be made.

The objectives of the Project are to identify, examine, assess, and propose;

- Various land use/spatial development models to sustain investment in state-of-the-art multi-modal urban/rural transportation systems;
- Cost effective models for an integrated public/private sector corridor/regional economic development;
- Vision, goals and objectives for each of the national development corridor and/or economic regions;
- Integrated growth and development strategies for each development corridor and/or region of national importance;
- Potential economic development projects and compile a comprehensive economic status map of national importance;
- Integrated multi-modal infrastructure facilities development Plan;
- Cost effective policies promulgation, and/or changes to enhance coordination of transportation services;
- Cost effective institutional arrangements model for efficient and effective investment, planning, implementation, operations, maintenance, and monitoring and
- Action agenda for the various key stakeholders based on the preferred development strategy and integrated development plan.

<u>Phase 3 Objectives</u>

Phase 3 is not ***"what is, or what will be, but simply what ought to be".***

The specific objectives of Phase 3: Forward Planning according to the ToR is as follows:

- To provide transport demand projections based on
  - Demographic growths and
  - Macro economic outlook
- To provide responsive supply of transportation infrastructure facilities and services to demand through:
  - Network capacities: Road, railways, maritime and air

The demographic and economic projections have been presented in the Phase 2 report. This Phase 3 report therefore focuses on the transport demand projections, which were based on the demographic, economic and land use projections.

It should be noted that the Financing and Institutional objectives of Phase 3 are addressed in the national FILM report.

1.4 METHODOLOGY

1.4.1 Project Phases from TOR

The broad approach is depicted in the figure below in terms of the four phases according to the TOR. The Phase 1 Inventory delivers the information about the existing supply and capacity of transport, the main demand side drivers and problems and deficiencies. The Phase 2 Forecasts deliver information about future demand and enables a vision to be developed about the transport supply-side, including the future capacity required and the standards necessary to provide cost-effective and globally competitive transport passenger and freight services. Phase 3 is basically about planning to schedule and prioritise infrastructure investment in sympathy with growing demand. Finally, Phase 4 deals with the necessary policy, institutional changes and support required for effective implementation and details a programme of action.

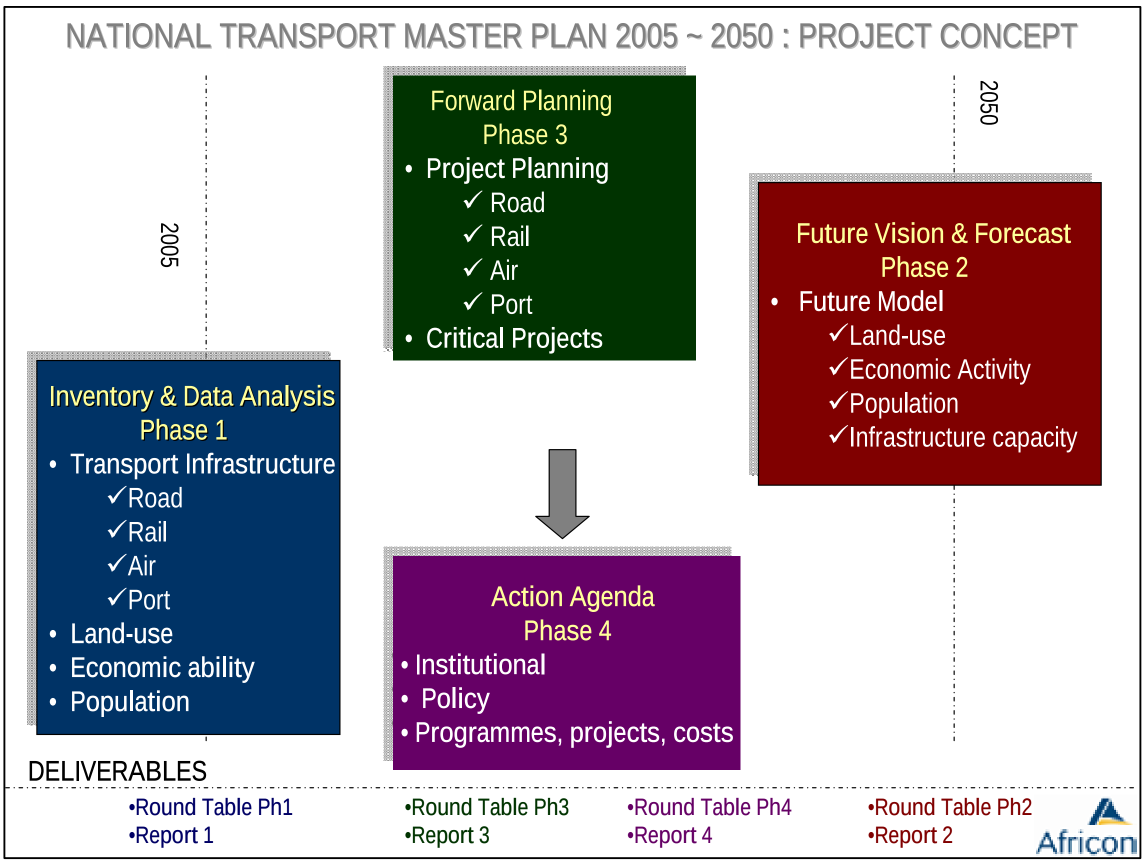


Figure 1.4.A: Four project phases from TOR

1.4.2 Revised Scope of Phase 3

It was agreed by the Project Management Technical Team (PMTT) that the project schedule and scope of Phase 3 would be adjusted according to the adjustment of the scope of the

Phase 2 report. The Phase 2 report will include some Inventory data, which were received late, as well as results of the Base Year models. As a result model projections are included in the Phase 3 report.

1.5 ISSUES AND STRATEGIES DEFINED IN PHASE 2

From the status quo data collected during Phase 1, various problems and issues were identified. In the Phase 2 Analysis, the location, size and severity of problems were determined. The following conclusions were drawn in the Phase 2 Report, as well as strategies to be addressed in Phase 3:

Conclusions

Land Use Analysis:
The KZN Provincial Economic Growth and Development Strategy (PGDS) and the Provincial Spatial Economic Development Strategy (PSEDS), as the spatial representation of the PGDS, aims to amend the apartheid space-economy of the Province by establishing a hierarchy of selected development nodes and corridors. This entails that future settlement and economic development opportunities should be channelled into activity corridors and nodes that are adjacent to, or link the main growth centres in order for them to become regional gateways to the global economy.

The Province is characterised by an extensive mosaic blanket of scattered rural settlements and villages and certain municipalities have been earmarked as Rural Development Nodes by the Government's ISRDS programme.

The nodes and corridors selected include existing well established nodes and corridors, as well as nodes and corridors which do not exist in the contemporary, or are very weak. Currently, only the primary and secondary nodes of the Province have been identified for priority interventions. These nodes all display some sort of potential as set out by the NSDP.

Demographic Analysis:
There are large numbers of people who travel long distances to work on a daily basis because of the concentration of job opportunities in the eThekwini Metropolitan Municipality. Thus, the need for effective public transport facilities in the contemporary and even more so in the future is clearly evident. High levels of unemployed people are found in villages scattered throughout the Province. Thus, the provision of access (public transport) to community facilities and job opportunities in centrally located nodes should become a priority.

Economic Analysis:
It is concluded that various factors are constraining economic development in the province. These are high poverty and unemployment levels, aggravated by the current financial and economic decline, dispersed and inaccessible settlements far from economic centres, and the unbalanced concentration of economic opportunities in a few major centres. However, the KZN has many economic opportunities, such as a supportive policy environment to

develop the economy, high tourist potential, international trade infrastructure and opportunities and abundant natural resources.

Passenger Operations:

- *Rising car ownership and use on inter-regional roads, give rise to congestion during peak holiday times, unacceptable levels of air pollution, and wasteful use of valuable urban land;*
- *Existing public transport is not sustainable under present operating and management practices;*
- *Low profitability for many private operators, resulting in a failure to adequately maintain and recapitalise fleets;*
- *Limited modal integration and modes are not used where most appropriate;*
- *Most households in KwaZulu-Natal have limited access to public transport, or cannot afford it;*
- *Long-distance rail suffers from very old rolling stock, low demand and hence low profitability;*
- *Long-distance stations and termini are in poor condition and generally not integrated with other supporting land-uses;*
- *Traffic safety is a major problem, due to old rolling stock, some poor roads, poor driving skills, etc;*
- *Inadequate policing and law enforcement, particularly relating to unsafe driving and un-road-worthy vehicles and poor observance of traffic laws and*
- *Operating License Boards lacks capacity resulting in delays.*

Freight Operations:

Freight transport in the KZN and in South Africa is generally inefficient, and suffers from many problems, such as:

- *Uncompetitive and un-commercial operations;*
- *Failure of funding mechanisms lead to obsolescent and inefficiency;*
- *Rates and tariffs do not relate to commercial practice;*
- *Excessive costs and low efficiencies inhibit industrial output;*
- *Institutional structure and monopoly control that inhibits private sector investments in non road sector industry;*
- *Unavoidable result is total dependence of private sector road transport and*
- *Medium term prospects for fossil fuels makes road transport highly vulnerable.*

The Gauteng-Durban freight corridor is the corridor with the highest freight volumes in South Africa, with almost (80%) of South Africa's freight exports going through the Durban harbour. Richards Bay serves as the coal export harbour of the country. As such, freight solutions and investments should be given a priority on these corridors and harbours.

The latent demand for rail service on corridors as well as urban and rural areas is being met by rapid expansion of road freight transport, causing severe un-recovered externalities in the form of road deterioration, congestion, accidents, pollution and excessive freight transport costs.

Cost comparisons indicate that there is urgent need for independent research to fully quantify the additional costs being incurred by lack of competition and to define the options for institutional, organisational and operational reforms to meet the freight transport needs of the country.

Rail infrastructure:
According to Transnet forecasts the following capacity constraints will develop for the network within the KZN:

- *Currently there are no capacity constraints;*
- *The capacity of the main line between Durban and Gauteng will be fully utilised by 2020 and will be exceeded by 2030;*
- *Steep grades limit the capacity of heavy freight trains on the Kwazulu-Natal section between Vooruitsig and Durban;*
- *The capacity of the Richards Bay - Ermelo coal line is limited by the single Overvaal Tunnel (in Mpumalanga). The demand will exceed the capacity of most sections of the line in Kwazulu-Natal by 2030;*
- *The capacity of the Durban – Swaziland line will be adequate until 2010. The section between Durban and Stanger will reach capacity by 2030;*
- *The branch lines are currently totally under utilised with virtually no demand for capacity. There are very few services currently available that conform to the requirements of potential customers (single truck loads) or that could compete with the road services and*
- *The condition of the coal line is good while the core lines are generally fair and the branch lines poor to very poor.*

Transnet Rail (Freight Rail and Rail Engineering) is making good progress in terms of:

- *Turnaround in rolling stock efficiency and utilisation (major progresses in backlog maintenance and operational initiatives have produced efficiency gains and greater asset utilisation) and*
- *Large-scale capital investment, although there are long lead times on locomotive purchases..*

Road Infrastructure:
The majority of KZN roads (46.9%) operate at LOS B. In total 81.2 percent of the network operates at LOS C or better. Approximately 18.4 percent of the network (1,792 km) needs to be upgraded in order to bring the service level of the whole network to LOS C or better.

Visual condition surveys showed that 52 percent of the blacktop roads are in a poor or very poor condition. A few sections on the N2 south beyond Kokstad and N2 North, the R42 near Volksrust, and the R22 near Swaziland are in a poor or very poor condition, while sections on the N2 south near Kokstad, R33 near Dundee and Vryheid, R42 south of Volksrust, are in a fair condition.

Two of the main constraints which prevent roads from remaining in a good to fair condition over their design life are a lack of funds for maintenance and overloading of heavy vehicles.

There are various constraints regarding overload control, such as lack of trained staff, lack of weighbridges to achieve geographic coverage, lack of the overloading enforcement system, and inadequate legal support.

Airport Infrastructure:

Durban International Airport: No further expansions will be done to increase the capacity, as the airport will be replaced during 2010. The airport is at capacity and is operating at a level of service below the recommended level of service of C. The existing airport is able to handle projected growth up to 2010 at substandard service levels.

The proposed new International Airport at La Mercy will have an ultimate capacity of 42 MAP. When opening in 2010, it will have a capacity of 7.5 MAP.

Pietermaritzburg Airport: The capacity of the terminal will be reached by 2033 assuming domestic growth rates of 10%. The terminal might therefore have to be expanded from 2028 to 2033 to handle the expected demand.

- *Margate Airport: No capacity constraints and*
- *Richards Bay Airport: No capacity constraints.*

Port and pipe line Infrastructure:

The chief constraints to the Port of Durban, once the Entrance Channel widening and deepening is completed in 2009, are as follows:

- *Lack of space for further major expansion;*
- *Road accesses are congested, both via the City to the Point area, and increasingly so to the Bayhead area and*
- *A rapidly expanding motor vehicle import/export programme is stretching current port facilities to its limit.*

The only berths which are constricted by virtue of their condition are as follows:

Maydon Wharf Berths 1 to 4, Berth 12, Island View Berth 5
Port of Richards Bay: There are no capacity or condition restraints on the berths.

Financial Analysis:

Nationally, except for the air mode, transportation investments have trailed economic growth and, in fact, come in the wake of general 'divestment' when considered against requisite spend just to maintain installed infrastructure and operational capacity. It is fair to conclude that current flurry of investments are a very necessary attempt to restore lost capacity.

Generally, provincial funding is critically (95%) depended on national transfers. Clearly, a multi-modal view of transportation funding, which factors in the enabling role of transportation *in the economy as well as transportation's fair share in the creation of the country's GDP has to be taken into account for NATMAP to succeed.*

KwaZulu-Natal Province currently relies more on provincial allocations in the form of equitable shares, conditional grants and other infrastructure transfers from Treasury. However, other sources mainly in the form of tax receipts as well as non tax receipts also contribute to the provincial funds.

The apparent acceleration of provincial capital expenditure, projected to grow at 15.6% average for all provinces over the MTEF, is encouraging, but this needs to be 'unpacked' to determine the share for transportation and its significance.

Institutional and Legal Analysis:

- *To clarify and contextualise the transport roles and responsibilities of the three spheres of government, in order to achieve integrated transport management;*
- *Comprehensive review/rationalization of legislation / institutional parameters to be undertaken, such as maritime issues;*
- *There is a need for more focused capacitation internally to Government;*
- *Institutions need to be more responsive to external innovations and requirements (international, environmental, land use, etc.);*
- *Linkage between policy, legislation and implementation;*
- *General performance in relation to allocated mandate, capacity and/or relationship to the Department of Transport;*
- *Gaps and Overlaps;*
- *Failure of cooperative governance;*
- *Institutional silos;*
- *Problems in procurement;*
- *Separation of planning, implementation and maintenance functions and*
- *Linkage to government.*

At present the Department administers payment of the subsidies and monitoring of the contracts and in terms of the NLTTA the eThekwini Transport Authority must take over this function for its transport area. KZN is unique at the moment in having the country's only transport authority (TA). The problems experienced by the ETA are being addressed by the replacing legislation to the NLTTA. These are mainly a lack of own funding sources and the confusion created by the local government legislation that has post-dated the NLTTA.

Another "unique" structure is the KZN Transport Appeals Tribunal; although some other provinces have also established provincial Appeal Tribunals.

With regards to roads, the KwaZulu-Natal Provincial Roads Act focuses on provincial roads and leaves municipal roads issues to be dealt with by municipal by-laws. However, it has been found in some other provinces that there is a need to regulate some aspects of municipal roads, e.g. on standards, by provincial legislation.

The KwaZulu-Natal Road Traffic Act 7 of 1997 needs to be amended or replaced to respond to the amendments to the National Road Traffic Act and to the AARTO and RTMC Acts. In the case of public transport, the NLTTA has given rise to the situation where there are different and diverse laws in the provinces replacing Chapter 3, which makes for a lack of uniformity and consistency, and is confusing for people who must implement the legislation. This aspect is under discussion with the revision of the NLTTA.

A serious problem appears to be the fact that regulations for the KwaZulu-Natal Public Transport Act have not been promulgated yet. This makes it impossible to implement many of the provisions of the Act.

Phase 3 Forward Planning Strategies

The following forward planning strategies to be addressed in Phase 3 were identified in the Phase 2 Report:

Land Use Analysis:
The Land Use task will be reactive in terms of the infrastructure plans that are proposed. The necessary land use framework within which infrastructure plans can be developed, has been provided. Once the spatial, type and size of planned infrastructure have been identified, these will be assessed in terms of land use impacts, and how transport can be used as a catalyst for development.

Demographic Analysis:
Phase 3 will focus on the impact of demographic and economic scenarios on sustainability in general (rural and urban) as well as on the integration of land use and transport in future e.g. the need to develop one-stop community centres in rural (poor) areas, to create jobs at such centres (poverty alleviation) and to improve public transport to these areas.

Passenger Operations:
The DOT's National Passenger Strategy and Action Plan focuses on Integrated Rapid Public Transport Networks aims to implement high quality networks of "car competitive" public transport services that are fully integrated, have dedicated rights-of-way and are managed and regulated by a capable municipal transport department. The basis of the NATMAP Passenger Operations strategy will therefore be an integrated inter-regional route network and services, linking up with the urban networks at the long distance modal transfer stations. The strategy should deploy the best mode(s) for each of the primary routes between the major urban areas, with supporting links to towns of national significance.

Freight Operations:
- *Reorganisation of Rail Freight Operations;*
- *Development of General Goods Freight;*
- *Modernisation and Competitive Management;*
- *Competitive Railway Institutional and Operational Structures;*
- *Restructure Port Institutional and Operational Framework and*
- *Road Freight Regulation*

Infrastructure:

Alternative infrastructure plans will be developed to satisfy the projected demand and also to improve the condition of the infrastructure. An integrated and balanced infrastructure plan will be developed for the various future time periods. In addition, the infrastructure problems within each mode will be addressed, as follows:

Rail infrastructure:

- *Vertical separation of the rail business to allow private sector operators to use the infrastructure;*
- *Assessment of the infrastructure condition assessment methodology use by Transnet to evaluate their condition assessment of the rail infrastructure and*
- *Assessment of the infrastructure demand as estimated by Transnet in relation to the total freight and passenger demand forecast for Phase 3.*

Road Infrastructure:

- *Reduction of traffic volumes by introducing congestion charges together with the introduction of regular and reliable public transport (such as BRT schemes);*
- *Adding additional capacity through extra lanes;*
- *Introduction of a heavy vehicle fee (HVF) to cover externality costs incurred by HV's;*
- *Classifying transport infrastructure and services as either economic transport or social transport. The DOT could then be responsible for economic transport and the province and District Municipalities can take responsibility for social transport and*
- *Revision of the overload control programmes with the view to differentiate between urban an inter-urban overload control.*

Airport Infrastructure:

- *The long term roles of some of the minor airports will be investigated;*
- *An investigation into the development of new airports has been conducted and this will be examined and*
- *Information regarding the possible aviation developments will be attained from the National Airport Development Plan/Policy.*

Ports:

All of the Transnet Infrastructure Development Plans will be reviewed in the light of the Transnet Integrated Demand Forecast, and the projections developed by the NATMAP Freight Transport Operational Analysis. Cognisance will be taken of Transnet's Hub Strategy Analysis, where the various physical options are evaluated to assess which option is most beneficial to Transnet. It is in this regard that careful attention will be paid in assessing whether the decisions reached by Transnet were in the interests of the country as a whole, taking into account all modes of land freight transport, rather than the Transnet focus of rail transport.

The alternative strategies to be investigated in Phase 3 will mainly comprise the analysis of Transnet's Hub Strategy Analysis, although any alternative layouts considered by the Working Group to be a viable option will be assessed and included as such.

Financial Analysis:

- *NATMAP will seek to ensure sustainability and capacity expansion to 2050;*
- *The Goal Achievement Matrix will be developed, which is essential for the evaluation of alternative plans and strategies. Cost estimates will be made of the forward plans for each mode, and alternative plans will be evaluated against the goal achievement matrix and*
- *Various funding strategies per mode have been assessed in Phase 2, and final recommendations in this regard will be made in Phase 3.*

Institutional and Legal Analysis:

Recommendations will be made on how to address the many problems identified and analysed in Phase 2. Institutional and legal reform is clearly needed in order to establish the required institutional structures and enabling legislation to deliver a high quality transport system for South Africa. This will be a major challenge to overcome the many constraints identified. Some of these are lack of capacity, gaps and over laps in roles and functions between various role players, and in legislation.

1.6 PROJECT MANAGEMENT AND CONSULTATION

The NATMAP project is managed through Technical and Steering Committees at provincial and national level. Details are listed below:

- A dedicated KZN DoT Project Manager facilitates the KZN work at a provincial level by:
  - Coordinating the project in the province;
  - Assisting with data collection and
  - Assisting with logistical arrangements and Provincial meetings
- A Technical and Finance Committee at national and KZN Provincial level consisting of government officials to:
  - Advise and give recommendations on technical issues;
  - Assist in identifying and obtaining data and
  - Evaluate deliverables
- A Steering Committee at National and Provincial level consisting of heads of departments to:
  - Provide strategic guidance on the project;
  - Make policy decisions and
  - Receive and review milestone deliverables

The Project Team from the three Consortia, are managed and guided at operational level by the DoT Project Management Technical Team (PMTT), consisting of:

- The DoT Project Manager;
- The Project Manager of each of the three Consortia;
- DOT Project Coordinators, one allocated to each Consortium and

- Project Manager of the DOT Consolidated Working Group consisting of representatives from Universities and technical institutions, advising the DoT and integrating the provincial master plans in one national master plan.

Each of the three Consortia is responsible for between two and five provinces. The Consortia co-ordinate their work at a national level to ensure that the work is done to the same standard, level of detail and scope. There are six Working Groups covering the following topics:

- GIS, Databank and Modelling (GDM)

- Operations, consisting of two sub-working groups:
  - Passenger Transport and
  - Freight Transport

- Infrastructure, consisting of four sub-working groups:
  - Roads;
  - Railways;
  - Airports and
  - Ports and Pipelines

- Financial, Institutional, Legal and Management (FILM)

- Energy and Environment

Representatives of the Consolidated Working Group (CWG) and the DoT also serve on the Working Groups.

The SSI Consortium coordinates its work by means of meetings, telephone discussions, email, and participating in National Working Groups with the other Consortia.

At the end of each Phase, a Round Table Conference of national and provincial stakeholders is held where the Project Team informs stakeholders of findings and where the stakeholders provide their inputs and views. The Phase 2 Round Table was held on 7 and 8 May 2008, and the Phase 3 Round Table was held on 3 and 4 November 2009.

Besides the Round Table Conferences, the NATMAP Team (DOT, Consolidated Working Group, and three Consortia) had special meetings with the following national agencies, i.e.:

- SARCC;
- ACSA;
- TRANSNET and
- SANRAL

At national level, a workshop was held in September 2009 with the DOT, the Consolidated Working Group and other Consortia on the Phase 2 results.

1.7 STRUCTURE OF THIS REPORT

The structure of this report follows that agreed by members of the Project Management Task Team in consultation with the DoT's Project Implementation Manager. Aside from the preliminaries, the report contains the following sections:

1. Introduction
2. Economic Role of Transport
3. Demographic Forecasts
4. Land use Development
5. Passenger Transport Strategies
6. Freight Transport Operational Analysis
7. Infrastructure Development Plans
8. Consolidation of Strategies
9. Implications for Phase 4

2. ECONOMIC ROLE OF TRANSPORT

2.1 INTRODUCTION

The Terms of Reference (TOR) requires an investigation into the economic role of transport (road, rail, air, maritime, pipelines, passenger and freight). The specific items listed for investigation may be divided into two broad categories by subject matter, namely:

1. The role of transport in economic growth and development and
2. The analysis of transport investment or the appraisal of transport projects in order to determine optimal strategies of achieving an efficient multi-modal transport system.

It is a given that transport is an indispensable activity in economic growth and development, trade (both domestic and international) and individual mobility (both domestic and across international borders). This is reflected in the economic history of every country, community and household, and a hypothesis such as "*transport is the fabric of our national socio-economic development*" or "*transport is the prerequisite of our socio economic development*", or "*transport is the heartbeat of the economy*" (as set out in the TOR) does not require to be substantiated in the face of overwhelming consensus in the empirical literature. While this study needs to deal with more than just economic history, an appreciation of the role played by transport in South Africa's economic growth and development should be reflected in the report. This should draw on an examination of the qualitative history of transport in South Africa, and provide a more nuanced document than could be produced by a mere quantitative analysis. However, a quantitative analysis establishing the contribution of the transport sector to national economic growth (relating to economic indicators such as GDP, investment, employment and value added) is also required as an integral part of the study.

Two important aspects of the role of transport do not appear in the TOR. These are:

- The regulatory, institutional and policy framework within which the transport sector has operated, and the effect of this framework on the role played by the various modes (listed in the TOR) in South Africa over the years and
- The social costs (externalities) of the different modes of transport, and the effect of these costs on overall economic welfare and hence on assessing the true performance and contribution of the transport sector to the South African economy.

It is suggested, therefore, that the investigation into the economic role of transport focus on the following tasks:

- Brief review of the international literature on the economic role of transport (i.e. its role in economic growth and economic development), and a review of the literature (both qualitative and quantitative) on the role of transport by mode in the growth and development of the South African economy;
- A quantitative analysis by mode of the historical and current contributions of transport to South African GDP, investment, employment and value added;
- An analysis of the regulatory, institutional and policy framework in which the transport sector functions, identifying any distorting effects of this framework on the past and

current economic role of transport, and recommending steps to overcome distortions and achieve optimal efficiency in inter-modal transport;

- A literature review and discussion of the social costs of the different modes of transport, with recommendations for undertaking further work in quantifying these costs in order to overcome distortions and achieve optimal efficiency in inter-modal transport and
- Taking the above tasks into account, provide a framework of project appraisal, taking full social costs into account, to be used in determining the comparative viability of alternative investments in individual projects in the sector. This study, however, cannot be expected to provide more than a generic approach; the actual appraisal of any particular project or alternative projects is something that can be undertaken only in relation to each specific proposed project or set of projects.

2.2 INTERNATIONAL LITERATURE ON ROLE OF TRANSPORT IN ECONOMIC GROWTH

Transportation is a basic human activity. Without it there would be no movement of people or of goods, and hence no exchange of goods and no economic transactions of any kind. However, the development of an economy requires investment in a range of activities, not just transport, and all these investments together make economic growth possible.

The history of transportation has moved from head porterage, human or animal-drawn sleds and simple dug-out canoes through the technological revolutions of the wheel, sailing vessels, canals, railways, motorised transport and manned flight. Each advance had a profound effect in expanding the potential for economic growth at the time. Technological change has become more rapid over time as is evidenced by a brief recapitulation of developments since the middle of the 20th century. Technological advances have led to the demise of the passenger liner and its replacement by jet aircraft. Cargo vessels have largely been replaced by container ships. The development of bigger and better trucks and buses has helped road transport to take over much of long-distance goods and passenger transport from railways. In many cities patronage of public transport (trams, trolley buses, commuter rail and buses) has declined in favour of the private motor vehicle, while in the third world buses have lost ground to smaller, more ubiquitous vehicles of various forms such as minibus taxis.

2.2.1 Early Studies

Adequate transport is a *sine qua non* for economic growth and social development. Among other things, transport:

- Makes possible the movement of bulk goods, therefore facilitating the exploitation of mineral, agricultural and forest resources;
- Improves competitiveness of remote areas by reducing travel time to urban markets;
- Improves business competitiveness by introducing greater reliability in delivery times both of inputs needed in the production process as well of raw materials and finished goods to markets;
- Reduces costs both of inventories and of the logistics supply chain;

- Facilitates specialisation and the adoption of new production activities and techniques;
- Reduces the isolation of remote areas and
- Facilitates the incorporation of countries into the globalised economy.

Baum and Tolbert (1985) point out that the transport sector accounts for an average of about 5-6% of GDP in developed and developing countries and usually for about 15-25% of total annual investment in developing countries; it would be less than half that on average in developed countries. The transport sector also has significant links with other sectors of the economy, and therefore contributes to economic growth through multiplier effects. It has extremely strong linkage effects with the construction sector, the automotive industry (manufacture, assembly and servicing of motor vehicles and transport equipment), energy, and labour, employing between 5 and 7% of the labour force in developed countries and perhaps double that in developing countries.

Economists began to pay serious attention to theories of economic growth in the 1950s. Transportation was assigned a central role in a number of the theories. It was during this time that terms such as "social overhead investment" and "infrastructure" were introduced into the economic lexicon. Rosenstein-Rodan (1961) and Nurkse (1961) made transportation and power the crucial elements in their theories of growth: the provision of social overhead capital was necessary to precede the development of directly produced activities. Rostow (1960) propounded a stages theory of economic growth in which he regarded railways as having been the leading sector, the most powerful single initiator of what he called the "take-off", in the United States. These theories commanded considerable influence in the late 1950s and early 1960s, and hence influenced the sectoral allocation of investment by international aid agencies.

Since then, although the indispensable part played by transport in economic growth has not been disputed, the debate has formed around whether transport has led or followed economic growth. Fogel (1964), for instance, argued that the railway was "a part rather than a condition of the industrial revolution" in Britain, while in the United States it followed the large-scale migration to the west. It becomes clear that the debate should not be trapped in a discussion of the role of any particular mode of transportation. Fogel pointed out that, although cheap inland transportation was a necessary condition for economic growth, it did not entail a specific form of transportation. The form determined not whether growth would take place but which of the many possible growth paths would be followed. Moreover, transportation patterns varied from one country to another. In both these countries the chief competitive advantage of railways was speed − in the United States in relation to inland water transport, and in Britain in relation to the canals and turnpikes (the latter particularly for passenger transport). In a large country such as Russia, prior to 1917 the railways, by replacing primitive modes of transportation and reducing time and costs, opened up the markets of European Russia to the cotton-growing region of Central Asia, and made possible the transformation of this region into one of highly specialised commercial agriculture. In the Soviet period the rapid economic growth of Central Asia was associated with an ambitious programme of railway building designed to integrate a hitherto relatively isolated region into the national economy (Taaffe, 1960).

In developing countries, mechanised transport was a necessary but not a sufficient condition in India where the British-built railways failed to develop the economy. In tropical Africa transport in the pre-colonial subsistence economy was mainly by head porterage and water. The building of railways led to the production of cash crops and hence the transition to an exchange economy, while the motor vehicle and bicycle permitted change to spread.

Gradually, then, economists adopted a more sober view of the role of transportation. From (1965) they assigned to transportation four functions in the development process, namely:

- It is a factor input, i.e., it enables goods and passengers to be transferred between and within production and consumption centres;
- It shifts production possibility functions by altering relative factor costs;
- It has beneficial effects on factor mobility and
- It is a private and public consumption good.

Thus, attempts at developing a theory of transportation and development have come to the not very original conclusion that transport is a necessary but not a sufficient condition to induce economic growth. Even if a transport investment opens up a new territory for the first time and allows the resource base such as soil conditions or mineral deposits to be exploited, it is only one of a number of investments that will be required. However, this debate related mainly to investment in transport infrastructure and not to the role which transport organisation and policy plays in economic growth. The extent to which transport investment promotes economic growth depends not only on the natural resource base of the area but also on the response of individuals and governments to the creation of economic opportunities, to the emergence of entrepreneurial talent, and to the efficient organisation of the transport sector and policies relating to its operation.

The World Bank (1994) concluded that economic infrastructure (public utilities, public works and transport) raises productivity and lower production costs, but that it has to expand quickly enough to accommodate growth. It found that a 1% increase in the stock of infrastructure was associated with a 1% increase in GDP across all countries, and found that the transport sector (the capital infrastructure, equipment, facilities and services) contributed in terms of value-added 5.34%, 6.78% and 9.46% of the GDP of low-income, middle-income and high-income countries respectively.

Much of the work focuses on the relationship between infrastructure investment and economic growth rather than on transport investment in isolation. The World Bank (1994) says of this work: "*many studies attempting to link aggregate infrastructure spending to growth of GDP show very high returns in a time-series analysis. Some cross-national studies of economic growth and infrastructure − notably, one using public investment in transport and communications and another using capital stocks in roads, railways and telephones − also show that infrastructure variables are positively and significantly correlated with growth in developing countries. In both types of studies, however, whether infrastructure investment causes growth or growth causes infrastructure investment is not fully established. Moreover, there may be other factors driving the growth of both GDP and infrastructure that are not fully* *accounted for. Neither the time-series nor the cross-sectional studies satisfactorily explain the mechanisms through which infrastructure may affect growth*".

World Bank research found that, in general, basic infrastructures such as water, irrigation and (to a lesser extent) transport was important for low-income countries, while transport become more important for middle-income countries and power and telecommunications at the high-income stage.

Pointing to studies of the relationship between infrastructure and investment in economic growth in developed countries, the Bank reported that a number of studies found that causation runs in both directions although many studies concluded that the role of infrastructure in growth was substantial. Nonetheless, findings varied greatly from study to study. The Bank, therefore, endorsed previous findings to the effect that infrastructure is a necessary but not a sufficient condition for growth. Returns to infrastructure investment are affected by a number of conditions, for example, a weak policy climate for economic activity lowers returns, while relieving capacity bottlenecks may produce high returns.

2.2.2 Recent Studies

If the earlier work was heavily quantitative in nature, the subject has continued to receive the attention of economists who have employed increasingly sophisticated statistical techniques of analysis in order to demonstrate quantitative relationships. This recent work has focused on economic infrastructure rather than on transport per se, and it does not negate the fact that the economic role of transport is broader than a mere concentration on infrastructure investments.

Recent international work on the infrastructure-economic growth relationship is summarised by Fedderke and Garlick (2008). Empirical studies in the 1980s and 1990s found strong positive relationships between the two. Infrastructure spending today is interpreted as capital expenditure; infrastructure stock is compared to GDPO and infrastructure flows to GDP growth. They point out that most models stress the supply side rather than the demand side of economic growth, i.e., the production process drives output rather than consumer demand driving output.

In terms of supply-side explanations, the ways in which infrastructure investment can stimulate economic growth are:

- An increase in inflation stock increases output and therefore directly induces growth;
- Improvements in infrastructure lower costs of production – firms would incur very high costs if transport infrastructure is inadequate, making it almost impossible for them to engage in international merchandise trade or services, e.g. tourism and
- Boosting productivity.

On the demand side, the construction and maintenance costs associated with infrastructure projects increase aggregate demand, but the dominant view is that such effects are of a short-term nature. Another impact of infrastructure investment is that a government might use it as a tool of industrial policy, e.g. allocating funds to a particular project such as a transport corridor in order to influence private investment decisions.

Although recent international studies confirm a generally positive relationship between infrastructure and growth, there are a number of caveats (Fedderke and Garlick 2008).

- If a particular project results in over-provision, it could have a negative effect on growth;
- The measures used may give misleading results, e.g., infrastructure expenditure may not indicate the efficacy of the investment or the quality or usefulness;
- Since the quality of infrastructure cannot be quantified, it is not possible to compare the growth impact of investment in new infrastructure with investment in maintenance of existing infrastructure, and therefore to determine an allocation of expenditure that maximises growth, i.e., by new construction or maintenance;
- The impact of infrastructure on aggregate output may be indirect (by influencing, e.g., the productivity of physical capital) rather than direct;
- There are other factors besides infrastructure that influence economic growth, and it is difficult to control for these other determinants of growth and isolate the role of infrastructure;
- Inappropriate aggregation of infrastructure measures could obscure the relative importance of different types of infrastructure in economic growth. The focus has tended to be more on economic than on social infrastructure and
- Even if a strong statistical association between infrastructure and growth is revealed, this does not by itself define the direction of causality; some theories hold that economic growth affects infrastructure investment. Thus, if aggregate output increases, it could generate demand for more infrastructure, e.g., in order to transport the output.

During the last 20 years, as the globalisation of economies has increased, competitiveness in international trade has been significantly strengthened in countries which have adequate and reliable infrastructure. Major advances in communications, transport and storage technologies, together with improved management of logistics systems, have led to new practices designed to reduce logistic costs, including those in transport. This has been based on information technologies using telecommunications infrastructure. Cost reductions and the increased speed of freight movements have increasingly been based on multimodal transport, notably containerisation, which requires intensive coordination by shippers across various modes (rail, port, air and road freight).

2.3 THE SOUTH AFRICAN EXPERIENCE

2.3.1 Initial Analysis on Economic Role of Transportation

The initial analysis drew on four studies in South Africa on the relationship between transport investment and economic development. These studies however only covered rail, road and ports.

2.3.1.1 The Relationship between Transport Infrastructure and Economic Development

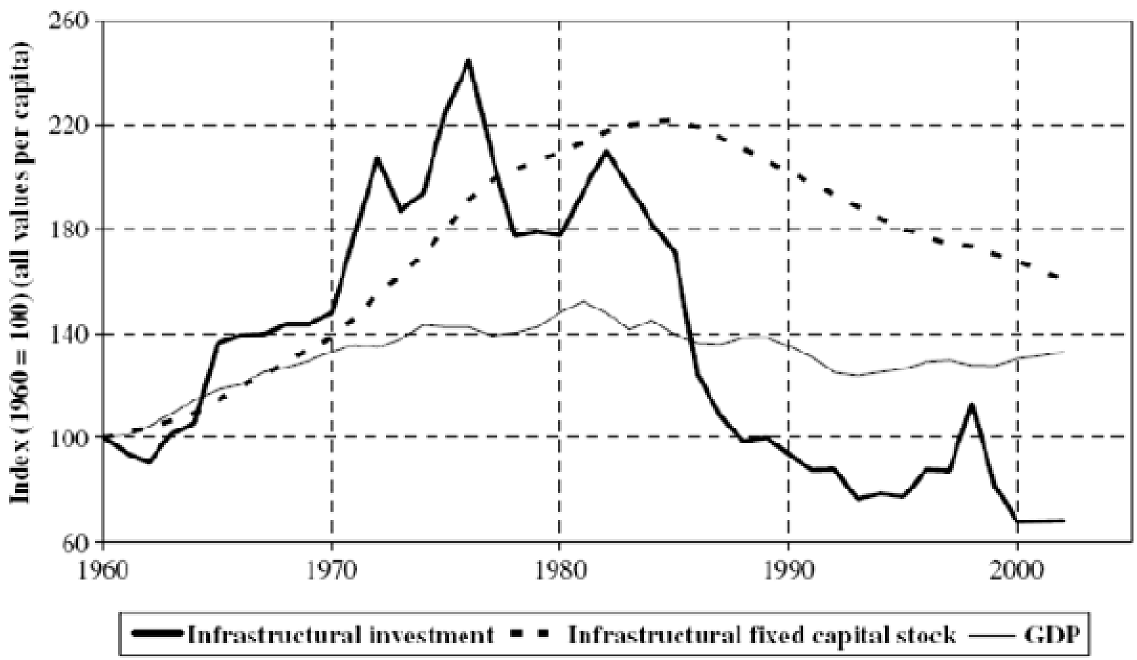
Joynt (2004) concluded that the benefits of transport infrastructure are transmitted in four ways, namely:

- Via the impact of the initial investment;
- Via actual network performance once the infrastructure is in place;
- Via the impact on transport operating costs and benefits and
- Through the multiplier effect of initial investment on demand in other areas of the economy.

A study by Arup (2008) uses the work of Perkins et al (2005), and states the following general conclusions on the nature of dependence of economic development data on economic infrastructure data:

- Economic infrastructure (including transport infrastructure) has both direct and indirect impacts on overall economic output;
- The impact of public sector investment on private sector investment in physical capital is particularly strong and
- Empirical results are generally supportive of South African fiscal authorities' renewed interest in public sector investment since 2002.

The study by Arup uses the work of Perkins et al (2005) to show the relationship between infrastructural investment, infrastructural fixed capital stock and GDP for South Africa between 1960 and 2003. This relationship is graphically indicated in **Figure 2.3.A**.



Source: Arup (Pty) Ltd, 2008 and Perkins et al (2005).

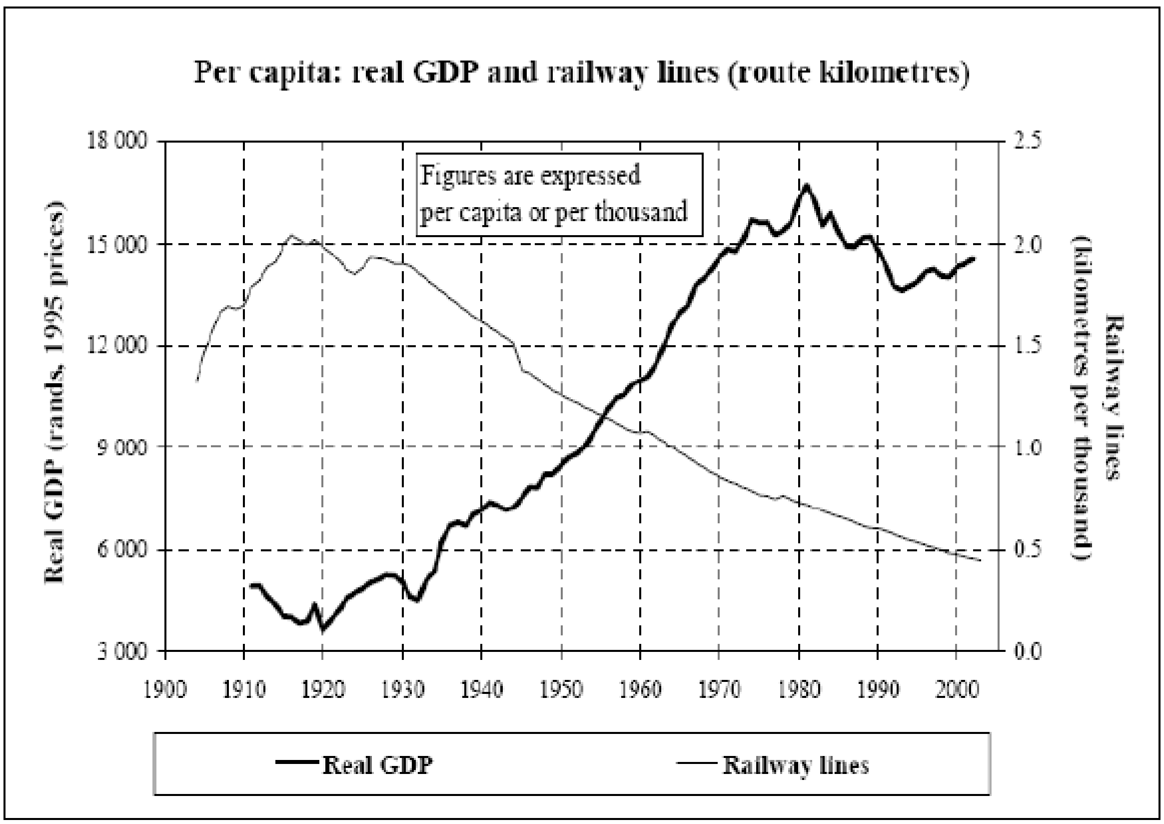
Figure 2.3.A: Real GDP and Gross Public Sector Economic Infrastructural Investment and Fixed Capital Stock, 1960 to 2003

The following points may be noted from the graph:

- In pre-sanctions period between 1960 and the mid 1970s, there is a broadly consistent pattern of alignment between infrastructure investment and capital stock growth and rising GDP;
- Infrastructure investment peaks in the mid 1970s, falls, sees a further rise in the early 1980s and then falls dramatically, eventually drawing fixed capital stock down as well as old stock is not replaced;
- From the mid 1980s, more or less half way through the sanctions period, GDP begins to fall and
- Investment in economic infrastructure and GDP both begin to rise again after the sanctions period, though fixed capital stock has not turned within the period presented.

2.3.1.2 Rail Capacity and GDP Growth in South Africa

Figure 2.3.B and **Figure 2.3.C** show how rail line development and rail carrying capacity have compared with GDP growth in South Africa.

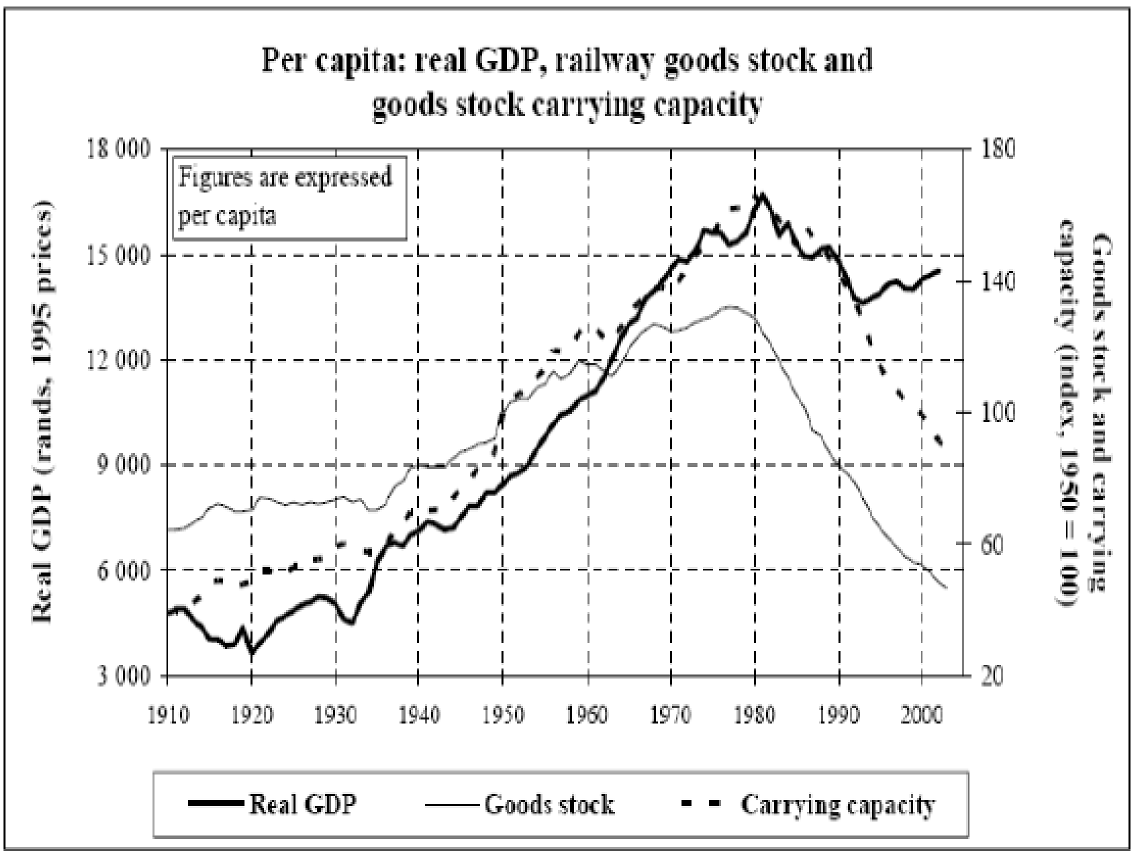


Source: Arup (Pty) Ltd, 2008 and Perkins et al (2005).

Figure 2.3.B: Rail Line Route Kilometres versus GDP, South Africa 1900 – 2003

The following points are noted by Arup (2008) on the relationship between rail development and GDP:

- Investment in rail line extension measured in route kilometres (Figure 2.3.B) increases steeply to about 1920. Investment in railway goods stock and carrying capacity (Figure 2.3.C) continues to grow until 1980 and then declines;
- Investment in railway line route kilometres per head of population (Figure 2.3.B) has generally moved in the opposite direction to real per capita GDP, especially after 1920 (which is when the majority of the existing rail network was completed);
- There has been a relatively close parallel between the development of the rail network's cargo carrying capacity and GDP (Figure 2.3.C); both rise consistently to 1980 and fall thereafter;
- While the fall in both GDP per capita growth and rail capacity after 1980 coincides with the impact of the sanctions period, it should also be noted that deregulation of freight transport took place at the same time and this will also be a factor in the steep decline in rail after this point and
- By 2003, rail carrying capacity had not recovered to match the 1990s post-sanctions recovery in GDP growth. This suggests that GDP growth is now less dependent on rail capacity than it may have been previously. The failure of rail to attract new investment in the post- sanctions period may also reflect the fact that it no longer had a protected market.



Source: Arup (Pty) Ltd, 2008 and Perkins et al (2005).

Figure 2.3.C: Rail Goods Stock and Carrying Capacity versus GDP, South Africa 1900 – 2003

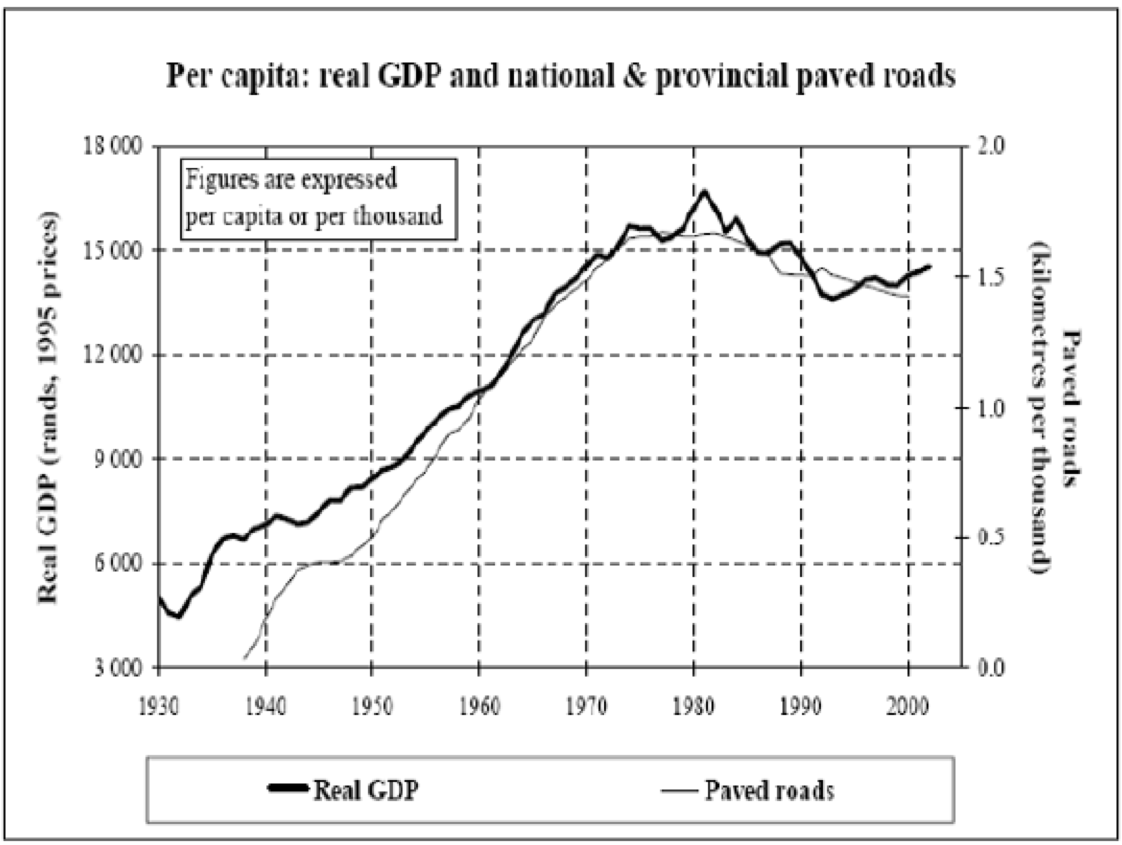
In commenting on the direction of causality between rail transport and GDP, Perkins (Perkins et al, 2005) notes that the correlation from GDP to rail investment is stronger than the other way round. The implication is that growth of rail freight transport is occasioned by periods of strong economic development rather than being itself the cause of general economic development.

Perkins et al (2005) suggests that this may be because the bulk carrying nature of rail transport may mean that its development is associated with the particular requirements of key industries or commodities rather than its being the means of sustaining a wider range of other industries, not associated with the original development of rail freight carrying capacity.

These statistically based comments are made cautiously, however, and caveats are added that the data are indicative only and that decisions on which infrastructure to invest in should be supplemented by appropriate cost-benefit analyses.

2.3.1.3 Road Transport Infrastructure and GDP Growth in South Africa

Figure 2.3.D compares the development of the national and provincial paved road network in South Africa with growth in real GDP over a 60 to 70 year period.



Source: Arup (Pty) Ltd, 2008 and Perkins et al (2005).

Figure 2.3.D: Paved Road Development versus GDP Development, South Africa 1940 – 2003

The following points are noted by Arup (2008) on the relationship between paved road network development and GDP:

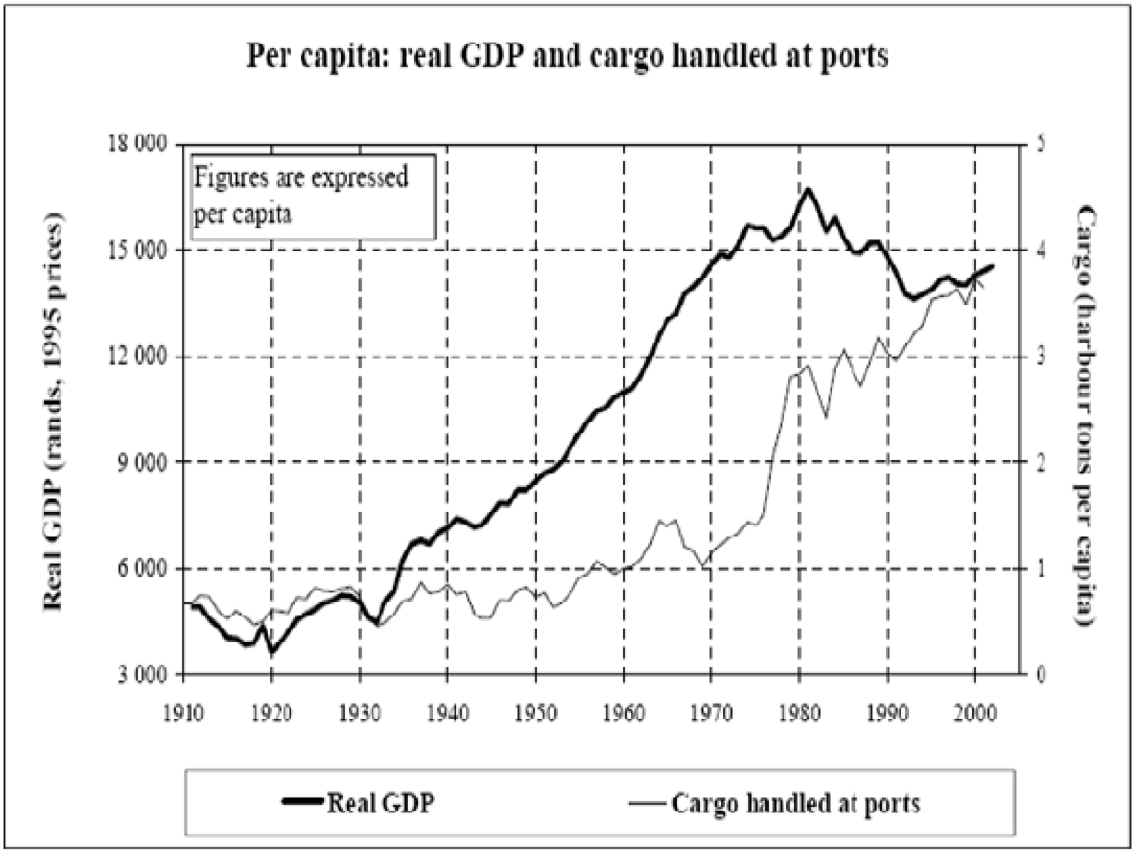
- The extent of paved roads per capita and GDP per capita exhibit an extremely close pattern consistently throughout the period measured;
- The tailing off of roads construction during the sanctions period from the mid 1970s to the mid 1990s precedes decline in GDP growth and
- Resumed economic growth following 1994 has occurred despite there being no further growth in the paved roads ratio.

Based on detailed statistical analysis, (Perkins et al 2005) comments that the development of paved roads in South Africa has exhibited a ‘forcing effect’ on GDP growth. In other words, the direction of causality in the relationship is much stronger from roads investment to GDP growth than vice versa. The evidence across the whole period measured is therefore that investment in paved roads is supportive of general growth in GDP.

The fact that GDP growth has resumed, and accelerated, following the ending of sanctions and the commencement of the democratic era, does not necessarily imply that the observed correlation no longer holds. It is more likely that capacity created in the years of high growth is being taken up with congestion being the inevitable outcome. Worsening congestion indicates that it may be difficult to sustain long-term growth in GDP without considering further expansion of road transport infrastructure.

2.3.1.4 Ports Throughput and GDP Growth in South Africa

Figure 2.3.E presents the relationship between goods handled at South African ports per head of population and general per capita GDP growth for the period 1910 to 2003.



Source: Arup (Pty) Ltd, 2008 and Perkins et al (2005).

Figure 2.3.E: Ports Development versus GDP Development, South Africa 1910 – 2003

The following points are noted by Arup, (2008) on the relationship between goods handled at ports, and GDP:

- GDP per capita has generally grown at a higher rate than goods at ports;
- The sustained period of GDP growth between the early 1930s to 1980 incorporated the belated investment in port infrastructure from the early 1970s as shown by the steep acceleration of goods traffic, the decade when the ports of Saldanha and Richards Bay were being developed and
- In contrast to other infrastructure modes, growth in ports traffic continued even after GDP growth started to slow and then decline.

The statistical correlation analysis of Perkins et al (2005) shows that ports capacity is probably being led by economic growth rather than the other way round. It is possible, though, that this conclusion is determined more by the experience of two very large bulk exporting facilities having being developed in quick succession than by any intrinsic relationship between the variables.

2.3.1.5 Conclusions on the Role of Transport Infrastructure in Economic Development

Based on the time-series analysis referred to in the previous sections, the following key findings are noted Arup (2008):

- Transport infrastructure investment (together with electricity and telecommunications) is strongly correlated with GDP growth. The general conclusion that may be drawn is that transport infrastructure investment facilitates the realisation of economic growth where that growth potential is present;
- Transport infrastructure facilitates but does not necessarily create economic growth or development. The general point can be illustrated by considering a road built to a location where there are no resources at all, whether human or physical. The simple presence of the road (or a railway line) does not conjure economic development from nothing. On the other hand, where a potentially valuable economic resource already exists, whether human or physical, any major improvement in transport accessibility can result in the potential of such resources to be expressed;
- There is some evidence that the direction of causality between infrastructure development and GDP growth varies for different types of infrastructure. For example, the expansion of the paved roads network in South Africa seems to have had a ‘forcing effect’ on GDP growth. With rail and ports infrastructure, the evidence suggests that causality is stronger in the direction of GDP growth to the infrastructure capacity creation;
- Although this evidence could have significant policy implications for transport infrastructure investment priorities, Perkins (Perkins et al, 2005) emphasises that any policy decisions that may be based on it should be reviewed against cost-benefit appraisal results for individual projects;
- The policy implication for rail transport may be that major investments in new infrastructure or capacity should generally be considered only if they are linked to a secure high volume trade, where the economic benefits derive primarily from that trade and not from any wider economic impacts;
- Road transport on the other hand appears to be associated with a range of economic activities that go well beyond any initial economic activity with which an investment may have been associated and
- The policy implication for ports investment appears to be a matter of finding ways to ensure that handling capacity keeps pace with the growth of trade.

2.3.2 Extension and Review of Initial Analysis

2.3.2.1 South African Literature

Fedderke and Garlick (2008) point to a paucity of studies on the infrastructure-growth relationship in South Africa despite increased attention to the subject since 2003. Moreover, the emphasis has been heavily on economic infrastructure as is the case in international literature. They summarise these recent studies, and a summary of their summary is provided below.

The studies speak of the direction of the “forcing” or “driving” of the relationship rather than the direction of causality. In this sense, Perkins et al (2005) found that the direction of forcing varied among different types of infrastructure. In terms of transport sectors specifically, their results showed that

- Roads (total km, paved km, no. of passenger vehicles) drive GDP;
- GDP drives ports (freight volumes) and airports (passenger numbers) and
- The direction is ambiguous for rail.

Fedderke et al (2006) refined the analysis and came to similar conclusions except in respect of railway infrastructure – some parts were driven by GDP and for some parts the relationship was ambiguous.

Kularatne (2006) finds a positive relationship for infrastructure investment in South Africa from 1976-2002. Fedderke and Garlick (2008) conclude that recent studies using more sophisticated analytical techniques bear out the earlier findings of a positive relationship. However, they also found feedback effects from output to some forms of infrastructure, and a large measure of indirect relationship with increased infrastructure investment increasing fixed capital stock and productivity which in turn increased output. In particular, it was found that infrastructure stock has a positive effect on export performance which in turn has a positive effect on economic growth.

Fedderke and Garlick (2008) point out that the most consistent finding is that investment in roads has a "more robust impact on growth than other forms of physical infrastructure". They argue that the studies "provide some guidance to policy-makers regarding the relative importance of different types of infrastructure". However, they appear to qualify this by alluding to the findings of Perkins et al (2005) to the effect that a particular type of infrastructure may be especially crucial at a particular time and that sequencing, therefore, is important.

They conclude that there is a positive relationship between infrastructure and economic growth with

- Aggregate infrastructure stock and investment driving economic output;
- The driving relationship between economic output and infrastructure varying significantly across different types of physical infrastructure and
- Infrastructure affecting output both directly and indirectly via increased private investment, improved productivity and increased exports.

2.3.2.2 Comments on the Findings

These findings of the South African studies need to be carefully examined. The contention regarding the differential impact between the different sectors, in particular attributing a more robust impact to road than to rail or ports, requires scrutiny.

The analysis of Perkins (2003) summarised with figures in section 2.3.1, in revealing differential relationships to economic growth of investments in rail and road, fails to consider a fundamental attribute of infrastructure investment, namely, its lumpiness. Transport infrastructure often has to be provided in large, indivisible ("lumpy") amounts, examples being a railway, a new port berth or an airport runway. Moreover, there is a differential relationship between the role of the public and private sectors in the provision and operation of infrastructure among different modes. Omitting these factors skews the findings.

Let us first examine the impact of lumpiness. This is more important for railways than for roads. A railway has to be built to at least a single-track standard or not at all and, once constructed, can last almost indefinitely, provided it is well maintained. Modernisation in terms of signalling and so on is required from time to time, but expansion to double track may never be necessary. Thus, there was no reason for further investment in railways once the national network had been laid down by about 1930. The next need for additional capacity did not arise until the 1970s when the development of overseas markets for bulk mineral exports made it imperative to build the lines to Richards Bay and Saldanha. No wonder, then, that the figures in section 2.3.1 are shaped the way it is, but to draw inferences is disingenuous. Much the same argument may be applied to ports.

Road infrastructure is less lumpy – a road can be built to very low standards and then be upgraded to two-lane gravel with a design life of 20 years. There are regular upgrades thereafter, and this is a characteristic of the road sector. Rapid economic growth from 1946 onwards, together with the lifting of import controls on motor vehicles, spurred a massive road upgrading and paving programme from about the mid-1950s. GDP grew at a mean rate of 4.2% between 1946 and 1950, and 4.9% between 1951 and 1955. It averaged 5.7% over the period 1961 to 1970 and then fell to 3.7% between 1971 and 1975 and 3.1% between 1976 and 1980. All told, a sustained 30-year period of high GDP growth was maintained from 1946 to 1975. It may be argued that road investment responded to the needs of economic growth but did not lead it.

The statement about the tailing off of road investment from the mid-1970s preceding the decline in GDP growth also needs to be qualified. The reasons why growth fell were the continued interventionist policy of the government, the oil crisis of 1973, internal political unrest, the slowdown in the economies of major trading partners, and the growing sanctions and disinvestment campaigns (Maasdorp 2002). Thus, the economy was in decline quite independently of public investment in road infrastructure.

2.3.2.3 The Development of Transport Infrastructure

The history of transport is that the provision of infrastructure followed a modal sequence as new modes were being introduced over a long period of time as inventions occurred. Thus, rudimentary ports and roads preceded rail which was followed by more substantial ports, paved roads, airports and pipelines in that order. The transport sector in South Africa until the discovery in diamonds and gold in the second half of the 19th century was dominated by the ox wagon and, for international commerce, the maritime sector. Once the mineral wealth of the country had been uncovered, modern inland modes of transport were introduced, commencing with rail and being followed in the first quarter of the 20th century by road motor transport and airways.

Railways

The first wave of modern infrastructure investment in South Africa was related to railways, particularly during the period 1875 to 1930. Private enterprise constructed lines in the Durban and Cape Town areas from 1859 but these were soon taken over by the governments. The discovery of diamonds in 1867 and gold in 1886 triggered a railway-building period. The railway system was expanded systematically from the coast to the interior, and in 1916 the various railway and port administrations were merged into a single body, South African Railways and Harbours (SAR&H). The period of railway building petered out from about 1930 when the national network was reasonably comprehensive and the advent of motorised road transport made it no longer necessary to expand the rail system into remote rural areas. After 1930 the only investment required in the rail sector was not in expanding route km but in procuring locomotives and rolling stock in order to keep up with demand for goods and passenger traffic, thereby contributing to economic growth. Further demand for railway construction did not arise until the 1970s when the bulk mineral lines to Richards Bay and Saldanha were constructed.

The age of rapid railway development had ended by the time of the great depression (1929 to 1932). The development of road motor services under the control of the SAR&H meant that it was no longer necessary to construct railway lines into remote and sparsely populated rural areas where farmers and other producers could be served by road. Nonetheless, the volume of traffic carried by the railways continued to increase − from 11 188 million ton-km in 1929 to 37 209 million in 1959 (Houghton 1964).

Post-war railway expansion in South Africa has more or less been limited to the construction of the two bulk mineral lines to Richards Bay and Saldanha respectively. These lines together resulted in the track length increasing from 19 800 km in the early 1970s to 21 217 km in 1987. By the end of the 1990s the figure had fallen to 20 400 km with the closure a number of low-density branch lines.

The focus of South African railways has changed considerably over time. In the early years passenger services were as important as goods. There were separate passenger and goods train services and, in some remoter parts of the country, mixed trains. With greater industrialisation and urbanisation in the interior, the railway moved to becoming a general freight operator, conveying almost all goods together with a considerable share of passenger traffic. Once the road network developed and private vehicle ownership grew, the railways lost much of their passenger traffic. With the development of larger and more powerful trucks, the railways began to lose freight to roads, and to focus on the movement of bulk goods over long distances. This meant that the focus of the railways has been shifted towards conveying minerals, bulk agricultural products, and primary manufactured goods such as steel and chemicals. Large sections of the network have been closed as Transnet focuses on a small number of core lines carrying bulk traffic between the ports and the interior. Transnet has been willing to lose market share in the general cargo field, and has even relinquished bulk traffic such as timber to which rail is better suited than road. Total track length figures, therefore, do not reflect reality.

Rail's share of traffic was further eroded by the deregulation of the transport sector in 1988. The government protected its state-owned monopoly from competition from other modes, and moreover the railways became a heavily politicised institution, being an employer of last resort for poor whites from the 1920s onwards. This political interference meant that the railways were significantly overstaffed and, operating without the stimulus of competition, served a captive market which encouraged inefficiency. The railways became notorious for the poor quality of service, particularly in terms of speed. However, the competitive position of the railways has been severely compromised by the adoption of a highly flawed deregulation policy since 1988 which will be discussed in next sections.

Jones (2002) shows that the performance of rail transport between 1970 and 2000 closely followed that of ports, with rail showing the "same chronic bipolar disorder as the ports, with a bulk export infrastructure of genuine world class coexisting with a general cargo-handling network of increasing fragility".

Roads

The road network had its origin in footpaths and wagon tracks. Although improvements occurred from the mid-1800s, long-distance road transport gave way to rail in the last quarter of the nineteenth century and it was not until the introduction of motor vehicles that more substantial gravel roads were built. Large-scale paving took place after World War II, particularly from about the mid-1950s, and much of the network was subsequently redesigned and upgraded, culminating in the construction of toll roads from the 1980s on certain trunk routes.

The early roads were mainly crude tracks over the veld and carried wagon-loads of people and goods from the ports into the interior. Prior to the advent of motorised transport in the early 1900s, roads remained fairly rudimentary and carried animal-drawn vehicles such as wagons and carriages. The next stage of road development was in the hands of provinces and municipalities until the National Roads Board was established in the 1930s. This led to the establishment of a Road Fund in 1948 and the adoption of common road standards. The post-world War II boom and the lifting of import control in the 1950s led to a rapid expansion in the number of motor vehicles and to the implementation of a massive programme of road building, particularly in terms of tarring and upgrading the existing national roads system. The length of the network increased from 75 600 km in 1916 (when there was very little tarring) to about 180 300 km in 1959 of which about 16 000 km were tarred. Conditions for long-distance road travel improved, and there was a rapid increase in the motor-vehicle fleet from 40 000 (of which motor cycles accounted for as much as 40%) in 1920 to 391 000 in 1940 and 1 025 000 in 1958 when the fleet consisted mainly of cars (74%) and commercial vehicles (19%). From about 1965 onwards there were significant developments in heavy-vehicle technology, leading to ever bigger and more powerful rigs and other combinations, and trucks gradually gained a greater share of the freight traffic market despite being heavily restricted by the railway monopoly, e.g., in port cities such as Durban, cartage contractors were allowed to operate only within a radius of 30 miles of the harbour although this was gradually increased.

By the early 1980s the road network has been considerably improved in terms of standards which ranged from freeways through to toll roads. This further encouraged the movement of freight from rail to road, and in 2003 roads carried approximately 75% of total freight volumes in South Africa.

The road haulage industry has grown extremely rapidly since about 1970. This was when demands for greater competition in the freight market increased, and the restrictive permit system was eased although not abolished, enabling road haulage companies to convey goods over greater distances and acquire the new breed of articulated heavy vehicles which offered economies of scale. During the period 1978 to 1996, the distance which road hauliers were allowed to operate over without permits was increased, maximum permissible vehicle lengths were increased several times, the road permit system was abandoned in 1989, and the gross combination mass rose rapidly to its present level of 56 tons with an overloading tolerance of 5%, allowing effective payloads of 45 tons once axle-load limits were increased. Thus, road transport today carries the majority of freight traffic.

A weakness of the figures relating to total road length is that they do not reveal the standard or quality of the roads. In fact, a large proportion of the road network is in poor condition − something that will be discussed in greater length in the following sections.

Ports

Harbours represented the first real transport infrastructure investments in South Africa, but were developed in isolation until the establishment of the SAR&H. No new ports were built for over 100 years until the bulk mineral export ports of Richards Bay and Saldanha were opened in the 1970s. In 2009 another new port at Ngqura near Port Elizabeth was opened. Ports continue to be operated as a state-owned oligopoly.

Dickinson (1988) mentions that coastal shipping played an essential role in South African economic development, particularly after 1850. It reduced transport costs and encouraged the growth of markets. Prior to the introduction of a steamship coasting service in 1838, sailing ships had been used as coasters but the growth of the service was constrained by the seasonal nature of winds. The discovery of diamonds and gold led to increased demand for coastal shipping, and attracted new entrants. After the Durban-Witwatersrand railway was completed in 1895, the demand for cargo increased to such an extent that deep-sea liners engaged in international trade also carried on coastal trade. In 1852 a steam coaster service between Cape Town and Durban carried mail, and the first shipment of unrefined sugar was carried in 1861. The coaster services used various small ports including Port Shepstone and Port St Johns, but Port Shepstone was no longer used once the railway reached the town in 1901 and offered a speedier service. The protection of railways meant that the coaster service up to 1954 was largely confined to the transportation of sugar and paper. The lifting of railway protection in 1954 led to an expansion of coastal shipping, and general cargo accounted for an increasing fare of total volumes carried.

Jones (2002) points out that the construction of new deepwater ports at Richards Bay and Saldanha, both of which were opened in 1976, was undertaken in order to “propel South

African economy into a phase of export-led growth predicated on high volumes of low-value bulk staples". At the time, these two projects were the largest discrete infrastructural projects in South African history. Concurrently with the construction of these two bulk export ports, the existing ports were upgraded in order to handle the container revolution in international shipping. All these investments helped South Africa to become a major sea-trading nation by the end of the 20th century. South African port traffic increased rapidly from 40 million tons in 1969/70 to 80 million tons in 1977/78 and 186 million tons in 2000. The increases were attributable very largely to Richards Bay and Saldanha. Durban remained the largest general cargo port, but investment in general cargo facilities at South African ports was neglected and the facilities remained mediocre in sharp contrast to the world-class bulk facilities at Richards Bay and Saldanha. Nonetheless, Durban remains the leading multi-purpose general cargo port, and Richards Bay the most diversified bulk port, both in Africa and the Southern Hemisphere. Durban is the regional hub port from which trans-shipment traffic is distributed, and the harbour mouth is currently being widened in order that it may accommodate the largest container vessels. However, the port requires considerable investment in further expansion, but various blueprints for such expansion have not be ratified and there is no clarity as to where increased container-handling capacity will be provided in South Africa. Richards Bay has been mentioned as an alternative, while the new port at Nqura which opened in October 2009 has been developed as a deepwater port (but with only four berths) to handle container vessels and tankers.

The efficient role of ports in the South African economy is constrained by a number of policy weaknesses, notably the failure to expand general cargo-handling facilities. Jones (2002) further points out that, while the cost of using the ports is low for ships, it is high for cargoes. Marine charges (such as port dues and tug charges) have been relatively low, but cargo charges have grossly exceeded cost, principally because of the application of ad valorem wharfage. Jones regards this as an "economically inefficient pricing mechanism", resulting in container and general cargo terminals offering poor service at high cost.

Ships provided the only means of transport for overseas merchandise and passenger movements until an air service carrying mail and some passengers commenced in the 1930s, and remained the major carrier of passengers until the 1950s. Ships required investment in ports, and thus it was infrastructure investment in ports that allowed South Africa to engage in international trade and which made possible the development of exports, both agricultural and mineral. Perkins et al (2005) compare the growth rates of cargo volumes at the ports with GDP and find a long-run forcing relationship from GDP to cargo handled. This is only to be expected, however. Once the port is opened, the volume of cargo will depend on the demand for exports and imports which in turn depends on the state of the economy. However, without the port there would be no trade and hence no development of the economic sectors engaged in exports and imports. The expansion of the iron ore and coal mining in South Africa could not have taken place without investment in the new ports of Richards Bay and Saldanha.

2.3.3 Air Transport

Prior to World War II the larger municipalities constructed and operated aerodromes, sometimes with military assistance. It was only after South African Airways was established in 1934 that air traffic services were established on a regular basis. The role of air transport was to convey passengers, mail and small volumes of freight, mainly perishable goods. The advent of jet aircraft in the 1950s led to the development of international routes, and under the Civil Aviation Branch of the Department of Transport, international airports were developed at Johannesburg, Durban and Cape Town. In the 1980s the Airports Company of South Africa (ACSA) was established to operate nine regional airports on behalf of the Department of Transport. The monopoly of SAA was broken when air transport was deregulated in the late 1980s, and competition from other operators, including budget airlines, has offered greater consumer choice and lower fares. Most airfreight is in the form of belly cargo in international passenger aircraft, conveying low-weight, high-value goods to and from overseas markets. The role of air transport in economic growth has been mainly in the facilitation of business traffic, domestically and internationally, rather than in the field of freight.

There has been a rapid growth of international and domestic air travel, with both having doubled over the period 1996 to 2003. Most airports have been upgraded, particularly in respect of terminal buildings, over the last 15 years, while a new airport is being constructed at La Mercy north of Durban. Private interests constructed the Kruger Mpumalanga International Airport near Nelspruit in the early 2000s. Tied in with the construction of La Mercy airport is that of a dedicated freight-handling division known as the Dube Trade Port. This is an attempt to introduce into South Africa the equivalent of “logistics platforms” found in Europe and North America.

South Africa was well entrenched in the international trading system prior to the age of jet travel, but in order to remain competitive it was necessary for the aviation sector to be developed rapidly. It was massive investment in airports and aircraft fleets that allowed business travel and the development of markets for low-volume, high-value goods (including perishables) that were carried mainly as belly cargo in passenger aircraft but also in special air freighters. The long-term forcing relationship from GDP to the number of passengers transported by SAA (only one of the commercial airlines operating on the domestic and international routes) found by Perkins et al (2005) is not unexpected: investment in the aviation sector was in response to new forces at work in the global travel market as a result of technological advances in the aircraft industry.

2.3.4 Pipelines

Pipelines are the safest and most economic way to transport fuel. Pipeline infrastructure to convey petroleum products was introduced in the 1960s under the control of the SAR&H, and today pipelines serving the liquid fuel industry are mainly operated by Petronet. The current length of pipelines is about 3 900 km.

Crude oil and refined products were transported by rail until 1962. The first pipeline, 700 km from Durban to the Witwatersrand, was opened in 1962. Extensions of the early network were made in the 1980s to Rustenburg, while in the last ten years the system has also transported gas. The crude oil pipeline from Durban to Coalbrook was commissioned in 1969, and a refined products pipeline was added in 1971 with a further addition in 1979. In 1972 a shorter pipeline for the transport of jet fuel was constructed from Coalbrook to Johannesburg airport. One of the crude oil pipelines was converted to transport coal gas from Sasolburg to KwaZulu-Natal in 1996. Refineries at Sasolburg and Secunda produce gas from coal, and Sasol operates a pipeline network of 1 550 km to serve customers in the inland provinces as well as KwaZulu Natal. Secunda is connected to gasfields in Mozambique by a 865 km pipeline which commenced operation in 2004, the major shareholders being Sasol and the governments of South Africa and Mozambique.

Transnet is building a R 12.7 billion, 670 km multi-product pipeline from Durban to Gauteng to open in 2011, while Petroline is constructing a 400 km petroleum products pipeline from Maputo to Kendal in Mpumalanga where it will join the Transnet system. It will also open in 2011. The existing Durban-Gauteng pipeline is running at full capacity (4 billion litres per annum), and expensive and inefficient rail and road transport is now carrying 2 billion litres per annum (Business Day 1 June 2009).

2.3.5 Transport in GDP and Employment

Statistics SA provided information on the contribution of the transport sector to GDP and employment. Between 2000 and 2006 the contribution of transport to GDP showed a marginal upward trend around a median of 5.7%. This compares well with the average of 5 to 6% of GDP in other countries referred to in previous sections.

Employment in the transport sector has been hit by the economic recession, and 30 000 jobs having been lost between the first and second quarters of 2009. Total employment in the sector fell from 774 000 in the fourth quarter of 2008 to 757 000 in the first quarter and 727 000 in the second quarter of 2009. Of total employees in transport in the second quarter of 2009, 531 000 (or 73%) were in the formal sector and 196 000 (27%) in the informal sector. The majority of employees in transport were males (79%).

Between 1993 and 2008 the median contribution of transport to the total South African compensation of employees was 7.6% annually. However, the trend was consistently downwards from 8.2% in 1993 to 6.7% in 2008. When compared to the transport sector’s contribution of 5.4% of total employment in South Africa, average salaries and wages in the sector are clearly higher than the average across all sectors.

2.4 Effects of Regulatory, Institutional and Policy Environment

The role of transport in the economy is affected by the regulatory, international and policy environment in which the sector functions. This environment historically has been inimical to the operation of an efficient transport sector.

2.4.1 Protection of Railways

As mentioned in previous sections, railways and ports were under state control from an early stage of their development. The establishment of the SAR&H led to railways and ports being under a single state authority, and in addition the SAR&H operated a monopolistic road motor service. The RMS complemented but did not compete with the railways, the policy being to protect railway traffic against competition from other modes. This included coastwise shipping. The results of this protectionist policy were to stunt the development of a road freight industry and coastwise traffic. The SAR&H subsequently also took control of air transport, so that it controlled and operated the railways, harbours, air transport and the bulk of road motor transport.

Dickinson (1988) described the effects of rail protection on the development of the coastal shipping industry. The Competitive Railway Rates were carried over from the Cape Colony into the Union of South Africa, and involved charging railway rates lower than coastwise shipping rates. The rationale was to retain traffic for the underutilised railway rolling stock capacity, and these lower rates attracted high-tariff goods traffic such as foodstuffs and liquor. Coastal shipping was left with low-tariff bulk cargoes, mainly sugar and paper. The Competitive Railway Rates were abolished in 1954. Up to 1954 volumes of coastwise sea traffic depended largely on the demand for sugar from fruit canners in the southern and Western Cape. Once the Competitive Rates were abolished in 1954, cargo migrated to the maritime sector and coastal shipping activities expanded rapidly. More vessels were acquired and schedules were rationalised. In the 1960s the direction of coastal trade remained unbalanced, and little cargo could be obtained for return voyages from Cape Town to Durban.

2.4.2 Deregulation

The National Transport Policy Study (NTPS) during the 1980s examined the liberalisation and deregulation of the transport sector. As a result of the NTPS, the decision was made to abandon the road permit system with effect from 1989. The freight transport system was deregulated, allowing road transport to compete openly with rail.

When the decision to deregulate was made, it was stipulated that a Road Transport Quality System (RTQS) would be implemented, imposing strict standards with regard to vehicle roadworthiness, training of drivers, control of overloading, and in general greater traffic policing. However, deregulation proceeded without the implementation of the RTQS. What the failure to implement the RTQS did was “to destroy equitable intermodal competition, and to threaten the survival of the economy’s road infrastructure. The story of South African road transport since 1970 is consequently largely a story of regulation, its relaxations and its mismanagement” (Jones 2002).

Another important aspect of the deregulation policy that has not been implemented is the recovery of full user charges for road transport. One reason for the decline of rail freight transport has been “the emergence of a road freight industry based on prices that are emphatically wrong, in so far as heavy freight vehicles systematically underpay for the use of the road infrastructure" (Jones 2002). The result is that the market fails to give the right price signals, particularly with regard to externalities.

South Africa today has underutilised rail infrastructure, much of the network having been allowed to fall into disuse, while road infrastructure is deteriorating rapidly. Most of the road network was constructed before the end of the 1970s, and certainly before new articulated combinations were introduced onto South African roads. The road network in general, with the exception of toll highways, was not constructed to handle these heavy-vehicle combinations, but heavy vehicles are not restricted to any designated routes. Apart from some bridge restrictions on certain rural roads, heavy vehicles have untrammelled access to any road in South Africa. With overloading being rife, severe damage is inflicted to the road surfaces. The Financial and Fiscal Commission reported that the poor state of the roads cost vehicle owners R 20 million per annum in extra fuel and vehicle maintenance costs (Daily News 1 June 2009).

The DBSA report (2006) points out that, while the national road network and some provincial roads in Gauteng remain in a stable condition, the remainder of the network continues to decline. This is attributed partly to the shortage of funding on the part of provincial authorities, but very largely to damage inflicted by heavy vehicles on an ageing and inadequate road system. The DBSA points to severe overloading by heavy vehicles have led to major structural damage on certain routes. Despite this, extra-long timber trucks were introduced onto inadequate roads in KwaZulu-Natal in September 2009 to convey cargo previously on rail but rejected by Transnet.

The KwaZulu Natal overloading report showed that of the 200,030 vehicle weighings at KZN DoT weighbridges during 2008,18% of them were overloaded, one by 24.1 tonnes. Heavy vehicles avoid the tolls and weighbridges and damage alternative routes of lower standard.

A recent press report points out that the number of trucks on the roads has risen from 200 000 in 2000 to about 300 000 in 2009. The low level of skills in maintenance and law enforcement is a problem, and truck accidents and fatalities have increased and are considerably higher than in the United Kingdom, United Status of America, Canada and Australia (Business Day 9 Sept, 2009).

2.5 THE NEED TO APPRAISE NEW INVESTMENTS

Although investment in transport infrastructure is in general likely to have a positive impact on economic growth, this may not necessarily be the case for each individual investment project. Not only may the project not produce acceptable rates of return but its timing may be wrong or it may not be the best alternative available.

2.5.1 Cost-Benefit Analysis

Given the importance attached to infrastructure investment by the Accelerated and Shared Growth Initiative in South Africa (ASGISA), it is clearly desirable that the limited funds available for such investment are utilised efficiently. This means that they need to be directed to the most economically viable projects. Thus, each project should be subjected to thorough appraisal. This can be done using well-established techniques of cost-benefit analysis (CBA) which have been widely used by the World Bank and other funding agencies since the 1960s to determine whether a particular project should be funded or not. CBA results are shown in the form of net present values (NPV), internal rates of return (IRR) or benefit/cost ratios (BCR). Usually both a financial and an economic analysis are required − the former to show the impact on the finances of the implementing agency, i.e., the project's commercial viability, and the latter to show the impact on society.

There are various manuals of CBA which are available, and a number have in fact been prepared for public-sector projects in South Africa. The intricacies of CBA do not require to be repeated here, but an example of project appraisal of a proposed toll road bypassing a town is discussed for illustrative purposes. The project would be compared with a "do-nothing" base case. In the financial analysis the cash flows of the administering agency are analysed. The cost side covers capital outlays, amortisation, and maintenance and operating costs, while the benefits consist of the revenue streams from toll fees. In the economic analysis, the costs consist of capital and maintenance while the benefits conventionally consist of savings in vehicle operating costs, time and accident costs. Shadow prices are used in the economic analysis in order to show the real resource costs, and are arrived at by subtracting transfers (such as fuel, customs duties on imported items, and VAT) and adjusting labour costs especially in respect of unskilled labour. The composition of benefits will vary across the modes but the principles remain the same. Future costs and benefits are discounted back to the base year of the project.

In any CBA there are some unquantifiable costs and benefits. Environmental costs, for example, are difficult to quantify. Nevertheless, such items need to be listed and the consultant needs to indicate their importance.

2.5.2 Social Accounting Matrix

Another quantitative technique which may be useful is the social accounting matrix (SAM). This is a device for showing the direct, indirect and induced macroeconomic impacts of a project. Performance criteria are GDP (for assessing the contribution to economic growth), capital formation (to indicate the demand for scare resources), employment creation (to indicate the impact on income distribution), low-income household income (to indicate the impact on poverty relief) and a series of social indicators. Direct impacts are the impacts on the particular sector itself; indirect impacts are impacts on other sectors that supply inputs and induced impacts are those which result from the remuneration of employees in the particular sector and sectors indirectly linked through the supply of inputs. Remuneration leads to increased demand for goods supplied by other economic sectors.

2.5.3 Social Costs

Different transport modes impose different costs on society. Social costs are often referred to as externalities and, unless they are recovered in full from transport infrastructure users, they can distort the intermodal allocation of traffic. This issue is particularly pertinent to the question of competition between road and rail for freight.

It is well known that road transport imposes higher social costs than does rail transport. Its environmental impacts are greater, largely because of its greater demands on land. New road construction is often at odds with the environment, and is opposed by environmental lobbies. Other forms of social costs are:

- Vehicle emissions which are important contributors to air pollution. The World Bank (1994) points out that vehicles account for up to 95% of lead contamination and that, in Central and Eastern Europe, road transport accounted for 30 to 40% of total emitted nitrogen oxides and hydrocarbons;
- Noise pollution and
- Accidents. In many developing countries road accidents are the first or second most important cause of death.

The mitigation of externalities involves considerable public outlays. Examples of these are:

- Traffic policing to control speeds, improve road safety, reduce accidents, control heavy-vehicle overloading, check licensing of vehicles and drivers. All these aspects require elaborate bureaucratic structures in provincial and local government;
- Promoting energy-efficient technologies such as the imposition of congestion costs on motor vehicles in urban areas;
- Introducing pollution premiums on road users;
- Investing in automated traffic controls in order to improve traffic flows and road safety and
- Road safety campaigns involving advertising.

In South Africa the question as to whether road users pay the full charges of using the road infrastructure is controversial. An underfunded study to quantify heavy-vehicle externalities was made in 2000, and concluded that there was perhaps a 15% under-recovery (Gaffen et al 2000). However, because of the underfunding, the coverage of the study was far from comprehensive, and hence the estimate was too low. Jones (2002) believes that the market mechanism is “so distorted by externalities that the resultant pattern of resource allocation threatens the sustainability of both the road infrastructure and the rail system”. Available evidence points to an over-recovery from light vehicles and an under-recovery from heavy vehicles.

On certain toll highways such as the N3 between Durban and Pietermaritzburg, the inside lane has had to be specially rebuilt and strengthened in order to deal with damage inflicted by heavy vehicles on the ordinary surface. Since large volumes of heavy vehicles require strengthened surfaces in order to obviate damage to the roads, it follows that the cost of providing that strengthened surface should be recovered from heavy vehicles. It is highly unlikely that this is the case in South Africa when the ratio of toll fees paid by heavy vehicles to those paid by light vehicles is considered. Moreover, accident costs attributable to heavy vehicles are not levied on the particular heavy vehicle involved, and the absence of an adequate policing network and weighbridge control system allows road hauliers to overload with impunity. In September 2009, 200 road haulage firms guilty of overloading were “named and shamed” on the front page of a Durban newspaper (Mercury, 7 September 2009). The practice is rife, and since it involves the breaking of laws, represents a criminal act. By contrast, if axle-loads on rail are exceeded, the result is track failure and derailment; hence there is an inbuilt policing function in the rail freight sector.

The question of externalities has received serious attention in Europe, and should be taken into account in assessing the economic role of transport. Thus, the project appraisal process should include, if not quantification, then at least an examination of the likely magnitude of social costs.

2.6 CONCLUSION

As was stated in section 2.1, transportation is a basic human activity without which there would be no travel or trade of any kind. An economist, therefore, would almost intuitively expect there to be a positive relationship between investment in transport infrastructure and economic growth. However, infrastructure investment is far too narrow a focus in any examination on the role of transport in the economy. Such a focus omits transport services and the inter-industry linkages which are integral parts of transport's overall economic role. The role of transport cannot simply be proxied by public investment or public capital stock in the sector and the statistical relationship of that investment and stock to GDP.

Although the findings of empirical research that the infrastructure-growth relationship is positive, the direction of causation is likely to vary from time to time and from investment to investment. Time lags between investments and their influence on growth also need to be considered. Lumpy investments provide capacity for decades before further investment is called for, while investments that are less lumpy require regular additions. Graphs purporting to show the relationship of lumpy (rail and port) and less lumpy (road) infrastructure investments to GDP are therefore guaranteed to have different shapes with different inferences being drawn.

The performance of transport in terms of efficiency also needs to be considered and this impinges on policy issues. And, although one might expect in general a positive relationship between transport investment and GDP, this does not necessarily hold for individual projects. Each proposed project needs to be appraised using cost-benefit analysis and also perhaps social accounting matrix models in order to determine its economic impact, while externalities are important in comparing the overall impact on society of investments in alternative transport modes.

All in all, the basic theme recurs: there can be no economic growth without transport but there is no magic in transport.

3. DEMOGRAPHIC FORECASTS

TOR requirements:

"The Consultant should postulate a number of different rates of natural and immigration and with the use of a proven state of the art predictive model, project population growth and identify possible population centroids and demand in order to facilitate forward planning for the supply of infrastructure facilities, rolling stock and equipment to both urban and rural areas".

3.1 INTRODUCTION

Global Insight Southern Africa (Pty) Ltd and the Bureau of Market Research (BMR) at the University of South Africa (UNISA) were appointed by the Department of Transport to develop future demographic scenarios for South Africa. This was necessary in order to have a uniform set of projections that could serve as input to the transportation demand model. By using various state of the art predictive models, projections were developed at a national level, followed by provincial and municipal levels.

The methodology applied, to develop the population and economic projections, was briefly described in the Phase 2 report. In short, factors such as the tracking of age groups over time, fertility rates, birth rates, migration rates, HIV Prevalence rates etc. were taken into account. For more detail the reader is referred to the original report dated February 2008: "Economic Scenario Projections for the National Transport Master Plan for South Africa 2005-2050".

Three different development scenarios were postulated in order to see the difference between a more rural development strategy versus a more urban orientated development strategy.

A brief description of the Scenarios follows:

LOW/RED

- Decentralised population growth by assuming lower inter-provincial migration than the migration measured between 1991 and 2001;
- High HIV/AIDS, which results in lower life expectancy and
- Lower outflow of people from rural provinces.

MIDDLE/BASELINE/BLUE

- Inter-provincial migration rates at the same level as we have measured between 1991 and 2001 and
- HIV/AIDS assumptions of greatest likelihood.

HIGH/GREEN

- Centralised population growth by assuming higher inter-provincial migration and resulting urbanisation. For the period 2002-2007, the inter-provincial migration streams of the Community Survey 2007 were assumed, after which the figures decline to levels slightly higher than the Census 2001 inter-provincial migration streams;
- Low HIV/AIDS; Higher anti-retroviral treatment roll-out to patients;
- Higher international in-migration and
- Higher outflow of people from “rural” provinces, those without a metropolitan area.

This chapter will describe the three scenarios per District Municipality in terms of actual numbers and growth rates. The results of the three scenarios will also be related to the issues identified in Phase 1. The discussion will focus on the following salient demographic features and strategic economic and development planning indicators:

- Population;
- Employment Status and
- Sectoral Employment.

A more detailed breakdown of the projections (per Local Municipality and centroid) is provided in the Annexure of the Phase 2 report and database. These served as input to the transportation model.

3.2 IMPLICATIONS OF THREE SCENARIOS

3.2.1 Population

Table 3.2.A, Figure 3.2.A and **Figure 3.2.B** show the expected distribution of people per District Municipality as postulated by the three scenarios.

Table 3.2.A: Population per Scenario in KwaZulu-Natal District Municipalities, 2005, 2025, 2050

DISTRICT	HIGH (Green) SCENARIO						MIDDLE (Blue) SCENARIO						LOW (Red) SCENARIO					
	2005	%	2025	%	2050	%	2005	%	2025	%	2050	%	2005	%	2025	%	2050	%
Ugu	715,895	7	802,049	7	962,353	7	710,873	7	761,805	7	899,264	7	709,564	7	724,880	7	806,799	7
uMgungundlovu	956,361	10	1,058,794	9	1,209,850	9	948,935	10	1,006,219	9	1,129,420	9	947,548	10	970,123	9	1,059,319	9
Uthukela	708,480	7	844,577	7	1,010,925	8	703,351	7	802,851	7	944,586	8	701,965	7	764,892	7	850,914	8
Umzinyathi	479,522	5	522,000	5	636,832	5	476,834	5	495,813	5	595,112	5	476,042	5	470,105	5	523,270	5
Amajuba	496,024	5	582,490	5	710,523	6	492,332	5	551,942	5	664,027	6	491,379	5	522,934	5	592,352	5
Zululand	803,266	8	909,861	8	1,120,981	9	797,732	8	863,693	8	1,047,849	9	796,089	8	817,316	8	914,315	8
Umkhanyakude	596,234	6	674,042	6	795,483	6	592,065	6	643,501	6	743,550	6	590,795	6	614,731	6	669,505	6
Uthungulu	941,132	9	1,090,696	10	1,274,127	10	934,192	9	1,039,827	10	1,190,869	10	932,367	9	996,744	10	1,093,157	10
iLembe	565,613	6	616,937	5	738,204	6	561,523	6	585,700	5	689,530	6	560,535	6	559,297	5	617,616	5
Sisonke	478,806	5	558,798	5	678,777	5	476,165	5	530,527	5	633,933	5	475,446	5	503,934	5	563,095	5
eThekwini M M	3,303,027	33	3,624,892	32	3,715,566	29	3,275,847	33	3,460,192	32	3,462,472	29	3,273,288	33	3,427,988	33	3,564,561	32
KZN TOTAL	**10,044,361**	**100**	**11,285,136**	**100**	**12,853,620**	**100**	**9,969,849**	**100**	**10,742,069**	**100**	**12,000,610**	**100**	**9,955,019**	**100**	**10,372,942**	**100**	**11,254,902**	**100**

DISTRICT	HIGH (Green) SCENARIO					MIDDLE (Blue) SCENARIO					LOW (Red) SCENARIO				
		2005 - 2025		2025 - 2050			2005 - 2025		2025 - 2050			2005 - 2025		2025 - 2050	
Ugu		0.6%		0.7%			0.3%		0.7%			0.1%		0.4%	
uMgungundlovu		0.5%		0.5%			0.3%		0.5%			0.1%		0.4%	
Uthukela		0.9%		0.7%			0.7%		0.7%			0.4%		0.4%	
Umzinyathi		0.4%		0.8%			0.2%		0.7%			-0.1%		0.4%	
Amajuba		0.8%		0.8%			0.6%		0.7%			0.3%		0.5%	
Zululand		0.6%		0.8%			0.4%		0.8%			0.1%		0.4%	
Umkhanyakude		0.6%		0.7%			0.4%		0.6%			0.2%		0.3%	
Uthungulu		0.7%		0.6%			0.5%		0.5%			0.3%		0.4%	
iLembe		0.4%		0.7%			0.2%		0.7%			0.0%		0.4%	
Sisonke		0.8%		0.8%			0.5%		0.7%			0.3%		0.4%	
eThekwini M M		0.5%		0.1%			0.3%		0.0%			0.2%		0.2%	
KZN TOTAL		**0.6%**		**0.5%**			**0.4%**		**0.4%**			**0.2%**		**0.3%**	

Source: Global Insight SA, 200

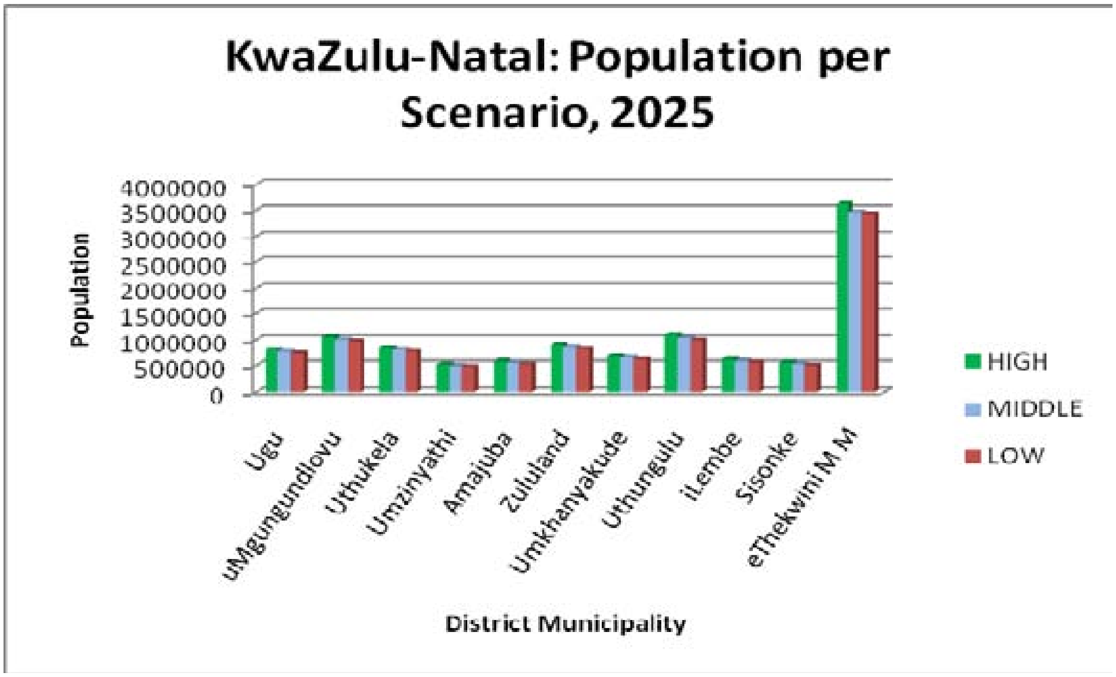


Figure 3.2.A: Population per Scenario in KwaZulu-Natal District Municipalities, 2025

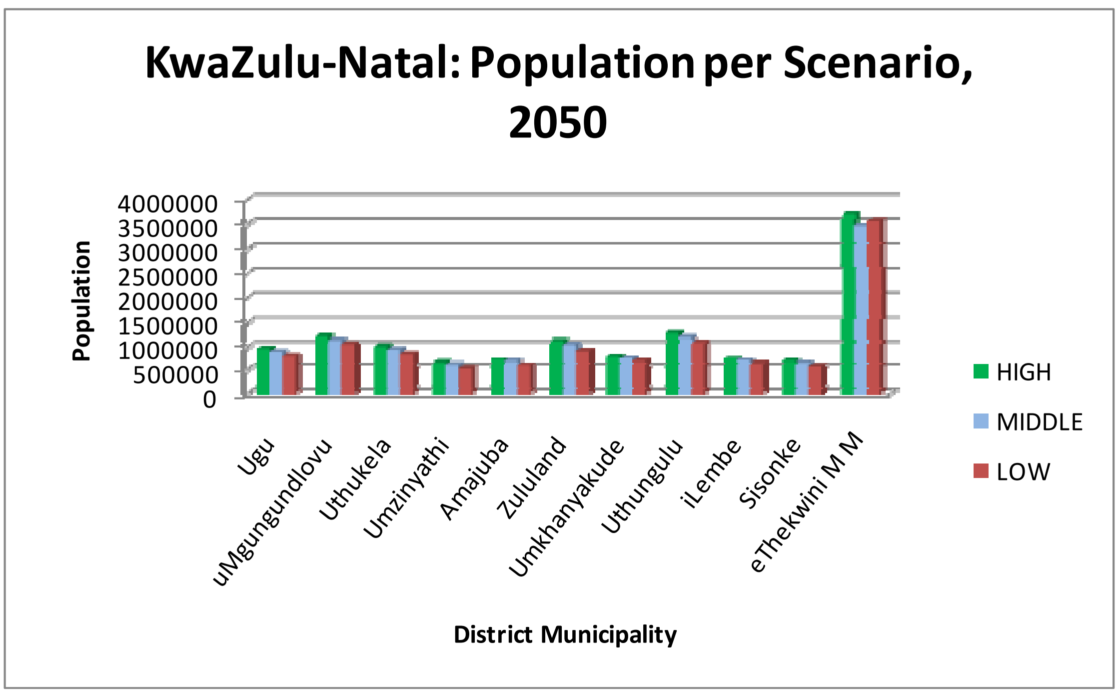


Figure 3.2.B: Population per Scenario in KwaZulu-Natal District Municipalities, 2025

The Province is characterized by an extensive mosaic of scattered rural settlements and villages. Vast numbers of these settlements and villages occur within the Zululand, Umkhanyakude, Umzinyathi and Ugu District Municipalities. The presence of villages, informal settlements, and formal urban areas increase towards the coastline with the most significant urban conurbation being located within the eThekwini Metropolitan Municipality (33% of the population).

Following from the above the following issue was identified in Phase 1 of the report:

The dispersed settlement pattern of the Province hinders the effective and sustainable provision of public transport in the rural areas.

From **Table 3.2.A, Figure 3.2.A** and **Figure 3.2.B** it is evident that the total population of KwaZulu-Natal is expected to be in the order of 12,85 million by 2050 in the High Scenario, versus 11,25 million in the Low Scenario, a difference of 1,6 million. The low scenario assumed a lower outflow of people from the rural villages, while the high scenario assumed a higher inflow of people from other provinces resulting in higher urbanisation rates.
Despite the different assumptions, it seems, however, that the dispersed settlement pattern of villages will to a large extent, continue in future.

Maps 3.2A-D and **Table 3.2.B** display the existing and expected population density per District Municipality and Local Municipality.

Table 3.2.B: Population Density by District Municipality, 2005, 2050

DISTRICT MUNICIPALITY	Area	HIGH (GREEN) SCENARIO		MIDDLE (BLUE) SCENARIO		LOW (RED) SCENARIO	
		Density (pop/ha)		Density (pop/ha)		Density (pop/ha)	
	(ha)	2005	2050	2005	2050	2005	2050
Ugu	506,326	1.41	1.90	1.40	1.78	1.40	1.59
uMgungundlovu	896,457	1.07	1.35	1.06	1.26	1.06	1.18
Uthukela	1,136,730	0.62	0.89	0.62	0.83	0.62	0.75
Umzinyathi	862,005	0.56	0.74	0.55	0.69	0.55	0.61
Amajuba	693,673	0.72	1.02	0.71	0.96	0.71	0.85
Zululand	1,488,570	0.54	0.75	0.54	0.70	0.53	0.61
Umkhanyakude	1,390,860	0.43	0.57	0.43	0.53	0.42	0.48
Uthungulu	824,332	1.14	1.55	1.13	1.44	1.13	1.33
iLembe	328,022	1.72	2.25	1.71	2.10	1.71	1.88
Sisonke	1,116,420	0.43	0.61	0.43	0.57	0.43	0.50
eThekwini MM	229,973	14.36	16.16	14.24	15.06	14.23	15.50
KwaZulu-Natal	**9,473,368**	**1.06**	**1.36**	**1.05**	**1.27**	**1.05**	**1.19**

From the above it is evident that eThekwini will remain the major population centroid in KwaZulu-Natal with an expected density of 16,16 people/ha in the high scenario or 15,5 people/ha in the Low Scenario (2050). The rest of the province is sparsely populated with less than two persons per hectare. The district of iLembe is expected to become a little more denser by 2050 (High Scenario).

3.2.2 Employment Status

The following issues were identified in Phase 1:

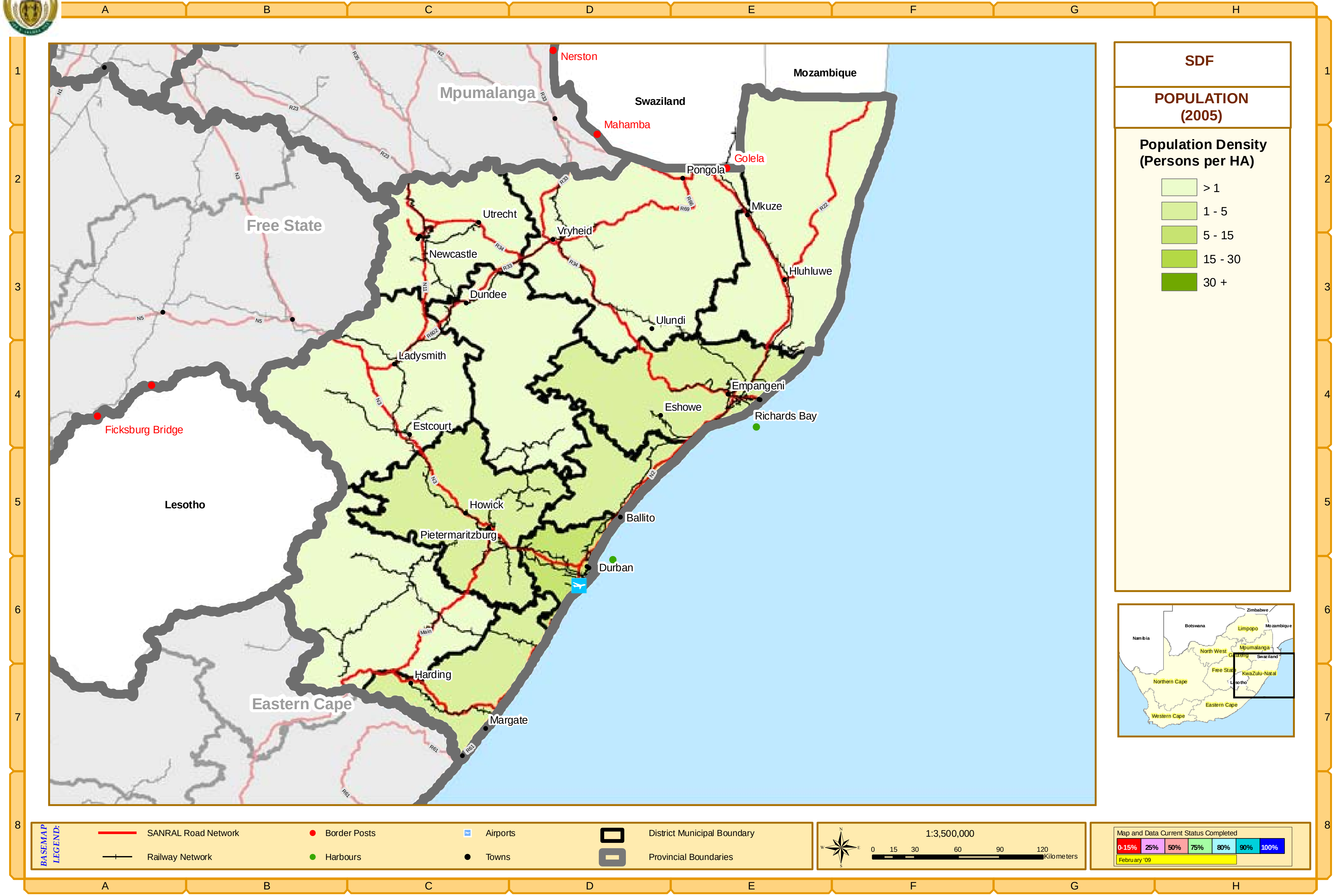
- **Only one third (3.2 million) of the population is economically active which is lower than the average for South Africa, namely 37%.**
- **According to Census 2001, nearly half (1,5 million) of the economically active population was unemployed. The eThekwini Metropolitan Municipality registered the lowest unemployment rate (43%), whereas the highest was found in the Umkhanyakude District Municipality (63%). The largest number of unemployed people (591 000) was however registered in the eThekwini Metropolitan area.**

Large parts of KwaZulu-Natal are gripped by persistent poverty, high levels of unemployment and a high HIV/AIDS infection rate.

From **Table 3.2.A** and **Figure 2.3.A** it is evident that if the outcome of the High or Middle Scenarios could be achieved in future chances are better, compared with the Low Scenario, to lower the unemployment rate.

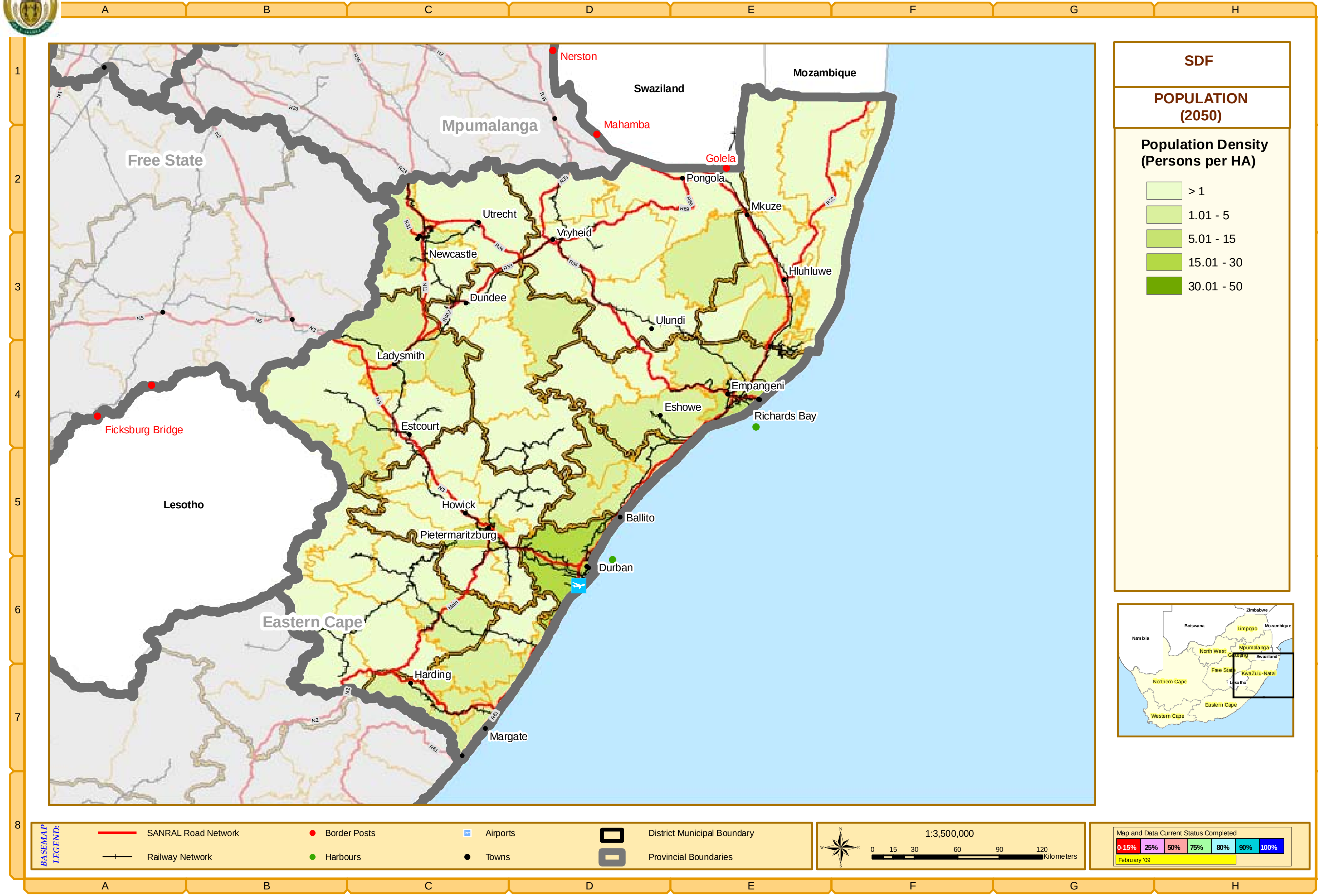
The average unemployment rate for KwaZulu-Natal is expected to decline to a low 9% and 10% in the High and Middle Scenarios respectively by 2050, and to 24% in the Low Scenario.

Kwazulu Natal Province: POPULATION DENSITY PER DISTRICT MUNICIPALITY (2005)



MAP 3.2A Population Density per District Municipality (2005)

Kwazulu Natal Province: POPULATION DENSITY PER LOCAL MUNICIPALITY - 2050 (HIGH SCENARIO)



MAP 3.2B Population Density per Local Municipality -2050 (High Scenario)

Kwazulu Natal Province: POPULATION DENSITY PER LOCAL MUNICIPALITY - 2050 (MIDDLE SCENARIO)

SDF

POPULATION (2050)

Population Density (Persons per HA)

- > 1
- 1.01 - 5
- 5.01 - 15
- 15.01 - 30
- 30.01 - 50

LEGEND:

SANRAL Road Network		Border Posts		Airports		District Municipal Boundary	
Railway Network		Harbours		Towns		Provincial Boundaries	

1:3,500,000

0 15 30 60 90 120 Kilometers

Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 3.2C Population Density per Local Municipality -2050 (Middle Scenario)

Kwazulu Natal Province: POPULATION DENSITY PER LOCAL MUNICIPALITY - 2050 (LOW SCENARIO)

SDF

POPULATION (2050)

Population Density (Persons per HA)

- > 1
- 1.01 - 5
- 5.01 - 15
- 15.01 - 30
- 30.01 - 50

BASEMAP LEGEND:

	SANRAL Road Network		Border Posts		Airports		District Municipal Boundary
	Railway Network		Harbours		Towns		Provincial Boundaries

1:3,500,000

0 15 30 60 90 120 Kilometers

Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 3.2D Population Density per Local Municipality -2050 (Low Scenario)

Table 3.2.C: Employment Status per Scenario in KwaZulu-Natal District Municipalities, 2005, 2025, 2050

DISTRICT MUNICIPALITY	HIGH (Green) SCENARIO								
	2005			2025			2050		
	ECONOMICALLY ACTIVE			ECONOMICALLY ACTIVE			ECONOMICALLY ACTIVE		
	EMPLOYED	UNEM-PLOYED	TOTAL	EMPLOYED	UNEM-PLOYED	TOTAL	EMPLOYED	UNEM-PLOYED	TOTAL
Ugu	104,424	89,768	194,192	163,697	64,060	227,757	205,500	30,724	236,224
(%)	54%	46%	100%	72%	28%	100%	87%	13%	100%
uMgungundlovu	199,046	167,293	366,339	309,077	95,796	404,873	390,405	46,184	436,589
(%)	54%	46%	100%	76%	24%	100%	89%	11%	100%
Uthukela	77,490	96,187	173,678	114,933	54,639	169,572	140,496	21,709	162,205
(%)	45%	55%	100%	68%	32%	100%	87%	13%	100%
Umzinyathi	29,310	59,229	88,539	47,484	37,044	84,528	56,459	13,153	69,612
(%)	33%	67%	100%	56%	44%	100%	81%	19%	100%
Amajuba	94,946	76,831	171,777	147,478	46,542	194,021	185,192	22,472	207,663
(%)	55%	45%	100%	76%	24%	100%	89%	11%	100%
Zululand	58,537	107,356	165,893	88,481	59,122	147,603	105,053	20,997	126,049
(%)	35%	65%	100%	60%	40%	100%	83%	17%	100%
Umkhanyakude	36,793	62,848	99,641	57,240	37,431	94,671	68,623	13,718	82,341
(%)	37%	63%	100%	60%	40%	100%	83%	17%	100%
Uthungulu	123,406	117,028	240,434	193,710	70,231	263,941	244,235	32,938	277,173
(%)	51%	49%	100%	73%	27%	100%	88%	12%	100%
iLembe	105,128	65,321	170,449	167,884	58,653	226,536	211,763	31,481	243,244
(%)	62%	38%	100%	74%	26%	100%	87%	13%	100%
Sisonke	44,157	55,769	99,926	60,202	29,847	90,049	71,072	11,376	82,448
(%)	44%	56%	100%	67%	33%	100%	86%	14%	100%
eThekwini M M	944,640	552,540	1,497,180	1,533,377	257,762	1,791,139	1,986,255	139,174	2,125,429
(%)	63%	37%	100%	86%	14%	100%	93%	7%	100%
KZN TOTAL	**1,817,876**	**1,450,172**	**3,268,048**	**2,883,564**	**811,128**	**3,694,692**	**3,665,052**	**383,927**	**4,048,979**
(%)	56%	44%	100%	78%	22%	100%	91%	9%	100%

DISTRICT MUNICIPALITY	MIDDLE (Blue) SCENARIO								
	2005			2025			2050		
	ECONOMICALLY ACTIVE			ECONOMICALLY ACTIVE			ECONOMICALLY ACTIVE		
	EMPLOYED	UNEM-PLOYED	TOTAL	EMPLOYED	UNEM-PLOYED	TOTAL	EMPLOYED	UNEM-PLOYED	TOTAL
Ugu	104,424	89,768	194,192	151,843	72,320	224,163	197,730	32,617	230,348
(%)	54%	46%	100%	68%	32%	100%	86%	14%	100%
uMgungundlovu	199,046	167,293	366,339	285,652	109,323	394,975	371,936	46,177	418,113
(%)	54%	46%	100%	72%	28%	100%	89%	11%	100%
Uthukela	77,490	96,187	173,678	106,876	61,109	167,986	135,699	23,327	159,026
(%)	45%	55%	100%	64%	36%	100%	85%	15%	100%
Umzinyathi	29,310	59,229	88,539	43,714	41,484	85,198	54,424	14,737	69,161
(%)	33%	67%	100%	51%	49%	100%	79%	21%	100%
Amajuba	94,946	76,831	171,777	137,611	52,143	189,754	179,194	23,457	202,651
(%)	55%	45%	100%	73%	27%	100%	88%	12%	100%
Zululand	58,537	107,356	165,893	81,723	65,983	147,707	101,060	23,082	124,142
(%)	35%	65%	100%	55%	45%	100%	81%	19%	100%
Umkhanyakude	36,793	62,848	99,641	52,936	42,095	95,031	66,032	14,917	80,950
(%)	37%	63%	100%	56%	44%	100%	82%	18%	100%
Uthungulu	123,406	117,028	240,434	178,775	79,690	258,465	233,168	34,245	267,413
(%)	51%	49%	100%	69%	31%	100%	87%	13%	100%
iLembe	105,128	65,321	170,449	155,040	66,227	221,268	203,442	34,129	237,571
(%)	62%	38%	100%	70%	30%	100%	86%	14%	100%
Sisonke	44,157	55,769	99,926	56,013	33,120	89,132	68,753	12,433	81,186
(%)	44%	56%	100%	63%	37%	100%	85%	15%	100%
eThekwini M M	944,646	552,534	1,497,180	1,413,577	307,303	1,720,880	1,879,005	120,575	1,999,580
(%)	63%	37%	100%	82%	18%	100%	94%	6%	100%
KZN TOTAL	**1,817,883**	**1,450,166**	**3,268,048**	**2,663,760**	**930,797**	**3,594,557**	**3,490,443**	**379,697**	**3,870,140**
(%)	56%	44%	100%	74%	26%	100%	90%	10%	100%

DISTRICT MUNICIPALITY	LOW (Red) SCENARIO								
	2005			2025			2050		
	ECONOMICALLY ACTIVE			ECONOMICALLY ACTIVE			ECONOMICALLY ACTIVE		
	EMPLOYED	UNEM-PLOYED	TOTAL	EMPLOYED	UNEM-PLOYED	TOTAL	EMPLOYED	UNEM-PLOYED	TOTAL
Ugu	104,424	89,768	194,192	130,226	97,061	227,287	164,127	72,469	236,595
(%)	54%	46%	100%	57%	43%	100%	69%	31%	100%
uMgungundlovu	199,046	167,293	366,339	244,309	151,120	395,429	302,741	107,122	409,863
(%)	54%	46%	100%	62%	38%	100%	74%	26%	100%
Uthukela	77,490	96,187	173,678	92,098	81,066	173,165	113,476	49,680	163,156
(%)	45%	55%	100%	53%	47%	100%	70%	30%	100%
Umzinyathi	29,310	59,229	88,539	36,490	55,285	91,775	44,729	31,157	75,886
(%)	33%	67%	100%	40%	60%	100%	59%	41%	100%
Amajuba	94,946	76,831	171,777	119,798	68,949	188,747	151,233	50,620	201,853
(%)	55%	45%	100%	63%	37%	100%	75%	25%	100%
Zululand	58,537	107,356	165,893	69,076	87,316	156,392	82,853	47,825	130,678
(%)	35%	65%	100%	44%	56%	100%	63%	37%	100%
Umkhanyakude	36,793	62,848	99,641	44,789	56,323	101,113	54,205	31,228	85,433
(%)	37%	63%	100%	44%	56%	100%	63%	37%	100%
Uthungulu	123,406	117,028	240,434	151,548	107,889	259,437	188,347	74,113	262,461
(%)	51%	49%	100%	58%	42%	100%	72%	28%	100%
iLembe	105,128	65,321	170,449	131,678	89,260	220,938	166,569	74,116	240,685
(%)	62%	38%	100%	60%	40%	100%	69%	31%	100%
Sisonke	44,157	55,769	99,926	48,367	43,178	91,545	57,745	25,168	82,914
(%)	44%	56%	100%	53%	47%	100%	70%	30%	100%
eThekwini M M	944,576	552,603	1,497,180	1,206,794	459,652	1,666,446	1,508,912	353,746	1,862,658
(%)	63%	37%	100%	72%	28%	100%	81%	19%	100%
KZN TOTAL	**1,817,813**	**1,450,235**	**3,268,048**	**2,275,173**	**1,297,101**	**3,572,274**	**2,834,938**	**917,244**	**3,752,182**
(%)	56%	44%	100%	64%	36%	100%	76%	24%	100%

Source: Global Insight SA, 2008

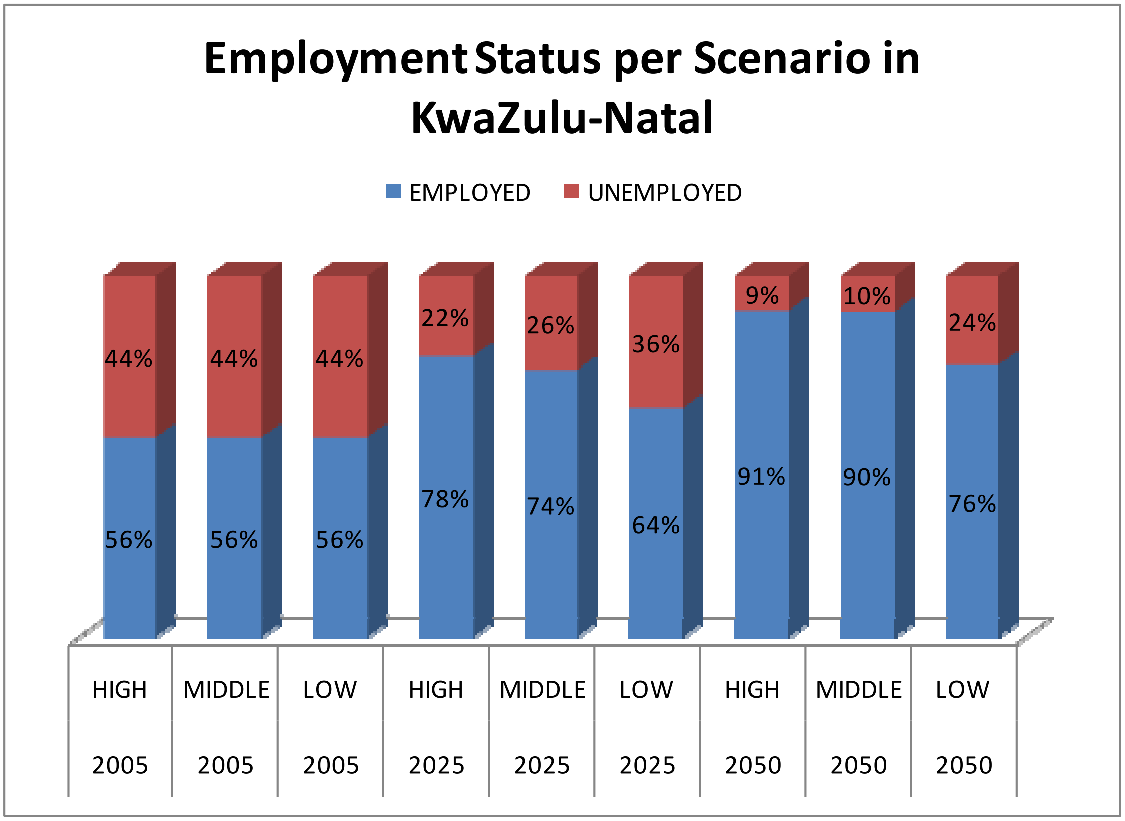


Figure 3.2.C: Unemployed (%) per Scenario in Kwazulu-Natal, 2005, 2025, 2050

3.2.3 Employment

Table 3.2.D, **Figure 3.2.D** and **Figure 3.2.E** compare the number of formal workers per scenario.

Table 3.2.D: Formal Workers per Scenario in KwaZulu-Natal District Municipalities, 2005, 2025, 2050

DISTRICT	HIGH (Green) SCENARIO						MIDDLE (Blue) SCENARIO						LOW (Red) SCENARIO					
	2005	%	2025	%	2050	%	2005	%	2025	%	2050	%	2005	%	2025	%	2050	%
Ugu	57,611	5	99,364	5	124,917	4	57,611	5	88,371	5	115,742	4	57,611	5	69,299	4	80,838	4
uMgungundlovu	129,695	11	223,750	10	285,312	10	129,695	11	199,781	10	264,322	10	129,695	11	156,290	10	185,536	10
Uthukela	45,187	4	77,174	4	95,274	3	45,187	4	68,676	4	88,679	3	45,187	4	52,898	3	61,590	3
Umzinyathi	16,696	1	28,540	1	35,235	1	16,696	1	25,474	1	32,939	1	16,696	1	19,927	1	22,833	1
Amajuba	53,971	4	96,775	4	122,953	4	53,971	4	86,239	4	113,996	4	53,971	4	67,101	4	79,619	4
Zululand	34,270	3	56,534	3	67,996	2	34,270	3	50,471	3	63,391	2	34,270	3	38,874	3	43,945	2
Umkhanyakude	22,529	2	35,072	2	39,180	1	22,529	2	31,405	2	35,969	1	22,529	2	24,762	2	27,071	1
Uthungulu	85,619	7	157,592	7	201,026	7	85,619	7	140,811	7	186,442	7	85,619	7	110,210	7	130,478	7
iLembe	51,423	4	86,604	4	107,966	4	51,423	4	76,234	4	99,902	4	51,423	4	59,247	4	69,171	4
Sisonke	22,450	2	35,715	2	42,066	1	22,450	2	31,843	2	39,028	1	22,450	2	24,725	2	27,065	1
eThekwini M M	709,351	58	1,290,216	59	1,703,753	60	709,351	58	1,156,499	59	1,571,882	60	709,351	58	917,996	60	1,116,317	61
KZN TOTAL	**1,228,802**	**100**	**2,187,336**	**100**	**2,825,678**	**100**	**1,228,802**	**100**	**1,955,804**	**100**	**2,612,292**	**100**	**1,228,802**	**100**	**1,541,331**	**100**	**1,844,464**	**100**

Source: Global Insight SA, 2008

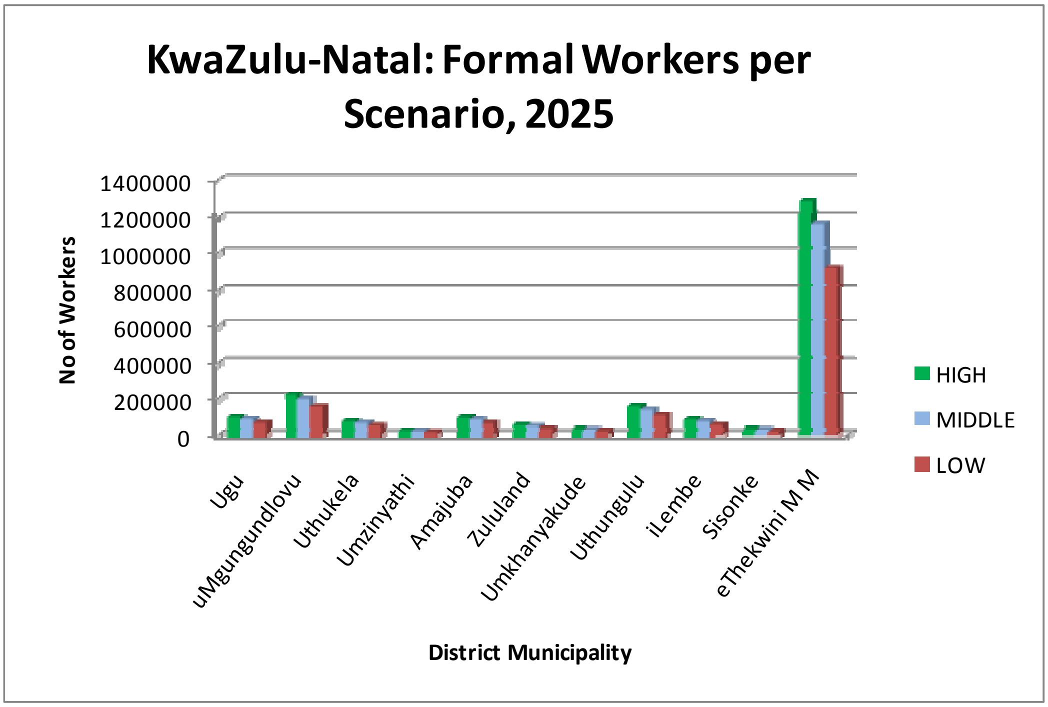


Figure 3.2.D: KwaZulu-Natal: Formal Workers per Scenario, 2025

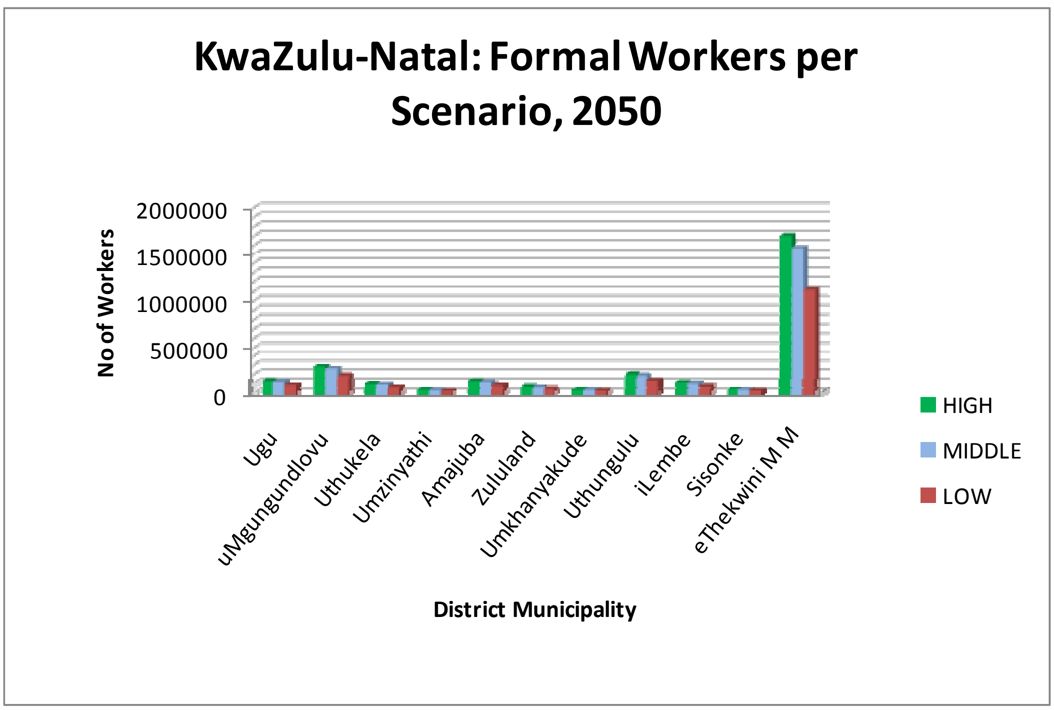


Figure 3.2.E: KwaZulu-Natal: Formal Workers per Scenario, 2050

The following issues were identified in the Phase 1 report:

- **KZN is the second largest province in terms of GDPR in South Africa. Most of the economic activity in KZN occurs within the eThekwini Metropolitan Municipality (e.g. 58% of all formal workers and employed in eThekwini).**
- **Economic concentration generally increases to the coast with eThekwini, Pietermaritzburg and Richards Bay constituting the major job opportunity centres. In many instances the accessibility from rural areas to the centres of employment are poor, hampering poverty alleviation programmes.**

From **Figure 3.2.D**, **Figure 3.2.E** and **Table 3.2.D** it is evident that the largest growth in workers is expected in the High Scenario, followed by the Middle and Low Scenarios. The concentration of job opportunities in the eThekwini Metropolitan area is expected to remain in the order of 60% in future (all three scenarios).

The total number of job opportunities in KwaZulu-Natal (2050) could vary between 2,8 million in the High Scenario and 1,8 million in the Low Scenario, a difference of close to 1,0 million workers.

3.2.4 Implications for Transport Planning

Figure 3.2.B and **Figure 3.2.D** show the distribution of population and job opportunities by District Municipality. It is very clear that large numbers of people travel to work on a daily basis because of the concentration of job opportunities in the eThekwini Metropolitan Municipality. Thus, the need for effective public transport facilities in the contemporary and even more so in the future is clearly evident. High levels of unemployed people are found in villages scattered throughout the Province. Thus, the provision of access (public transport) to community facilities and job opportunities in centrally located nodes should become a priority.

3.3 CONCLUSION AND RECOMMENDATIONS

From the above it is evident that the existing settlement pattern will to a large extent remain in future. From an urban perspective it is proposed that densification and infill development should take place along public transport corridors, in order for people to reduce their driving time to work. The provision of community facilities should become a priority in these corridors and nodes.

One stop community centres are also proposed in the rural areas. These centres should serve the people in the surrounding communities with services such as internet connections (very important to facilitate further education and information), medical facilities, pension pay points, shops etc. It is of utmost importance that a good public transport link be established from the urban areas to these rural services centres.

4. LAND USE DEVELOPMENT

4.1 DEVELOPMENT DIRECTIVES AND OBJECTIVES

A number of policy directives can be deduced from the various national policy documents discussed in the Status Quo Report. These directives have been set out in the Analysis Report and provide a strategic framework to achieve land use and transportation integration within a province. These directives can be used to formulate development objectives, which in turn can be used to evaluate the various scenarios of the transportation model in the Forward Plan.

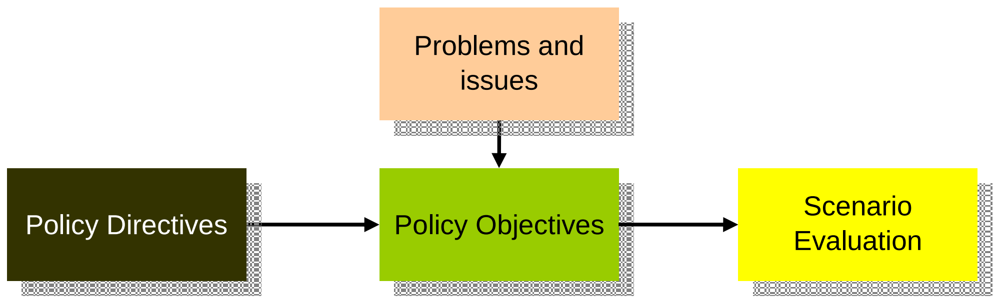


Figure 4.1.A: Policy Influence

Apart from relating to the development directives, the development objectives were defined to specifically address the key problems and issues that were identified in the Analysis Report. By doing this, the directives and objectives aimed to address problems and issues faced within the provinces with regard to land use and transportation integration in general.

4.1.1 Summary of Development Directives

The directives formulated in the Analysis Report broadly focus on settlement development, rural development, economic growth and sustainable development. The directives that were formulated in the Analysis Report can be summarised as follows:

Directive 1: Settlement and investment must be encouraged in areas with high development and economic growth potential

Infrastructure is necessary to enable economic growth and economic growth is a prerequisite for the achievement of other policy objectives, such as poverty eradication and equitable development. However, investment in infrastructure must preferably be concentrated in areas of high development potential or economic growth potential, to exploit the inherent potential on such areas. This will inevitably encourage settlement growth in areas with high development potential and economic growth potential.

Directive 2: Settlements of exclusion must be linked to areas with economic opportunity

Investment in economic infrastructure must not only address the basic needs of people, but should also create an environment that is conducive for income generating activities and productive employment. To achieve this, areas of exclusion should be linked to growth centres, rather than investing heavily in areas with limited economic growth potential. Growth centres can be towns or settlement within rural areas that show high levels of economic development potential.

Directive 3: Transportation must support an integrated settlement pattern

The integration of settlement development and areas of economic opportunity and potential requires focusing future settlement and economic development into activity corridors and nodes that are linked to main growth centres. These corridors must be designed to encourage growth within the key economic sectors that are found along those corridors.

Directive 4: Growth and development must be environmentally sustainable

Economic growth and development cannot be sustained over the long term if it is not done in an environmentally sustainable manner. This includes the conservation of natural resources, such as high-potential agricultural soils and ecologically sensitive area, as well as the sensible management of mineral resources.

Directive 5: Key rural areas must be developed into sustainable economic entities

Emphasis must be placed on facilitating the change of rural settlement and areas into sustainable economic entities. This requires focussed development or spatial targeting, where resources are directed to selected areas and nodes in response to development opportunities. Key to such an initiative is selecting programmes that reflect the diversity and uniqueness of rural communities, specifically in the agricultural, forestry and tourism industries.

Directive 6: Industrial development must focus on international markets

Industrial development must focus on international markets and the export of manufactured goods as a means to accelerate economic growth. As such, industrial areas need to be linked to major harbours or airports to enhance the export-orientated focus of these industrial areas. Transportation infrastructure development is essential for industrial development and enabling a competitive export industry.

Directive 7: Comparative and competitive advantages of regions must be exploited

A primary objective with regard to investment in transportation infrastructure needs to be to unlock the comparative and competitive advantages of regions. Although much of this potential is centred within and surrounding urban areas, areas and nodes within rural *areas may also have potential that is unique to that area or node. In other words, certain rural areas may have comparative and competitive advantages that can compete on a national and international level.*

4.1.2 Development Objectives

Using the development directives identified in the Analysis Report as a guide; development objectives were defined to address the key problems and issues that were identified in the Analysis Report. Focus was placed on those problems and issues relating to land use and transportation integration. The following objectives have been identified, as they relate to the mentioned directives:

Objectives relating to Directive 1

Directive 1 stipulated that settlement and investment must be encouraged in areas with high development and economic growth potential. In particular, this directive is relevant in rural areas, where rural settlements are dispersed, not having sufficient economic development potential to justify focussing infrastructure development within these rural areas. This does not imply that all rural areas or settlements do not have economic development potential, but rather that infrastructure development should be focussed on those rural settlements that do have such potential. Specific objectives relating to this directive include:

- Discourage a dispersed rural settlement pattern by directing infrastructure development to selected rural growth areas;
- Strengthen the central place function of existing towns through well-maintained transportation linkages;
- Enable the development of regional service centres in rural areas through the development or upgrading of transportation linkages to such centres;
- Encourage rural settlement consolidation through investment in transportation infrastructure in targeted areas;
- Use transportation infrastructure to open up areas with development potential;
- Only use transportation infrastructure to open up areas with sufficient water availability for settlement and economic activity;
- Provide access infrastructure to unlock and make available well-located land within metropolitan areas for affordable housing development and
- Invest in infrastructure to ensure the livelihood and sustainability of fishing villages.

Objectives relating to Directive 2

Directive 2 stated that settlements of exclusion must be linked to areas with economic opportunity. This directive relates to migration and enabling people to live within areas with no or little economic base to access employment opportunities. This applies to settlements of exclusion in both rural and urban areas. Objectives that relate to this directive include the following:

- Link rural settlements that have high population concentrations to towns or areas that contain economic opportunities;
- Use transportation corridors to link towns and settlements to metropolitan areas;
- Integrate areas of exclusion within a metropolitan area with nodal areas containing economic opportunities, using public transport;
- The development of infrastructure must take into account the depopulation of rural areas due to the migration of people from rural areas to major towns and metropolitan areas;
- Take into account cross-provincial movement on a daily basis between rural settlements and manufacturing clusters within metropolitan areas and
- Take into account cross-border movement of people to access shopping and medical facilities in towns near the South African border.

Objectives relating to Directive 3

Directive 3 states the transportation must support an integrated settlement pattern. This largely relates to urban areas and the need to curb urban sprawl through the sensible development of transportation infrastructure. Corridor development is central to implementing this directive. Objectives relating to this directive include:

- Discourage urban sprawl in metropolitan areas through the sensible location of new transportation infrastructure;
- Develop infrastructure that is public transport orientated and encourages public transport use in key economic and residential areas;
- Establish a network of corridors containing combined road and rail transport infrastructure where possible and
- Integrate fragmented urban areas through transportation infrastructure development.

Objectives relating to Directive 4

Directive 4 states that growth and development must be environmentally sustainable. On a national level, environmental sustainability largely implies the protection the valuable agricultural soils and areas of natural beauty. As such, this directive specifically applies to rural development. Objectives relating to sustainability include:

- Discourage development on valuable agricultural land and in areas of natural beauty through the sensible location of new transportation infrastructure and
- Protect and provide access to areas of natural beauty.

Objectives relating to Directive 5

Directive 5 stated that key rural areas must be developed into sustainable economic entities. Three primary economic sectors function within, and are linked to, the livelihood of rural areas: agriculture, forestry and tourism. These sectors or the lack therefore largely determine the economic development potential of a rural area. Specific objectives relating the unlocking this directive includes:

Agriculture

- Link and facilitate the transportation of agricultural products to international market;
- Exploit opportunities to better utilize areas with agricultural potential through infrastructure development;
- Enable subsistence agriculture to enter commercial markets through infrastructure development;
- Upgrade access roads to irrigation schemes that have potential for expansion and
- Establish good transport linkages between agricultural areas, agro-processing plants and local markets.

Forestry

- Unlock the potential of forestry by improving and constructing access roads to woodlots and
- Ensure that the transportation network can deal with increasing forestry payloads.

Tourism

- Align tourism routes with the key tourist attractions;
- Provide access infrastructure to unlock the development potential of untapped tourist resources;
- Reinforce the strategic advantages of coastal tourism nodes through infrastructure development and
- Improve air access to major tourist destinations in terms of capacity, distribution and frequency of flight.

Objectives relating to Directive 6

Directive 6 focuses industrial development on international markets. In other words, it deals with exports and enabling exports through transportation infrastructure and capacity development. In particular, this has to do with the type of freight to be moved and the most appropriate mode of transport to move the freight. Both industry and mining are significant exporters and objectives that relate to these economic sectors include:

Mining

- Link large mineral deposits to export harbours with appropriate logistical capabilities and
- Prevent the over-utilization of roads used for the transportation of bulk mining products by considering rail as an alternative.

Industry

- Provide an efficient freight transportation network that links industrial areas to export harbours;
- Enable an interface between the rail and port systems in order to compete with the road system;
- Link industrial and manufacturing areas with markets in neighbouring countries and
- Place emphasis on transporting high-value goods, such as petrochemicals.

Objectives relating to Directive 7

Directive 7 states that the comparative and competitive advantages of regions must be exploited. This applies to both to rural and urban areas. In terms of rural areas, the mining sector and mineral deposits provide advantages that can effectively be exploited. Industry is a competitive advantage that the largely linked to urban areas. Transportation capacity development is central to exploiting the competitive advantages posed by these industries. Objectives relating to this directive include:

Mining

- Provide road and rail access to large, untapped mineral deposits, such as coal deposits;
- Expand transportation infrastructure in line with growth in mining and
- Reassess the role of infrastructure serving abandoned mining areas and towns.

Industry

- Enhance the strategic advantages of key industrial location in metropolitan areas through infrastructure development;
- Provide industry with an entire logistics network, emphasizing transport services and logistic hubs and
- Transport infrastructure must support existing and envisaged Industrial Development Zones (IDZs).

4.2 SCENARIO EVALUATION

The 3 scenarios modelled (high, medium and low) were based on specific population and economic activity outcomes. In other words, each scenario aimed to model a different outcome to assess what the land use and transportation relation would be in each case. For example, the low scenario modelled a population and economic outcome that preferred a rural development bias. In turn, the high scenario aimed at modelling a population and economic outcome that had an urban development bias.

Figure 4.2.A: Policy Influence

The directives and objectives defined above were used to evaluate each of the 3 scenarios of the transportation model. This exercise aimed to determine how each scenario addresses the directives and objectives identified and whether each scenario fulfils the various directives and objectives in a good, fair or poor manner. This evaluation is done from a spatial development point of view.

4.2.1 Scenarios Modelled

Each of the population growth scenarios (low, middle and high) chosen to be modelled are based on several assumptions. The most prominent and diverging assumption being that of centralised versus decentralised growth manifestation. For example, it has been assumed that the high population growth scenario will be accompanied by a resulting higher rate of urbanisation around specific centroids, whilst the low growth scenario will be characterised by a more decentralised manifestation of population growth. The three scenarios are presented conceptually to illustrate the assumptions made for each of the scenarios in respect of spatial and economic manifestations.

Logically, each scenario will necessitate government to adopt a different policy in respect of transportation infrastructure development to support the specific spatial development configuration of each scenario. The end objective of this report will be to ascertain the most likely population and economic growth scenario and the most suitable transportation model to support this scenario. As a basic point of departure, such as transportation model must support sustainable and equitable economic growth and development within each province and the country as a whole.

Figures 4.2.B, C and D illustrates the three scenarios.

4.2.1.1 High (Urban) Scenario

The high population growth scenario assumes the occurrence of a centralised form of population growth around a relatively limited number of centroids, fuelled by a high inter-provincial migration rate, as individuals are increasingly drawn to existing and new urban growth areas. Consequently, the spatial scenario is characterised by a pro-active urbanization sentiment, which results in a settlement pattern comprising a limited number of dominant urban growth centres, connected via strong corridors of continuous or intermittent nodal development.

Fixed investment spending by government is primarily informed by the existing or latent competitive economic potential of an area (resource based), with such areas then becoming the primary focus for the provision of economic, municipal and transportation infrastructure deemed necessary to successfully facilitate the exploitation of the economic potential of these areas.

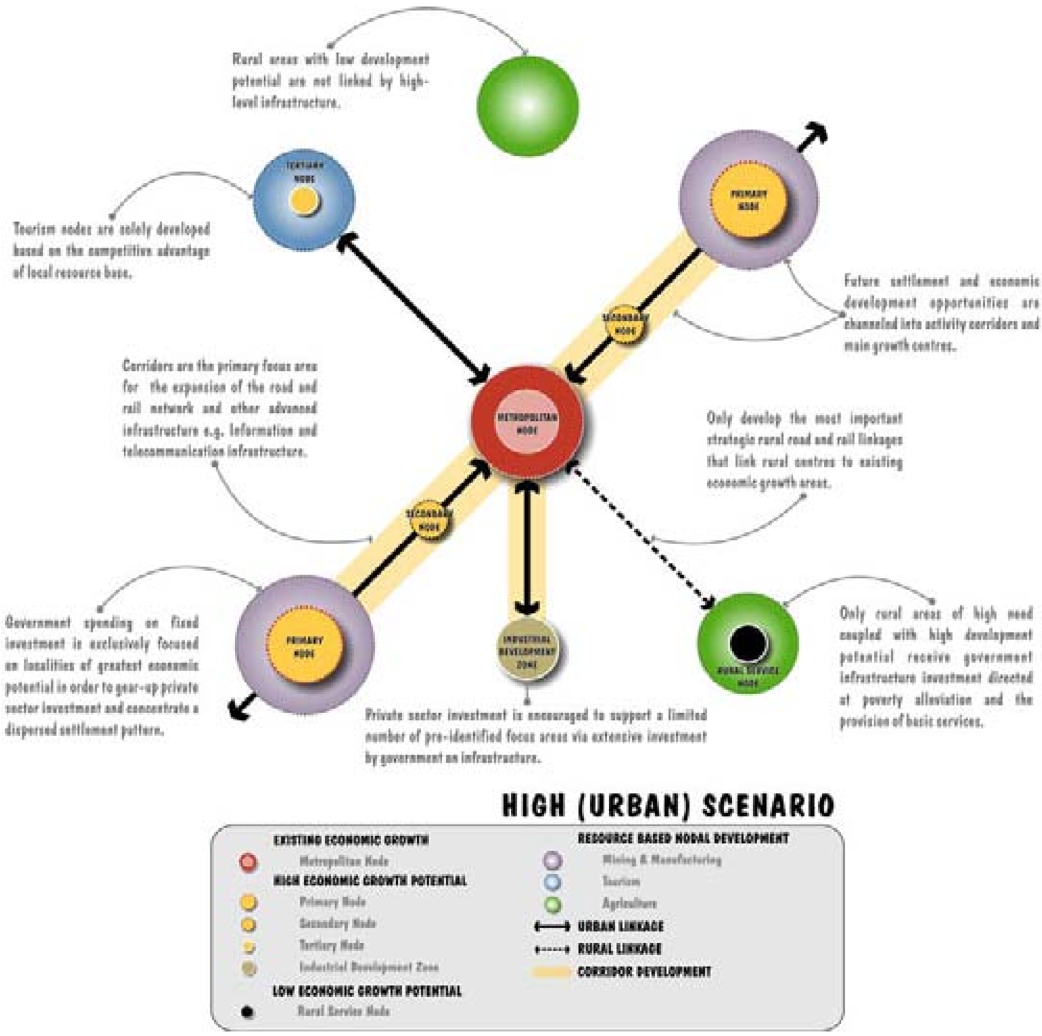


Figure 4.2.B: High (Urban) Scenario

Based on international trends in urbanisation, the majority of government spending will essentially be spent on a small number of urban centres, with the rationale being that infrastructure and community services can generally be provided more sustainable at higher densities at a selected number of locations. Hence, urbanization is pro-actively encouraged.

Since, rural development is not pro-actively encouraged, the model is characterised by a limited number of rural services centres, located in close proximity to existing urban activity areas. Areas are essentially selected based on the availability of infrastructure, whether the areas possess high development potential, and the proximity of these areas to existing growth centres. Government investment and spending within rural areas with no or limited development potential are restricted to the provision of basic services and human capital development.

4.2.1.1 Middle (Dual) Scenario

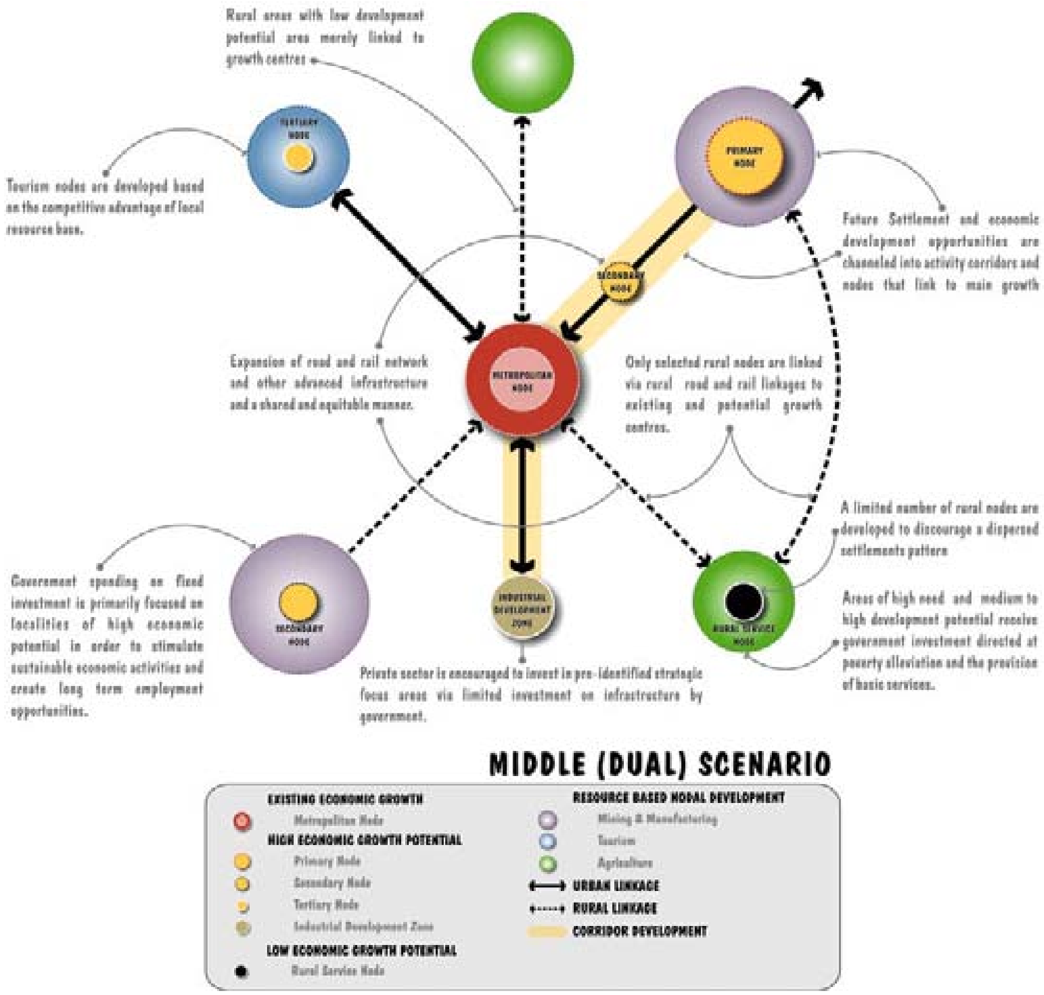


Figure 4.2.C: Middle (Dual) Scenario

The middle population growth scenario assumes the occurrence of a relatively centralised form of population growth around several existing and newly emerging urban and rural population growth centroids, as the inter-provincial migration rates are expected to continue. Consequently, the spatial model is characterised by a settlement pattern comprising a number of large and medium-sized urban growth centres, connected via corridors of continuous or intermittent nodal development. The rural landscape is characterised by a limited number of rural service nodes connected to one another and urban growth centres via strategic rural road and rail linkages.

Investment spending by government is informed by both the existing or latent economic development potential of an area (mostly resource based), as well as the relative need of an area. Areas with economic development potential become the

infrastructure development needed to successfully facilitate the exploitation of the competitive advantages of these areas.

As opposed to the high growth scenario, the middle scenario does not discourage rural development. Instead, it views rural development as a crucial part of achieving sustainable urbanization. To this end, the model promotes the development of rural service centres connected to one another and urban growth centres via strategic rural transport linkages. Rural service centres are selected based on its ability to sustain surrounding rural areas, as well as its ability to facilitate the consolidation of a dispersed rural settlement pattern, which often characterise provinces such as Limpopo and the Eastern Cape. Government spending within rural service centres is directed at projects and programmes that aim at providing a platform for the development of sustainable rural communities. Essentially then, this scenario is characterised by a balanced approach to government spending that encourages urbanisation that is not developed at the cost of rural areas, but enables a symbiotic relationship between rural and urban areas to exist.

4.2.1.2 Low (Rural) Scenario

The low population growth scenario assumes the occurrence of a decentralised form of population growth around multiple, scattered rural nodes, which is driven by a relatively low inter-provincial migration rate. Hence, this scenario assumes there will be a restricted outflow of people from rural areas to urban areas within neighbouring provinces. Consequently, this scenario is characterised by a pro-rural development sentiment, which results in a settlement pattern comprising a limited number of urban growth centres and a rural landscape dominated by multiple rural service centres. These rural service centres are connected to one another via a fine-grained rural transportation network. As opposed to the high scenario, the low scenario is characterised by limited corridor development and little prominence is given to existing urban nodes with inherent growth potential.

Government investment and spending is primarily informed by basic human needs in rural areas, irrespective of whether these rural areas have inherent development potential or not. In this scenario, government relies on the private sector to exploit localities of economic potential, such as metropolitan areas and resource-based rural areas. Within this model, the rural service centre or nodes become the primary focus for the provision of municipal and transportation infrastructure. In other words, investment in rural areas is not limited to the provision of basic services and human capital development, as in the high scenario.

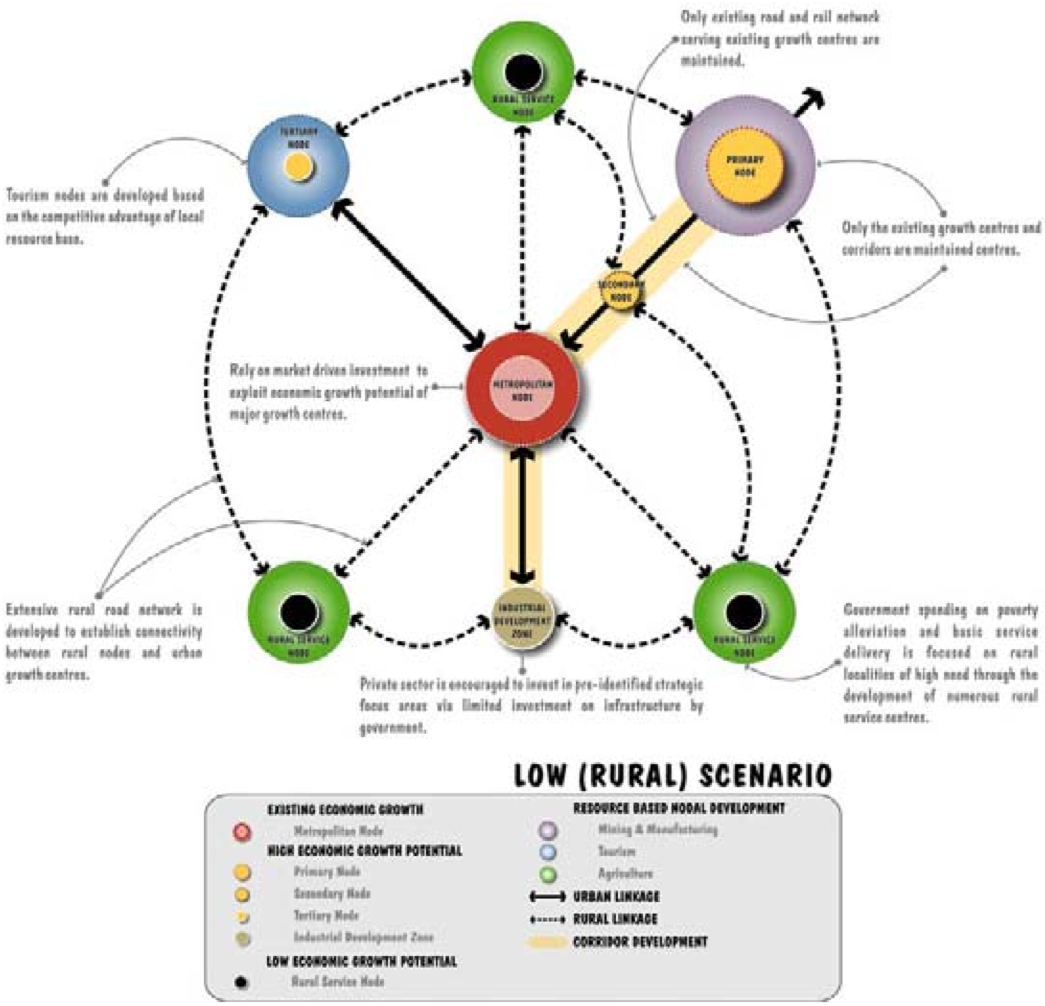


Figure 4.2.D: Low (Rural) Scenario

4.2.2 Scenarios Evaluated

The high, medium and low scenarios set out above were evaluated in terms of the directives and objectives defined in the first parts of this land use section. The directives were formulated, based on national policy documents, such as the National Spatial Development Perspective (NSDP). In turn, the objectives were based on the directives and specifically aimed to address the key problems and issues relating to land use and transportation integration within each province. Thus, evaluating the three scenarios in terms of the directives and objectives provides an indication of the measure to which each scenario addresses the issues and problems identified and the Analysis Report. Each scenario addresses the directive and objectives as follows:

> ***Directive 1*** stipulated that settlement and investment must be encouraged in areas with high development and economic growth potential. In this regard, the high and medium scenarios are best suited, as both these scenarios tend to focus on urban

growth centres and rural growth centres where inherent growth potential is present. The low growth scenario tends to address poverty alleviation in rural areas and is less bent on requiring inherent economic growth potential for government investment in such areas to occur.

Directive 2 stated that settlements of exclusion must be linked to areas of economic opportunity areas. This directive acknowledges the dependence of rural areas on urban growth centres and attempts to address rural needs through linkages with urban areas. This directive has an urban bias and is therefore better addressed though the high and medium scenarios. The medium scenario in particular tends to create a linkage between rural and urban areas, thus promoting a more balanced development approach between rural and urban areas. The low scenario tends to maintain that rural areas with high population numbers are sustainable under certain conditions, thus not needing urban growth centres to survive.

Directive 3 stated the transportation must support an integrated settlement pattern. This largely relates to curbing urban sprawl and dispersed settlement patterns through nodal and corridor development. The high and middle scenarios best suite this directive and its associated objectives, because these scenarios tend to focus settlement and economic development in urban and rural growth centres. The low scenario tends to support a dispersed rural settlement pattern, comprising a multitude of rural node or centres.

Directive 4 states that growth and development must be environmentally sustainable. Environmentally sustainability can be interpreted in two ways: (a) curbing urban sprawl to protect the natural environment and (b) harmonising development and conservation. In the high scenario, this will involve obtaining high urban densities to limit the sprawl of cities and in the low scenario; this will entail finding ways to have rural populations live in harmony with the natural environment. In both cases this will be a significant challenge. The middle scenario will apply both approaches to a certain extend; most probably resulting in the most sustainable settlement pattern.

Directive 5 stated that key rural areas must be developed into sustainable economic entities. This involves harnessing the three primary economic sectors found within rural areas: agriculture, forestry and tourism. This directive has a rural bias and will most probably be best served by the low scenario, where government spending is directed towards the development of these sectors in rural areas. The middle scenario also attempts to develop rural areas in balance with urban areas and should also fulfil this directive and its objectives to a degree. The high scenario will be bent on exploiting these sectors for its own (urban) gain, most likely at the expense of rural areas.

Directive 6 promotes industrial development that focuses on international export markets. In other words, it deals with exports and enabling exports through transportation infrastructure development. This directive has a significant urban bias, as it has often been proven in the past that large-scale industrial development is not viable in rural areas and rural towns. As such, this directive is best served by the high scenario and to a lesser extent the middle scenario. The low scenario is entirely unsuited to serve this directive, except where it has to do with the export of mined minerals.

Directive 7 states that the comparative and competitive advantages of regions must be exploited. This applies to both rural and urban areas and therefore to all 3 scenarios. In terms of rural areas and the low scenario, the mining sector and mineral deposits provide advantages that can effectively be exploited. In terms of urban areas and the high scenario, competitive advantages in industry can be exploited. Because this directive is broad-based, it is best served by the middle scenario, which allows the exploitation of competitive advantages in both urban and rural areas.

4.3 FUTURE SPATIAL VISION: ALIGNMENT OF LAND USE AND TRANSPORTATION

As was determined by the scenario evaluation above, the middle scenario best fulfils the development directives and objectives set for the national transportation network. In other words, it best achieves land use and transportation integration. In part, this is due to the fact that the middle scenario strikes a balance between urban and rural development. However, the existing national and provincial transportation network does have certain limitations in implementing the middle scenario, which can be related to one or more of the following aspects:

a. Identify new network linkages

Over the next 40 years, untapped mineral reserves can be exploited, planned large-scale initiatives can be developed and certain rural settlements can become significant urban areas. The challenge from a land use point of view is to identify the new linkages that are needed to unlock the development potential of the reserve, initiative and settlements.

b. Strengthen network capacity

The transportation model aims to identify bottlenecks within the existing transportation network. Key bottlenecks that need to be address can be supported from a land use perspective, where such bottlenecks hinder the implementation of the middle scenario. In other words, a land use justification can be given for addressing specific bottlenecks within the transportation network.

c. Consider alternative modes of transport

Considering the alternative transportation modes to transport freight and passengers is largely a function of the transportation engineers. However, a land use input can be given in this regard. Freight and passengers is linked to mining areas, tourism areas, settlement, etc. In other words, the type of mode use is linked to a specific land use and the land use planners can provide some suggestions with regard to the access requirements of these land uses.

Addressing the limitation of the above aspects in the existing transportation network can help improve the integration of land use and transportation in the middle scenario. In other words, suggestions can be made to improve the transportation network to better serve land use, thus improving land use and transportation integration.

Although NATMAP is not, and should not be seen as a Spatial Development Framework (SDF) to replace the existing SDF of a province, it can and does provide inputs or make suggestions with regard to improving the existing and proposed spatial development of a province in order to ensure greater land use and transportation integration. For example, suggestions with regard to transportation infrastructure upgrading and development will have an impact on spatial development, as certain movement lines of a transportation network will provide better accessibility to specific land uses in specific localities than others in a province.

4.3.1 Interpretation of Transportation Model

The three population growth scenarios (high, middle and low) were modelled using the national and provincial road network. Hence, considering the level used to simulate the growth scenarios, the following high-level observations and shortcomings can be identified in respect of land use and transportation:

4.3.1.1 Passenger Volumes

i. In all three scenarios (**Map 4.3.A, C and E**) it seems that the main movement of passengers occur on:

- The roads constituting the corridors immediately surrounding and traversing the Ethekwini Metropolitan Area;
- The roads constituting the corridor between Ethekwini and Richards Bay;
- The roads constituting functional linkages from Richards bay into the rural hinterland;
- The roads constituting the functional linkage between Ethekwini and Port Shepstone;
- The roads constituting the corridor between Ethekwini, Pietermaritzburg and some of the major economic activity and settlement areas located within the Free State;
- The roads constituting the corridor between Ethekwini, Pietermaritzburg, Ladysmith, Newcastle and some of the major economic activity and settlement areas located within the Mpumalanga Province and
- The roads constituting the corridor between Ladysmith, Vryheid and Pongola.

ii. Given the above observation (and acknowledging the fact that the connectivity of rural areas cannot be fully analysed given the fact that the model only focuses on roads of national significance), it would appear that in contrast to the level of connectivity between well-established urban areas, the linkages between areas of exclusion and areas of economic opportunity could be improved from a passenger transportation perspective. Vast numbers of settlements of exclusion occur within the Zululand, Umkhanyakude, Umzinyathi and Ugu district municipalities. Notably, these municipalities have been earmarked as Rural Development Nodes by the Government's ISRDS programme.

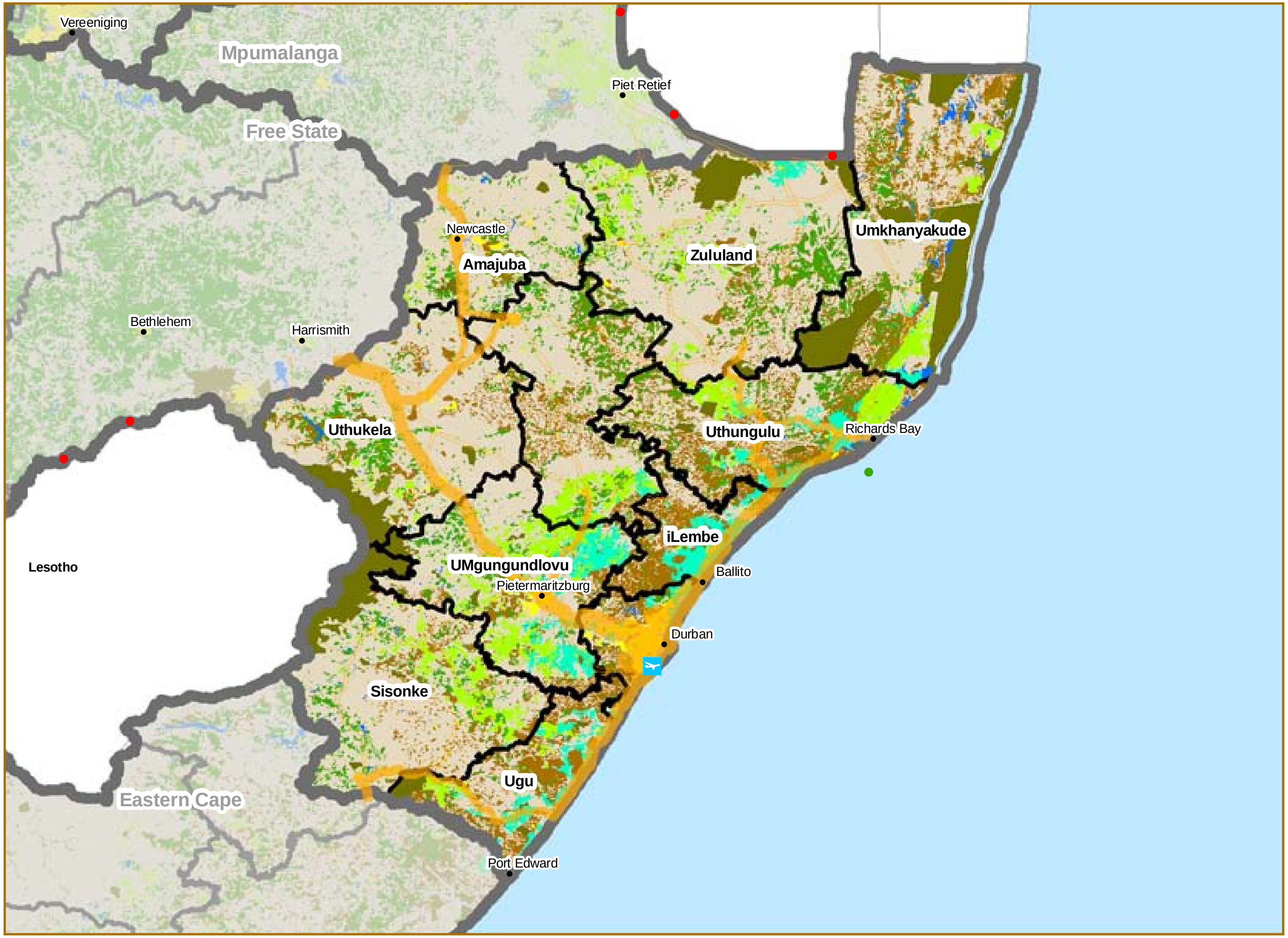
4.3.1.2 Freight Volumes

i. In all three scenarios (Map 4.3.B, D and F) it seems that the main movement of Freight occurs on:

- The N3 corridor linking Ethekwini and Gauteng;
- The N3 / N11 corridor linking Ethekwini to the Witbank-Middelburg economic activity area and
- The R34 road and rail corridor linking Richards and Ermelo via Piet Retief and Vryheid.

ii Given the above observation, the transportation infrastructure constituting the existing corridors can be upgraded and extended to better develop key rural areas and to further exploit comparative and competitive advantages of regions from a freight perspective. For example, establishing stronger direct linkages between the harbours of Ethekwini, Richards bay, Maputo and Nqura (Couga), as well as linking these gateways to key rural and agricultural areas.

Kwazulu Natal Province: PASSENGER VOLUMES -2030 (LOW SCENARIO)



PASSENGER VOLUMES 2030

LOW SCENARIO

- 0 - 5 000
- 5 001 - 15 000
- 15 001 - 50 000
- 50 001 - 75 000
- 75 001 - 174 069

Land Use

- Conservation
- Cultivated Land
- Forest Plantation
- Industrial and Commercial Area
- Mining Area
- Non Cultivated Land
- Rural Village
- Sugarcane
- Urban Activity Node
- Urban Area
- Waterbody

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 15 30 60 90 120 Kilometers

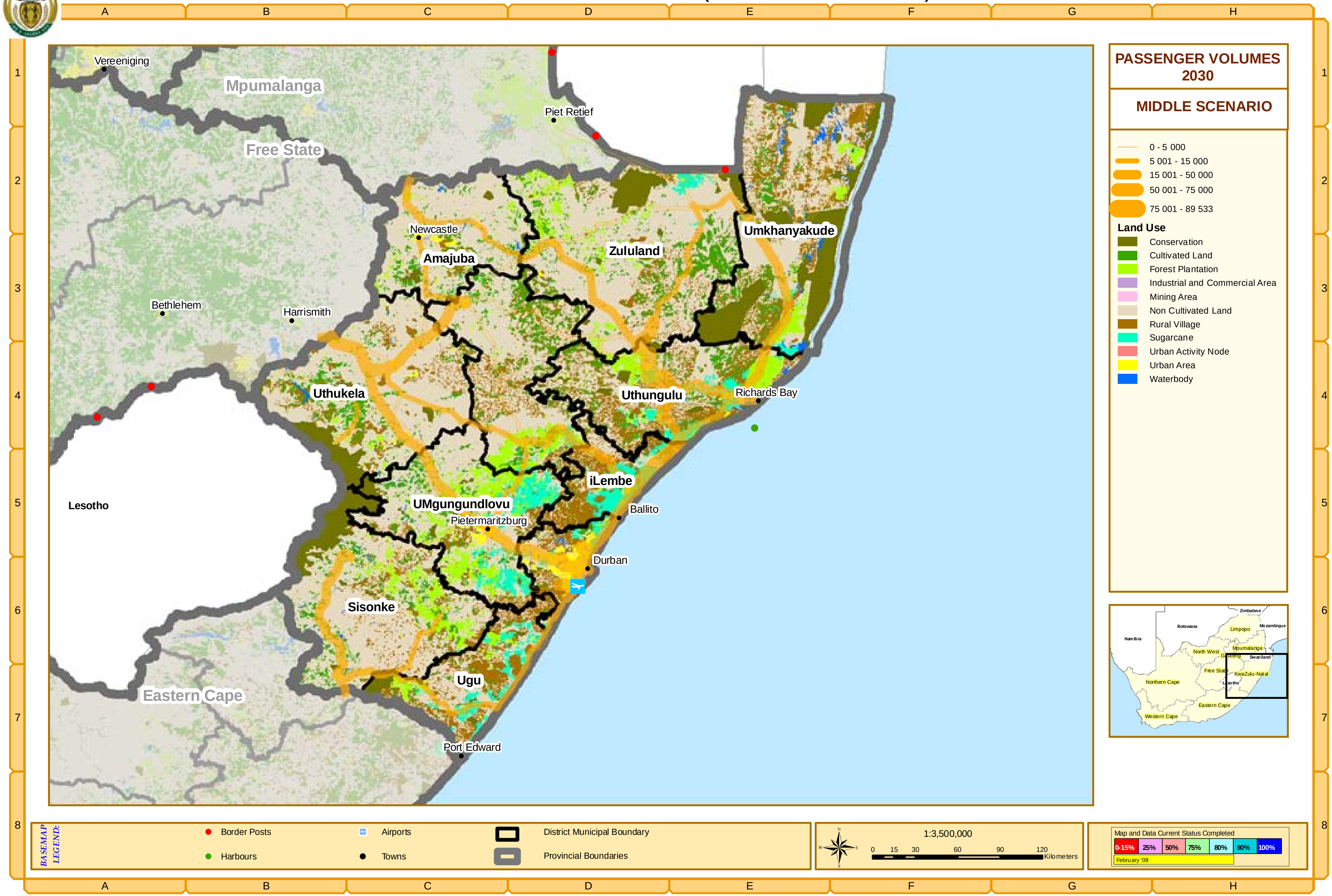
Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

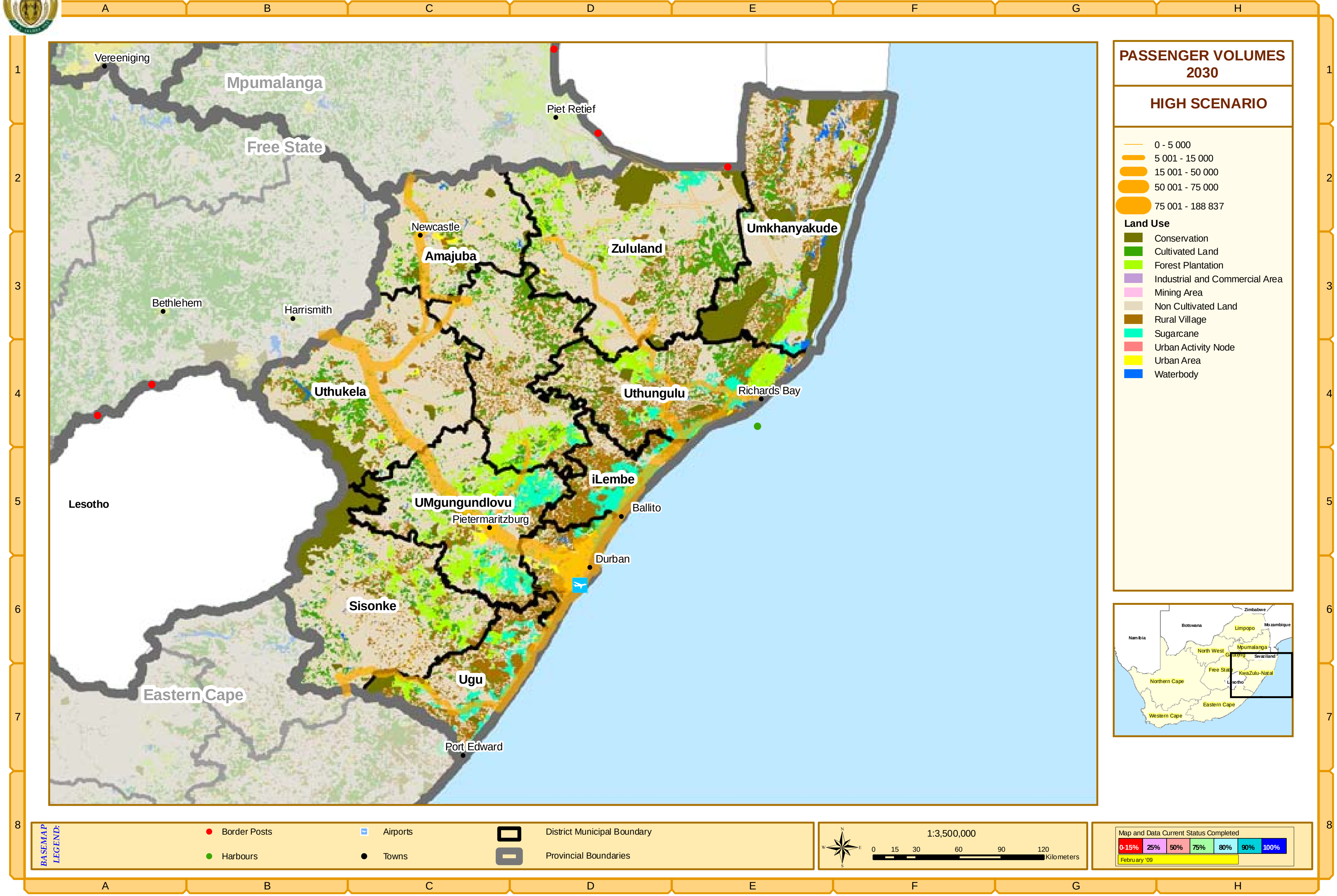
MAP 4.3A Passenger Volumes - 2030 (Low Scenario)

Kwazulu Natal Province: PASSENGER VOLUMES -2030 (MIDDLE SCENARIO)



MAP 4.3B Passenger Volumes - 2030 (Middle Scenario)

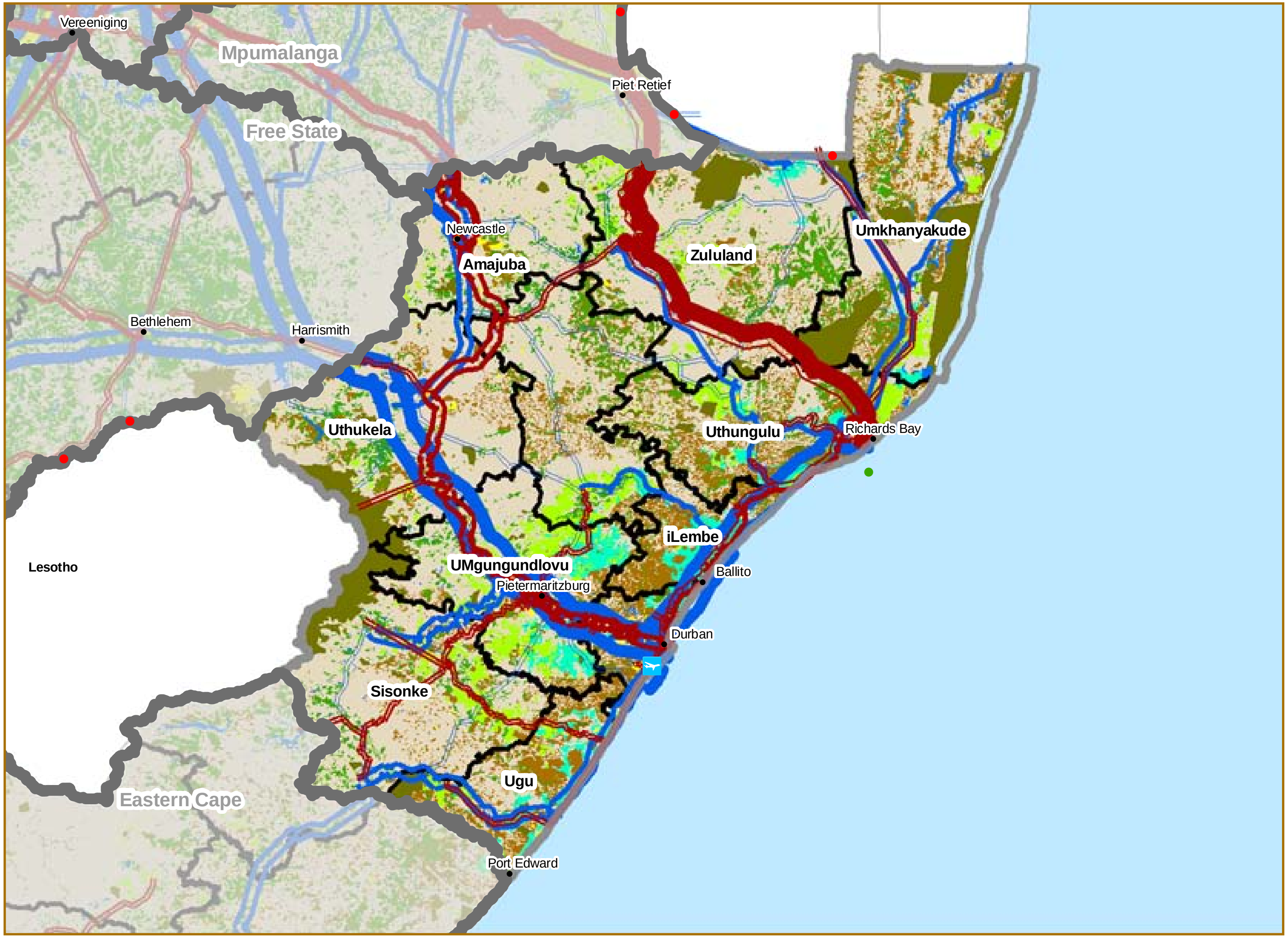
Kwazulu Natal Province: PASSENGER VOLUMES -2030 (HIGH SCENARIO)



MAP 4.3C Passenger Volumes - 2030 (High Scenario)

Kwazulu Natal Province: FREIGHT VOLUMES -2030 (MIDDLE SCENARIO)

A B C D E F G H



FREIGHT VOLUMES 2030

MIDDLE SCENARIO

Rail Freight
- 0 - 5 000
- 5 001 - 20 000
- 20 001 - 50 000
- 50 001 - 150 000
- 150 001 - 275 921

Road Freight
- 0 - 5 000
- 5 001 - 20 000
- 20 001 - 50 000
- 50 001 - 150 000
- 150 001 - 275 921

Land Use
- Conservation
- Cultivated Land
- Forest Plantation
- Industrial and Commercial Area
- Mining Area
- Non Cultivated Land
- Rural Village
- Sugarcane
- Urban Activity Node
- Urban Area
- Waterbody

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 15 30 60 90 120 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

MAP 4.3D Freight Volumes - 2030 (Middle Scenario)

NATIONAL TRANSPORT MASTERPLAN 2050

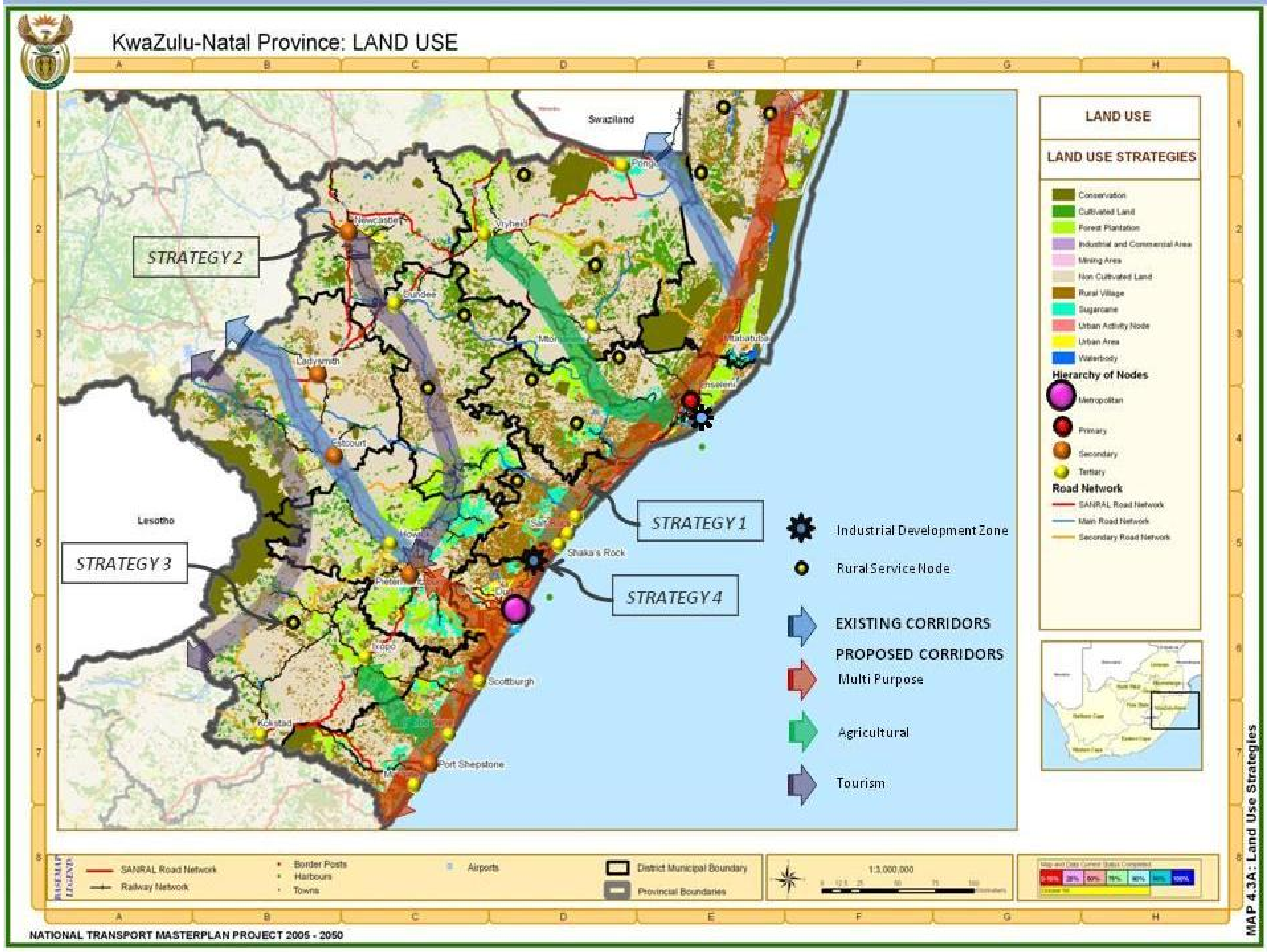
4.3.2 Strategies to Align Land Use and Transportation

A number of strategies based on the principles associated with the middle scenario (which seeks to strike a balance between urban and rural development) can be developed to ensure better land use and transportation integration, and help to exploit the competitive advantages of regions.

A number of strategies can be developed to ensure better land use and transportation integration, and to help exploit the competitive advantages of regions. To this affect, several strategies are proposed to help improve the alignment and integration of land use and transportation in the Province. The strategies are based on the aforementioned directives and objectives, as well as the development principles associated with the middle scenario, which seeks to strike a balance between urban and rural development.

It has to be stressed that the following strategies proposed are merely conceptual and only aim to provide some thoughts on how to better align land use and transportation within Kwazulu-Natal. Consideration of the strategies for implementation will require extensive feasibility studies and can be proven to be not feasible for a number of reasons, such as inaccessible terrain. In addition, it may be that a lower-level transportation infrastructure network already exist that serves the areas that are affected by the proposals, thus possibly negating the proposals made.

Given the aforementioned limitations, the following strategies aimed at better integrating land use and transportation within Kwazulu-Natal is proposed (**Map 4.3.G**):


KwaZulu-Natal Province: LAND USE
A B C D E F G H
Swaziland
Lesotho
STRATEGY 1
STRATEGY 2
STRATEGY 3
STRATEGY 4
Newcastle
Vryheid
Pongola
Dundee
Ladysmith
Estcourt
Mtubatuba
Richards Bay
Empangeni
Howick
Pietermaritzburg
Durban
Shaka's Rock
Ixopo
Scottburgh
Kokstad
Port Shepstone
Margate
Industrial Development Zone
Rural Service Node
EXISTING CORRIDORS
PROPOSED CORRIDORS
Multi Purpose
Agricultural
Tourism
LAND USE
LAND USE STRATEGIES
Conservation
Cultivated Land
Forest Plantation
Industrial and Commercial Area
Mining Area
Non Cultivated Land
Rural Village
Sugarcane
Urban Activity Node
Urban Area
Waterbody
Hierarchy of Nodes
Metropolitan
Primary
Secondary
Tertiary
Road Network
SANRAL Road Network
Main Road Network
Secondary Road Network
BASEMAP LEGEND
SANRAL Road Network
Railway Network
Border Posts
Harbours
Towns
Airports
District Municipal Boundary
Provincial Boundaries
1:3,000,000
MAP 4.3A: Land Use Strategies
NATIONAL TRANSPORT MASTERPLAN PROJECT 2005 - 2050

Map 4.3.E: Proposed Strategies for Integrating Land Use and Transportation within Kwazulu-Natal

4.3.2.1 Strategy 1: Integrate the space-economy of the Province and exploit the competitive advantages of regions in a sustainable manner

A primary objective with regard to investment in transportation infrastructure needs to be to unlock the comparative and competitive advantages of regions. Although much of this potential is centred within and surrounding urban areas, areas and nodes within rural areas may also have potential that is unique to that area or node. In other words, certain rural areas may have comparative and competitive advantages that can compete on a national and international level if sufficiently connected to one another and appropriate market contact points.

Market linkages can be created in many ways, with one such way being the establishment and development of transport linkages / corridors. Importantly though, the success of transport corridors depend on their ability to serve the key economic sectors that are found along such corridors.

To integrate the space-economy of the Province and to exploit the competitive advantages of regions in a sustainable manner, the following is proposed:

- **Action 1:** Maintain **existing Transport Corridors** through targeted fixed infrastructure spending on upgrading and maintenance activities of road and rail infrastructure. Applicable corridors include *inter alia*:

  - **The N3/N11 corridor** linking Durban to important economic activity nodes within the Province's hinterland such as Pietermaritzburg, Ladysmith, and Newcastle. It also serves to link Durban to the Witbank-Middleburg economic activity area within the Mpumalanga Province, via Volksrust and Ermelo;
  - **The Lebombo SDI Corridor** (N2, R22), focusing primarily on developments along the southern and eastern sections of the Pongola Poort Dam; tourism facilities along the new SDI Route to Mozambique; large scale agricultural development and enhancing the development opportunities related to the Greater St. Lucia Wetland Park and
  - **The N3 corridor** linking Durban to Gauteng via Estcourt and Harrismith in the Free State.

- **Action 2:** Develop an extended **Multi-Purpose Development Corridor** linking the new port and Industrial Development Zone (IDZ) of Nqguru (Couga) situated within the Eastern Cape, to Maputo via Port Shepstone, Pietermaritzburg, eThekwini and Richards Bay through fixed infrastructure spending aimed at leveraging the tourism, agricultural, mining, and industrial / commercial sectors. Transportation infrastructure functioning as corridors for the transportation of agricultural produce, mining, manufacturing and industrial related goods should receive priority infrastructure spending. Sub-corridors forming part of this extended multi-purpose development corridor include *inter alia*:

- The eThekwini / uMhlatuze Corridor (N2 North), linking Durban to Richards Bay, parts of Mpumalanga, Swaziland, and Mozambique via the R22 and R439. This corridor primarily focuses on development opportunities being presented as part of the La Mercy/DTP development.
- The N2 (South) linking Durban to Port Shepstone and the Eastern Cape.
- The eThekwini / Msunduzi / uMngeni Corridor (N3).
- The dedicated KwaMashu – Umlazi, North – South and Umlazi – Isipingo rail corridors.

- **Action 3:** Support the Agrarian Revolution Initiative by developing **Agricultural Corridors** through targeted fixed infrastructure spending on upgrading and maintenance activities of road and rail infrastructure. Applicable corridors include *inter alia*:

  - The R34 corridor from Richards Bay to Vryheid, and beyond to Piet Retief. This corridor includes the railway line between Richards Bay, Vryheid, and over the provincial border to Broodsnyersplaas and Ermelo;
  - The R33 link between Dundee, Vryheid, and Mpumalanga, which joins the R34 corridor at Vryheid;
  - The Port Shepstone / St Faiths / Ixopo Corridor (N2, R612, and R617), focusing primarily on developing the agricultural areas within the Ugu and Sisonke district municipalities and
  - The Lebombo SDI Corridor (N2, R22), focusing primarily on developments along the southern and eastern sections of the Pongola Poort Dam.

- **Action 4:** Exploit the tourism potential of the Province by developing tourism corridors through targeted fixed infrastructure spending on the upgrading and maintenance of road, as well as the construction of new linkages. Applicable corridors include *inter alia*:

  - The Battlefields Route Corridor (Umzinyathi) (R33, N11) between Pietermaritzburg and Newcastle, focusing primarily on the route between Dundee and Greytown via Msinga, as a priority for the further development of the Battlefields routes of the Province;
  - A proposed new corridor running parallel to the north-eastern, eastern and south-eastern sides of the Drakensberg to fully exploit the tourism potential offered by the Drakensberg region. This can be achieved by linking Little Switzerland situated on the KwaZulu-Natal – Free State border with Matatiele situated to the far south on the KwaZulu-Natal – Eastern Cape Border via Underberg, Himeville, Estcourt, Winterton and Bergville by upgrading existing provincial and secondary gravel roads;
  - The Lebombo SDI Corridor (N2, R22), focusing primarily on developments along the southern and eastern sections of the Pongola Poort Dam; tourism facilities

along the new SDI Route to Mozambique; large scale agricultural developmentand enhancing the development opportunities related to the Greater St. Lucia Wetland Park and
- The Port Shepstone / St Faiths / Ixopo Corridor (N2, R612, and R617), focusing primarily on developing a direct link between the Southern Drakensberg (Underberg) and the coastal areas to expand the basket of tourist destinations and spending options.

It is essential that the aforementioned different types of corridors are adequately served by appropriate transport infrastructure, as well as electricity, water, housing, health services, education facilities, and emergency and safety services.

- **Action 5:** Protect valuable agricultural land, environmentally sensitive areas, areas with high tourism potential, and air quality by:

  - Establishing ecological and biodiversity corridors as indicated by the provincial biodiversity management plan, e.g. all mountain ranges, rivers, wetlands, estuaries, beaches and national parks / nature reserves / wilderness areas should be regarded as no go areas for development;
  - Ensuring the protection of environmental corridors and biodiversity hot-spots via the delineation of urban growth boundaries;
  - Developing a concentrated settlement pattern through restructuring and integration of the urban environment, and encouraging urbanization to take place around strategically selected economic development nodes and
  - Making public transport systems more efficient and reliable so as to attract commuters from private to public transportation modes.

4.3.2.2 Strategy 2: Establish a clear hierarchy of settlements to guide infrastructure provision in an effective and sustainable manner

To ensure that the provision of transportation and other infrastructure helps to facilitate the restructuring of the apartheid space-economy and its associated dispersed settlement structure, a clear hierarchy of settlements should be created. This can be done by:

- **Action 1:** Promoting urbanisation via infill development, densification and services provision at identified rural and urban nodes (primary, secondary and tertiary). Infill development and densification should also be promoted along strategically selected development corridors, for example the proposed Multi-Purpose Development Corridors between eThekwini and Richards Bay, and between eThekwini and Pietermaritzburg. Furthermore, existing and proposed rail corridors should be strengthened by supporting / promoting densified spatial development along their lengths.

- **Action 2:** Strengthen nodes with potential by focusing fixed-infrastructure spending on existing economic activity nodes and other towns and settlements displaying both high need and development potential in order to stimulate sustainable economic activities and long-term employment opportunities. These may include for example the identified primary, secondary and tertiary settlements of eThekwini, Richards Bay, Pietermaritzburg / Msunduzi, Ulundi, Vryheid, Newcastle, Port Shepstone, Estcourt, Ladysmith Howick, Utrecht, Osizweni, Dannhauser, Stanger Pongola, Dundee, Mtonjaneni, Mtubatuba, Skakaskraal, Shakas Rock, Scottburgh, Hibberdene, Margate, Ixopo and Kokstad.

- **Action 3:** The establishment of rural service nodes within areas of high need in order to reach the rural poor in a sustainable manner and to fulfil government's developmental and constitutional obligations. Such nodes should preferably be located in areas of highest need and large population concentrations. Importantly though, only a limited number of strategically selected rural nodes should be developed at first, in order to discourage further entrenching the already dispersed settlement structure. Within the rural service nodes, government investment should be directed at poverty alleviation, human capital development and the provision of basic services.

- Focus areas for the priority development of rural service nodes could include municipalities earmarked as Rural Development Nodes such as the Zululand, Umkhanyakude, Umzinyathi and Ugu district municipalities.

4.3.2.3 Strategy 3: Link areas of exclusion to areas with economic potential by ensuring good access.

Investment in economic infrastructure must not only address the basic needs of people, but should also create an environment that is conducive for income generating activities and productive employment. To achieve this, areas of exclusion should be linked to growth centres, rather than investing heavily in areas with limited economic growth potential. Thus, a primary aim of the national transportation network should be to improve the linkages between settlement of exclusion and areas economic opportunities. This can be done by:

- **Action 1:** Ensuring good road-based public transport access between strategically selected rural services nodes and existing and potential growth centres.

- **Action 2:** Providing alternative modes of public transport (rail and BRT) to communities of exclusion situated in close proximity to or within the jurisdictional areas of large growth centres such as eThekwini, Richards Bay and Pietermaritzburg. Potential corridors for such initiatives may include the KwaMashu – Umlazi rail corridor; the North – South rail corridor and the Umlazi – Isipingo rail corridor.

4.3.2.4 Strategy 4: Accelerate economic growth by stimulating sector development and the development of the Province's existing and proposed Gateways.

To exploit the Province's economic potential and in support of accelerating growth and development, provision will have to be made for public funded infrastructure development – over and above the provision of basic services – in order to facilitate a climate that attracts private sector investment in the key economic sectors of the Province and South Africa. In this regard, several actions are proposed:

- **Action 1:** Developing the Province's existing gateways to bolster economic activity and development via focusing investment around key strategic infrastructure such as the International airport at La Mercy and the ports of Durban, Richards Bay and Dube Trade Port.

- **Action 2:** Establishing the Dube Trade Port as a premier IDZ through the development of dedicated road and rail infrastructure linkages between the Port and the Province's major economic activity areas.

- **Action 3:** The broadening of economic participation and the reduction of poverty through creating the conditions needed to develop existing and latent potential within the sectors driving the economy via:

  - Supporting the provision of access and urban infrastructure (especially water schemes) to areas and communities located in close proximity to the agricultural areas (specifically those being targeted by the Agrarian Revolution and Land reform Programme) located in and around Jozini, Makhatini, Ulundi, Nongoma, Pongola, Nkandla, Eshowe, Msinga, Estcourt, Bergville, UKhahlamba, Msunduzi, Impendle, Mshwati, and Ugu;
  - Initiating the development of Agri-hubs to facilitate skills training and the establishment of local markets. Such hubs should be linked to the local resource base e.g. sugarcane;
  - Supporting the provision of access and urban infrastructure to areas and communities located in close proximity to latent mining potential with a foreseeable life expectancy e.g. the Utrecht-Osizweni-Dannhauser cluster, Nongoma, Ulundi, Newcastle, Vryheid and Dundee;
  - Supporting the provision of affordable and appropriate housing, municipal, education, transport, health and leisure services within existing and potential industrial activity areas namely, Ethekwini, Umhlatuze / Richards Bay, Newcastle, Ladysmith, Howick, Pietermaritzburg, Stanger, Port Shepstone, the Dube Trade Port and the new King Shaka Airport at La Mercy;
  - Supporting the provision of access and urban infrastructure to areas and communities playing (or set to play) a key role in the growth of the services sector for example eThekwini, Richards Bay, Pietermaritzburg / Msunduzi, Newcastle, Port Shepstone, Estcourt, Ladysmith, Pongola, Vryheid, Dundee, Mtonjaneni, Mtubatuba, Stanger, Skakaskraal, Shakas Rock, Scottburgh, Hibberdene, Margate, Ixopo and Kokstad;
  - Support the Inanda / Ntuzuma / KwaMashu (INK) Regeneration Area and the proposed La Mercy airport development via extending the existing North – South rail corridor;

- Supporting the provision of access to and the linking of tourism nodes of significance to one another (e.g. via the Battle Fields Route road network - R33, R34, R68 and R74 – and the R22, N2 and N11) as well as the provision of urban infrastructure to potential tourism areas and communities located in close proximity to such areas for example the St. Lucia wetlands, the Hluhluwe-Umfolozi-Mkuze game reserves, and the Greater Drakensberg tourism activity areas, as well as the numerous holiday coastal towns located along the North and South coasts and
- Strengthening tourism opportunities within the Province via the upgrading of specific sections of roads to form three-dimensional scenic routes rather than point-to-point two dimensional high speed commuter and freight transport routes for example the roads from Durban to Port Shepstone (southerly direction) and St. Lucia (northerly direction).

5. PASSENGER TRANSPORT STRATEGIES

OVERVIEW

The focus of this Chapter is on a strategy for inter-regional passenger operations integrated with the proposed transport infrastructure plan discussed in Chapter 6.

This Overview gives a summary of the agreed scope of the Passenger Operations deliverables with the DoT, summary of policy directives, the objectives addressed by Phase 2, the problems assessed in Phase 2, and conclusions drawn from Phase 2.

NATMAP's Terms of Reference (ToR), in particular clause 4.3.4, states "determine the most sustainable high-quality country-wide, multi-modal, integrated passenger transport system over the planning period 2005 to 2050 in South Africa". The following interpretation was agreed by the client:

i) The Passenger Transport System should include institutional, legal and financial components covering both infrastructure and operations to ensure that strategies, programmes and projects can be implemented. These are addressed in the national Financial, Institutional, Legal and Management report;
ii) The emphasis is to be on long-distance passenger movement, i.e. inter-city in general, and inter-metropolitan in particular;
iii) Local passenger movement is only of concern where it compromises efficient long distance transport, e.g. congested or capacity restricted intra-urban trunk routes affecting access to ports and airports;
iv) The scope should be restricted to infrastructure and modes of travel regulated by the national Department of Transport. In this regard the passenger strategies, programmes and projects in NATMAP should be harmonized with the plans of independent transport entities such as the CAA, ACSA, PRASA and SANRAL and
v) Passenger strategies and actions developed in NATMAP should be mindful of energy depletion, environmental issues and the millennium development goals.

There are a number of policy issues which affect passenger transport and have a critical bearing on the passenger content of the Master Plan. These are:

i) Long-distance passenger transport is largely in the hands of the private sector (except for SAA and PRASA) and it is not appropriate for a government planning initiative to be involved in transport operations involving private sector service providers;
ii) There seems to be a gap in respect of policy review, namely poor performance in passenger policy implementation by most provinces and municipalities;
iii) Maritime, aviation and to a lesser extent inter-city rail are highly specialised services involving amongst other things international safety regulations, bi-lateral agreements and other specific matters of detail. NATMAP should be guided by existing and evolving Master Plans being prepared by ACSA and PRASA. Coastal passenger movement and its supply and demand is a private sector initiative and is not a national imperative, except as a “nice to have” for the tourist industry and
iv) Private transport both competes with and support, public transport. Policy positions need to be taken regarding the supply, regulation and standard of infrastructure for these essential passenger transport modes.

Phase 2 addressed the following objectives:

- To identify the main problems and issues from the Status Quo information in Phase 1;
- To determine the base year (2005) service capacity bottlenecks by comparing the demand and supply on various inter-regional routes;
- To identify alternative strategies to be investigated in Phase 3 and
- To assess the implication of existing plans on the Phase 3 forward plans.

Specific problems assessed in Phase 2 are:

- The issue of Government ownership of infrastructure and of service provision leading to in-efficiencies;
- Although inter-city air, bus, and mini-bus taxi are provided very efficiently by commercial and private operators, especially where they serve the higher income markets, the problems would get more severe in future with increasing demand;
- Rising car ownership and use give rise to congestion during peak holiday times and unsustainable energy and environmental impacts;
- Aged and, in some cases unsafe, rolling stock and public transport vehicles;
- Serious user dissatisfaction with almost all attributes of train, bus and minibus taxi services;
- Existing public transport is not sustainable under present operating and management practices;
- The modal integration of public transport services is limited;
- Modes are not used where most appropriate;
- Long-distance rail suffers from very old rolling stock, low demand and hence low profitability;
- Long-distance stations and termini are in poor condition and generally not integrated with other supporting land-uses and

- Traffic safety is a major problem relating to car, bus and mini-bus taxi transport.

From Phase 2, the following were concluded:

- There is a need for NATMAP to advocate decision-making on the basis of “value for money” and rigorous applying the principles of economic evaluation in appraising long-term projects and schemes;
- Numerous problems and issues are evident from the analysis of the existing passenger transport system in the province;
- The Integrated Rapid Public Transport Network (IRPTN) initiatives discussed in the Phase 2 analysis report must be the catalyst required to address the problems experienced in the province;
- NATMAP should endorse and support the IRPTN initiative and assist in extending public transport service improvements into the realm of inter-city and rural transport and
- NATMAP needs to engage in the debates about:
    - the most appropriate role of modes;
    - safety, energy efficiency and the environment;
    - the necessary regulatory response to achieve the desired vision for public transport in the RSA.

The main strategy to address the problems in passenger operations is to provide a high-quality, integrated public transport system linking the main cities and towns in South Africa similar to that found in Europe. In view of the projected passenger demand, a Strategic Public Transport Network is defined, similar to the Integrated Public Transport Networks (IRPTN) developed by the metropolitan authorities and other cities as part of the DoT’s Public Transport Action Agenda. Primary and feeder / distributor routes and public transport modal inter-changes forms part of the SPTN, typically located at CBD train stations and other key nodes. Appropriate modes providing public transport services on the network are subsequently defined based on demand and distance criteria.

It is appreciated that Passenger Operations involve many aspects, such as appropriate levels of services and specifications, operating costs and subsidy requirements, fare structure and subsidy policy, etc. However, in sympathy with the scope of NATMAP, which focuses on a master plan for transport infrastructure provision, the route network and appropriate modes addressed by the Passenger Operations Strategy are deemed to be sufficient for the purposes of NATMAP. The National Land Transport Act of April 2009, and draft regulations, adequately deals with the legal and regulatory aspects of Passenger Operations.

The DoT is also in the process of starting major projects on managing the Mini-bus Taxi Recapitalisation process and investigating public transport grants and subsidies. The Taxi Recap project will address the formalisation and legalisation of the taxi industry so that mini-bus taxis can be integrated into the formal public transport system. Public transport subsidy policy, subsidies, fare structures and grants will be resolved by the second project.

5.1 STRUCTURE OF CHAPTER

This Chapter is structured as follows:

- Projections of passenger demand for future year scenarios, based on the passenger transport model;
- The Strategic Public Transport Network strategy, developed based on the projected demand, incorporating existing plans of authorities;
- Appropriate modes strategy, based on the demand patterns and route distances and
- Conclusions and recommendations, as well as implications for Phase 4.

5.2 PROJECTIONS OF PASSENGER DEMAND FOR FUTURE YEAR SCENARIOS

5.2.1 Introduction

The passenger transport demand model provided the passenger demand projections for three demographic / economic scenarios, for each ten year interval from 2010 to 2050, and for each mode. The national modelling report discusses the data sources, model calibration and validation, and projections in detail. It must be appreciated that due to the numerous data problems experienced and the strategic nature of the NATMAP project, and hence the model, that the demand projections should be interpreted in this context. The model provides strategic national demand patterns and trends for different scenarios, and should not be used for detailed planning relating to specific transport links. The outputs must also be interpreted within the context of the coarse transport network and zoning system.

The road and rail link capacity analyses require a much higher level of accuracy than what is required for the purposes of the Passenger Operations forward planning. The passenger demand projections for different years and modes reported here should therefore be used only as an indication of strategic corridor volumes and growth trends.

In view of the coarse zoning system, the model ignores local travel, short-distance travel, i.e. trips within each zone.

Finally, in the interpretation of the demand projections, it should be considered that these are not “forecasts” but the transport outcomes based on different scenarios in terms of a wide range of assumptions relating to demographic, economic, land use and energy trends, globally and nationally. The details of these scenarios are provided in the Phase 2 report and their implications for Phase 3 Forward Panning are also discussed in Chapter 4 on Land Use. To simplify the analyses, the various assumptions have been combined to create low growth, medium growth and high growth scenarios. The most likely scenario would therefore lie somewhere in between the low and high scenarios.

For reporting purposes, only a selection of the outputs is provided here in terms scenarios, future years and modes, to highlight key trends. The full spectrum of information is available on the GIS and Databank for a more detailed review of the outputs.

Two passenger transport scenarios are presented here. Firstly, the Business as Usual Scenario, providing the future corridor volumes for the Middle Scenario 2010, 2030 and 2050 for all the road modes combined, rail and aviation. The conventional approach would be to plan for the projected demand for each mode. This approach supports the continuation of current inefficiencies, and would not lead necessarily to the most optimal mode for the demand conditions. The strategic nature of the model coupled with the data problems may also lead to poor planning decisions being taken based on the outputs.

The second and preferred scenario used for NATMAP purposes is one based on the total public transport demand potential along desired, shortest path routes. This was obtained by adding all the public transport trip matrices across all modes, and to assign these along shortest paths. For each corridor, it was assumed that a certain percentage of car trips will be attracted to public transport, which was added to the public transport trips. The public transport potential for future years were used to develop a Strategic Public Transport Network for inter-regional transport as well as appropriate modes to serve this demand.

5.2.2 Business as Usual Scenario

To assist in the interpretation of the modelled projections discussed below, the land use, demographic and economic assumptions made as part of the Low, Middle and High Scenarios should be considered. A detailed discussion of this is given in the Land Use chapter (Chapter 4).

To summarise, each of the population growth scenarios (low, middle and high) chosen to be modelled are based on several assumptions. The most prominent and diverging assumption relates to that of centralised versus decentralised growth. It has been assumed that the high population growth scenario will be accompanied by a resulting higher rate of urbanisation around specific centroids, whilst the low growth scenario will be characterised by a more decentralised, rural, manifestation of population growth. The Middle Scenario assumes a more balanced urban and rural development. In the scenario evaluation done in Chapter 4, the Middle scenario best fulfils the development directives and objectives set for the national transportation network, i.e. it best achieves land use and transportation integration.

For the purposes of the transport demand assessment, the Middle Scenario was therefore chosen. However, the range in demand between the Low and High Scenario is also provided in terms of some aspects, such as total demand and modal split.

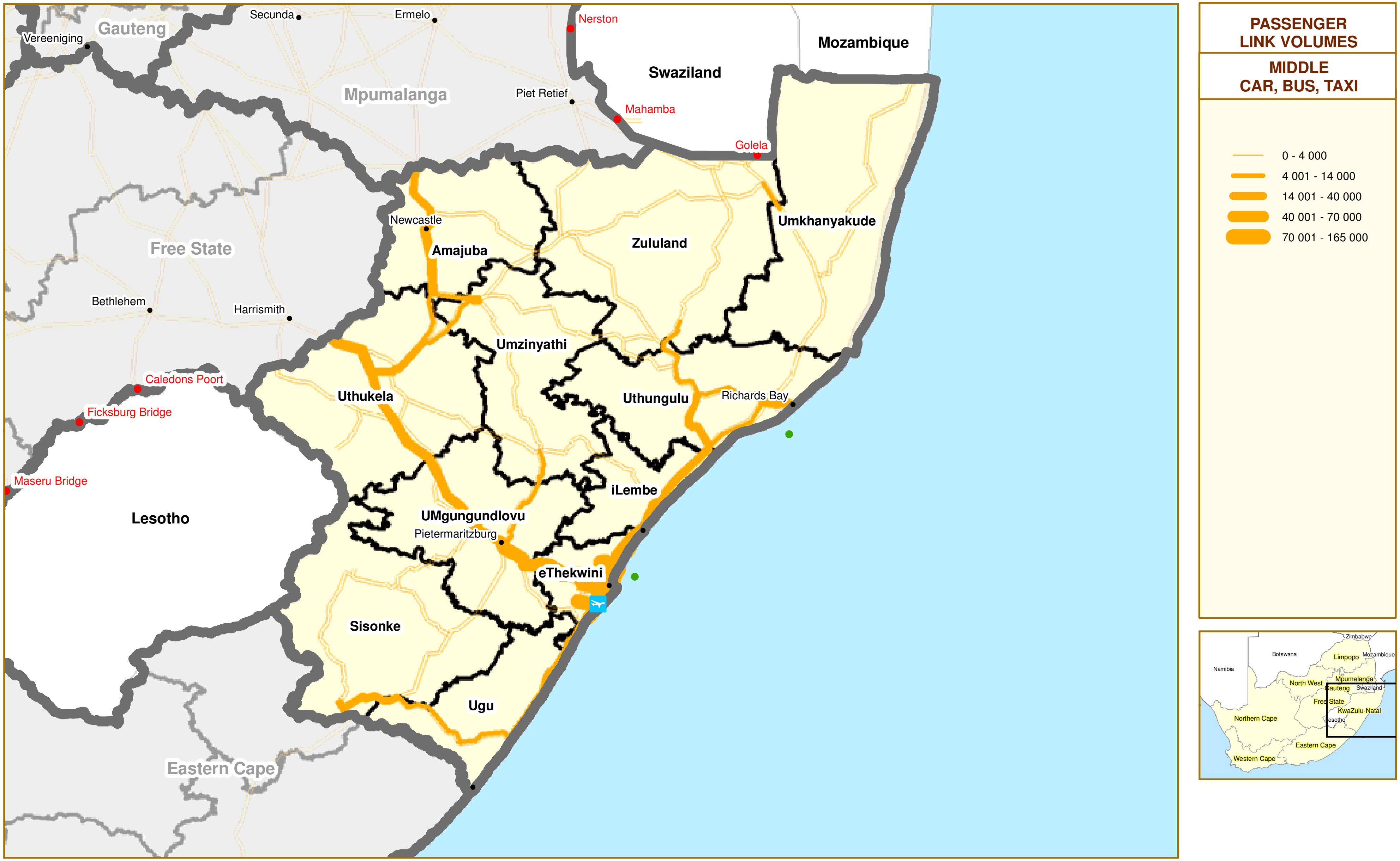
Maps 5.2.A, B and **C** indicates the corridor volumes for the Middle scenario for 2010 for road (car, bus, mini-bus taxi combined), rail and air in terms of average daily passenger trips. Table 5.2A gives the three highest corridor link volumes by mode and year and their locations, as supporting information to the maps.

For 2010 the national N3, N2 North and N2 South remain the most highly trafficked routes and the general pattern is similar to that of the base year 2005. However, in-land provincial routes are becoming prominent, such as the R66 from the coast towards Ulundi, the R74 between Ladysmith and Stanger, the R56 to the south of Pietermaritzburg, the R33 to the north of Pietermaritzburg, the R34 between Dundee and Richards Bay.

The utilisation of the rural rail lines remains very low, while high volumes are indicated around eThekwini along the commuter routes.

The Durban – Johannesburg air route remains by far the dominant one, similar to that in 2005, followed by the Durban – Cape Town and Durban – East London routes.

Kwazulu Natal Province: TOTAL ROAD PASSENGER LINK VOLUMES (2010)



BASEMAP LEGEND:

Border Posts | Airports | District Municipal Boundary

Harbours | Towns | Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

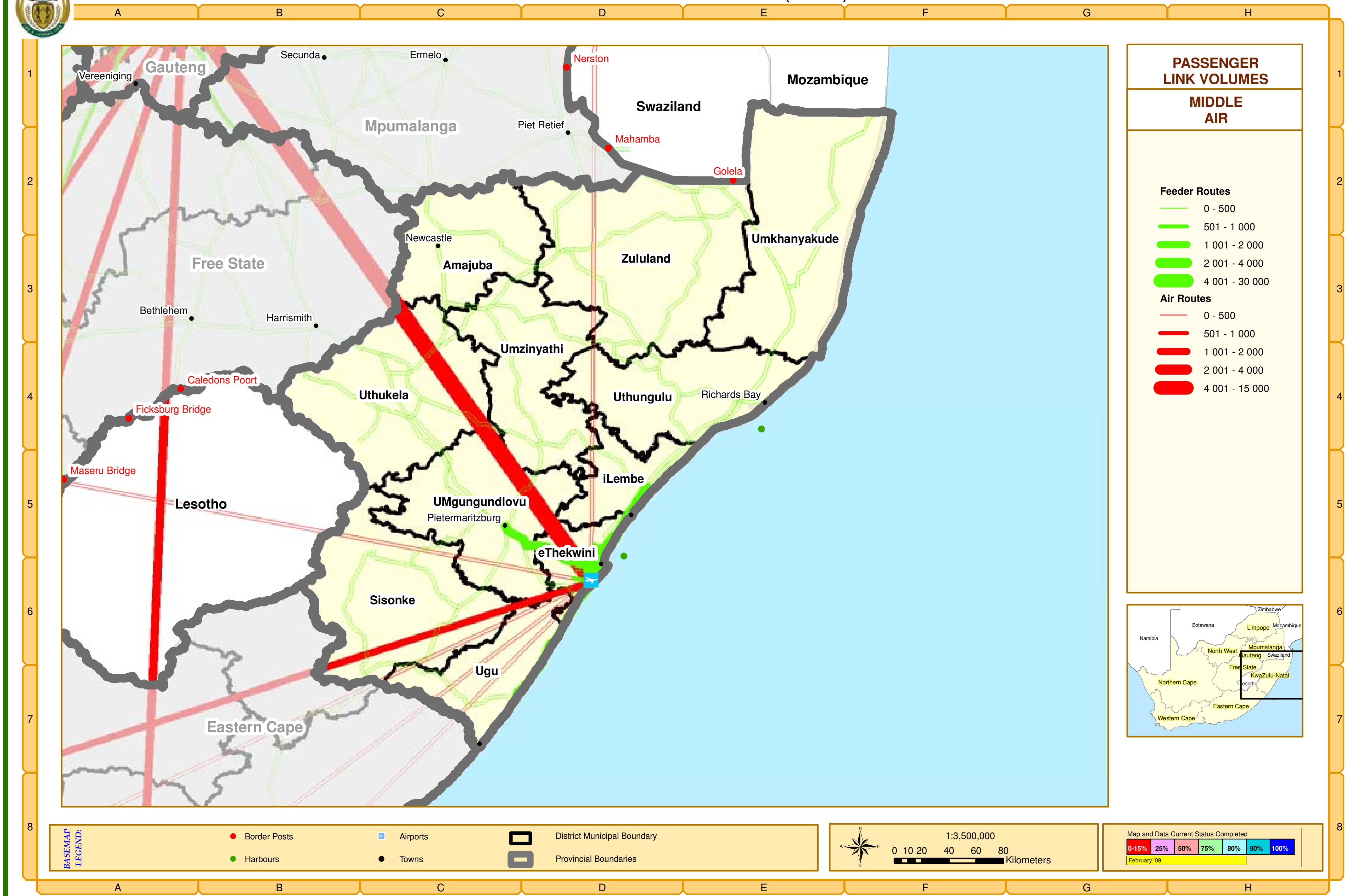
NATIONAL TRANSPORT MASTERPLAN 2050

MAP 5.2A Total Road Passenger Link Volumes 2010 Middle

Kwazulu Natal Province: PASSENGER LINK VOLUMES BY RAIL (2010)

MAP 5.2B Passenger Link Volumes by Rail 2010 Middle

Kwazulu Natal Province: PASSENGER LINK VOLUMES BY AIR (2010)



MAP 5.2C Air Passenger Link Volumes 2010 Middle

NATIONAL TRANSPORT MASTERPLAN 2050

Maps 5.2.D, E and **F** indicate the corridor volumes for the Middle scenario for 2030 for road (car, bus, mini-bus taxi combined), rail and air in terms of average daily passenger trips.

A positive outcome is that the N3 and N2 south indicates limited growth, and hence limited increase in congestion. The highest growth is shown on the R66 from the coast towards Ulundi of more than 40,000 passengers per day, and on the N2 north of between 15,000 and 40,000 passengers per day. Significant growth is also experienced on inland provincial roads, such as:

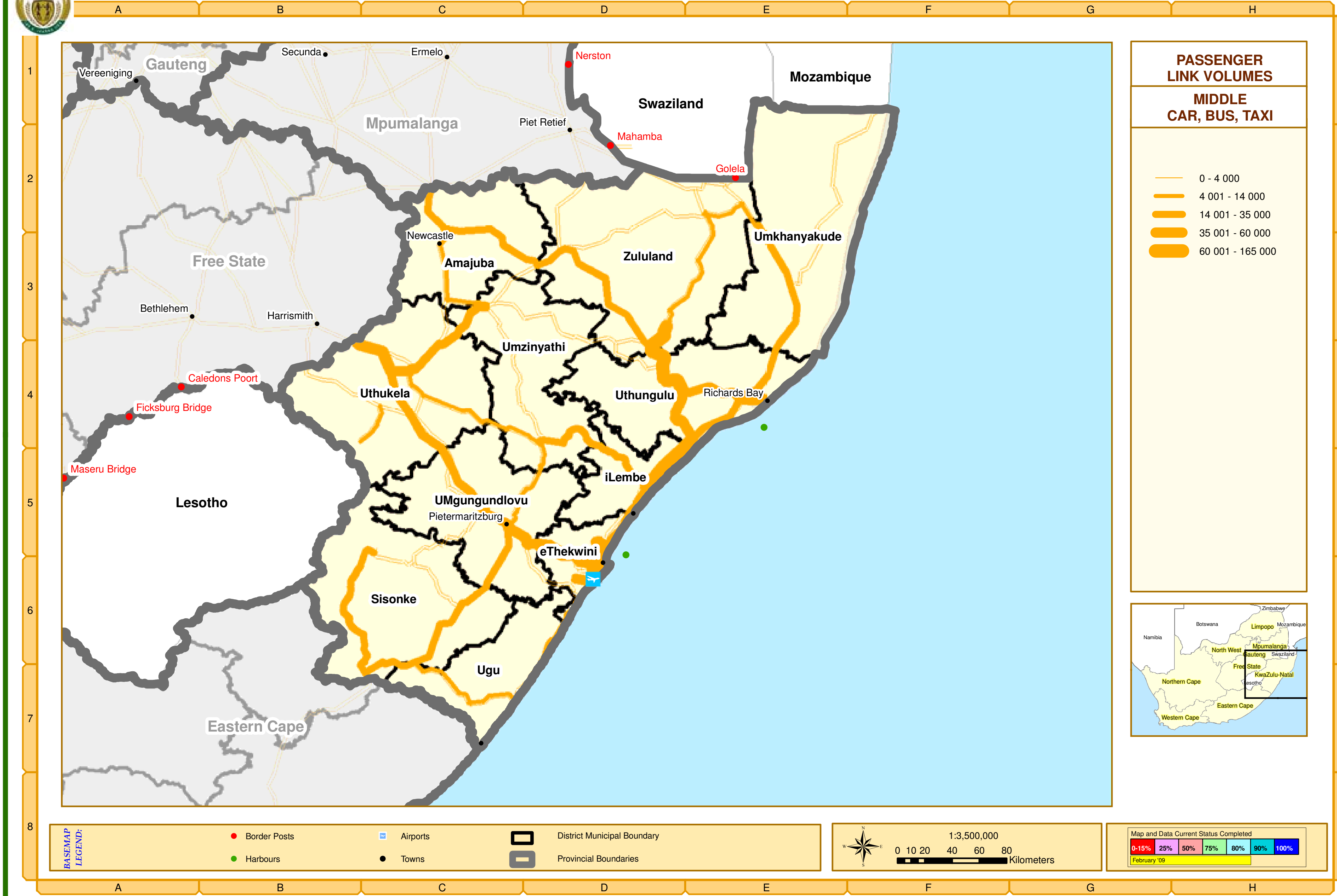
- The R74 between Ladysmith and Stanger (5,000-15,000 pass per day);
- The R56 to the south of Pietermaritzburg (up to 5,000 pass per day);
- The R33 to the north of Pietermaritzburg (up to 5,000 pass per day);
- The R34 between Dundee and Richards Bay (up to 5,000 pass per day);
- The N2 between Port Shepstone and Kokstad (up to 5,000 pass per day) and
- The R22 from the N2 north towards Mozambique (up to 5,000 pass per day).

The moderate rural growth scenario, coupled with the large rural settlements in KZN, therefore starts to put pressure on inland provincial roads, as well as on public transport services.

The pattern of utilisation of the rural rail lines remains similar to that of 2010, with limited growth.

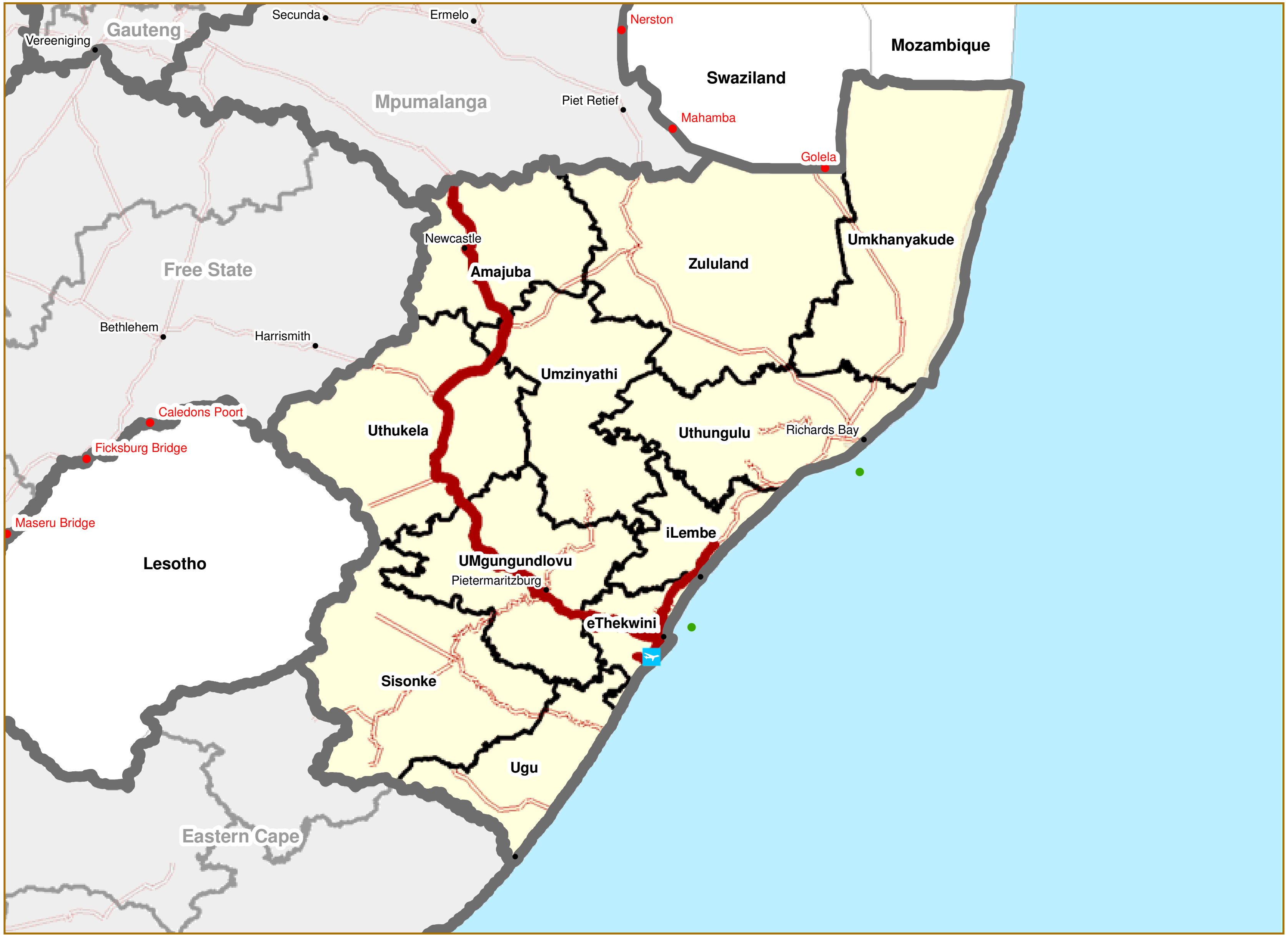
The Durban – Johannesburg air link remains by far the dominant one, similar to that in 2005, followed by the Cape Town and East London routes.

Kwazulu Natal Province: TOTAL ROAD PASSENGER LINK VOLUMES (2030)



MAP 5.2D Total Road Passenger Link Volumes 2030 Middle

Kwazulu Natal Province: PASSENGER LINK VOLUMES BY RAIL (2030)



PASSENGER LINK VOLUMES

MIDDLE RAIL

0 - 170
171 - 600
601 - 1 500
1 501 - 4 000
4 001 - 7 000

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

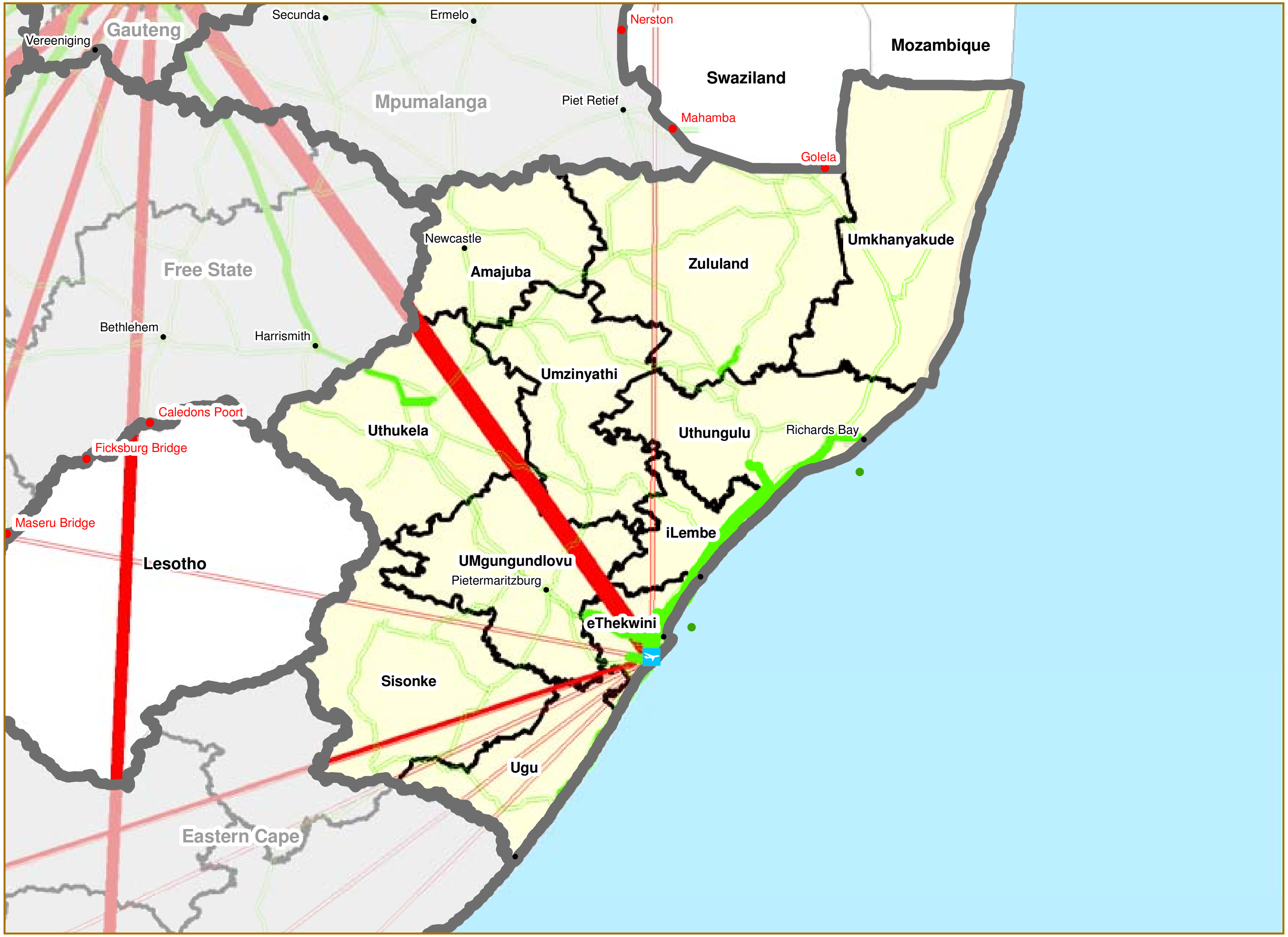
Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 5.2E Passenger Link Volumes by Rail 2030 Middle

Kwazulu Natal Province: PASSENGER LINK VOLUMES BY AIR (2030)



PASSENGER LINK VOLUMES

MIDDLE AIR

Feeder Routes

- 0 - 500
- 501 - 1 000
- 1 001 - 2 000
- 2 001 - 4 000
- 4 001 - 30 000

Air Routes

- 0 - 500
- 501 - 1 000
- 1 001 - 2 000
- 2 001 - 4 000
- 4 001 - 15 000

BASEMAP LEGEND:

- Border Posts
- Airports
- District Municipal Boundary
- Harbours
- Towns
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 5.2F Air Passenger Link Volumes 2030 Middle

Maps 5.2.G, H and **I** indicates the corridor volumes for the Middle scenario for 2050 for road (car, bus, mini-bus taxi combined), rail and air in terms of average daily passenger trips.

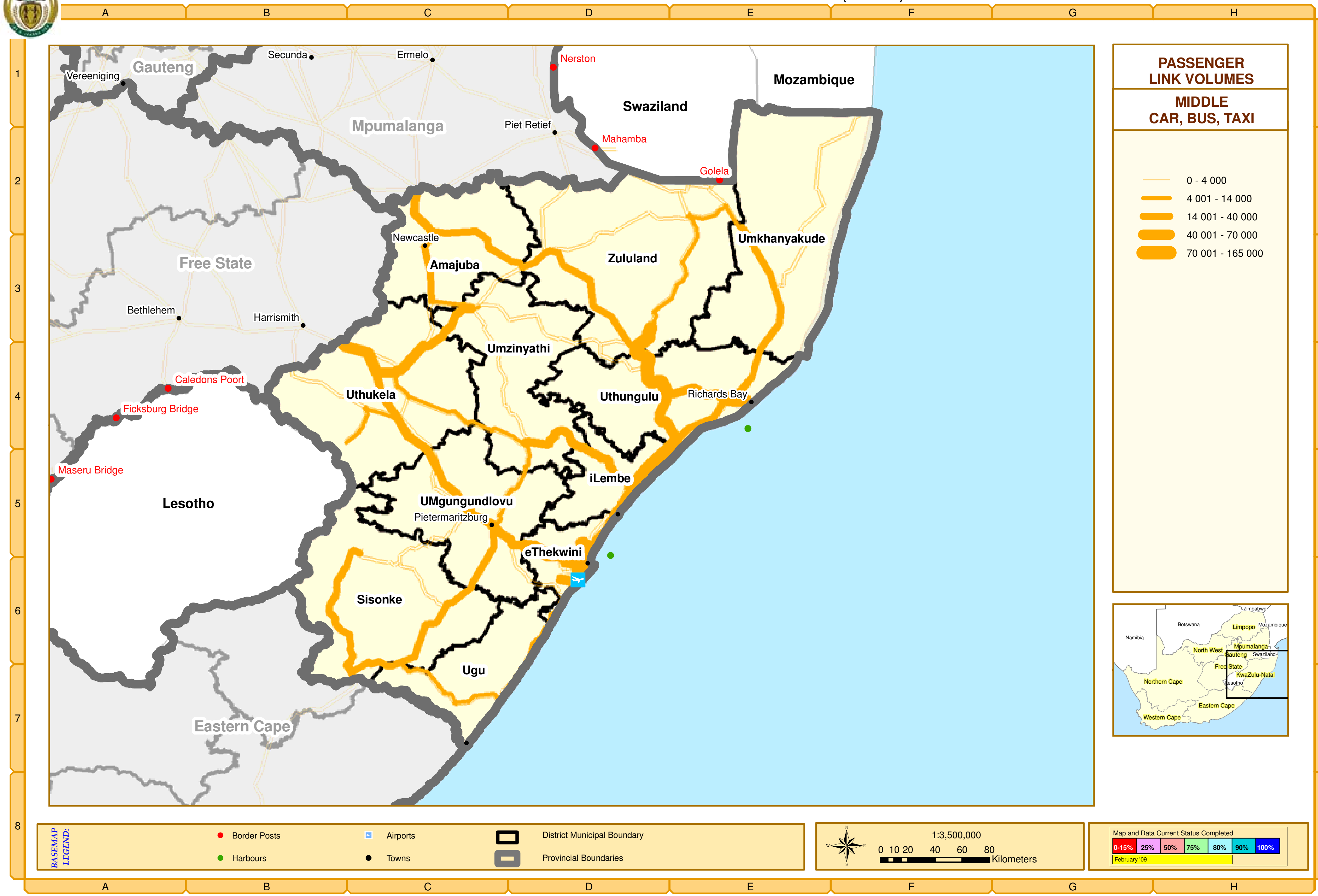
By 2050, most roads indicate moderate growth of up to 5000 passengers per day, except for the N2 north of Stanger and R66 from the coast towards Ulundi, indicating higher growth between 50000 and 15 000 passengers per day.

Further pressure is therefore exerted on road-based public transport services throughout KZN.

Significant growth is indicated on the rail line to the north and west of eThekwini, as a result of expanded growth along these corridors.

Further growth in indicated on the Durban – Johannesburg air ink, whereas growth is also indicated on the Durban Cape Town route.

Kwazulu Natal Province: TOTAL ROAD PASSENGER LINK VOLUMES (2050)



MAP 5.2G Total Road Passenger Link Volumes 2050 Middle

NATIONAL TRANSPORT MASTERPLAN 2050

Kwazulu Natal Province: PASSENGER LINK VOLUMES BY RAIL (2050)

BASEMAP LEGEND:

Border Posts | Airports | District Municipal Boundary
Harbours | Towns | Provincial Boundaries

1:3,500,000
0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed
0-15% 25% 50% 75% 80% 90% 100%
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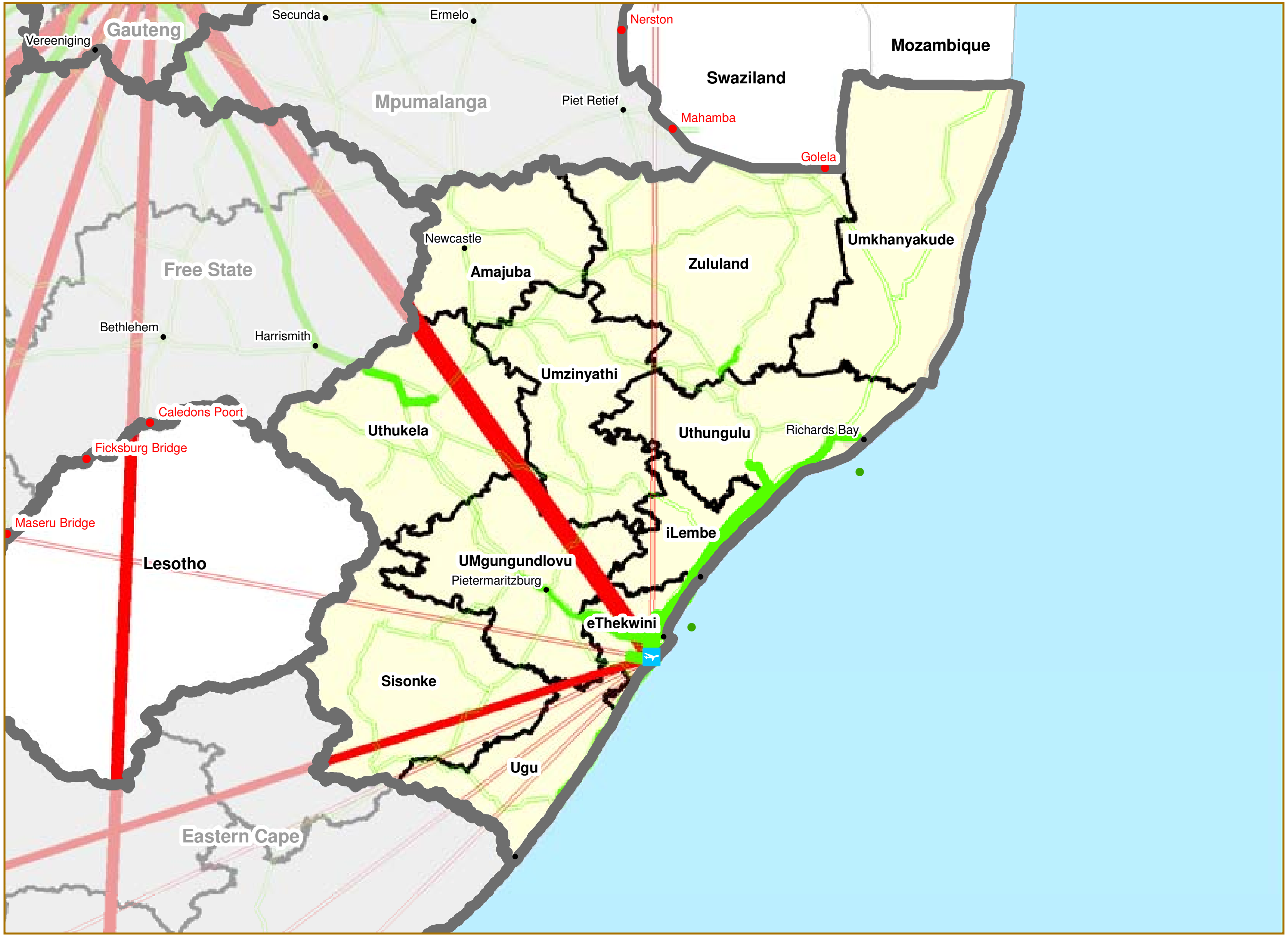
NATIONAL TRANSPORT MASTERPLAN 2050

MAP 5.2H Passenger Link Volumes by Rail 2050 Middle

Kwazulu Natal Province: PASSENGER LINK VOLUMES BY AIR (2050)



PASSENGER LINK VOLUMES

MIDDLE AIR

Feeder Routes

- 0 - 500
- 501 - 1 000
- 1 001 - 2 000
- 2 001 - 4 000
- 4 001 - 30 000

Air Routes

- 0 - 500
- 501 - 1 000
- 1 001 - 2 000
- 2 001 - 4 000
- 4 001 - 15 000

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 5.2I Air Passenger Link Volumes 2050 Middle

Table 5.2.A: Highest link volumes by Mode and Year

					Ave Daily Pass
Road	N3	Moorivier	Estcourt	2010	32000
Road	N2 North	Stanger	Rich Bay	2010	32000
Road	N2 South	Scottburgh	Port Shepstone	2010	24000
Rail	Jhb Line	Moorivier	Estcourt	2010	1400
Rail	Rbay line	Stanger	Rich Bay	2010	726
Air		DBn	Jhb	2010	15000
Air		Dbn	Cpt	2010	1200
Air		Dbn	EL	2010	700
Road	N3	Moorivier	Estcourt	2030	26000
Road	N2 North	Stanger	Rich Bay	2030	70000
Road	N2 South	Scottburgh	Port Shepstone	2030	15000
Rail	Jhb Line	Moorivier	Estcourt	2030	1100
Rail	Rbay line	Stanger	Rich Bay	2030	1000
Air		DBn	Jhb	2030	13000
Air		Dbn	Cpt	2030	1300
Air		Dbn	EL	2030	600
Road	N3	Moorivier	Estcourt	2050	29000
Road	N2 North	Stanger	Rich Bay	2050	78000
Road	N2 South	Scottburgh	Port Shepstone	2050	15000
Rail	Jhb Line	Moorivier	Estcourt	2050	1200
Rail	Rbay line	Stanger	Rich Bay	2050	1100
Air		DBn	Jhb	2050	15000
Air		Dbn	Cpt	2050	1500
Air		Dbn	EL	2050	600

Table 5.2.A shows the modal split by mode and year for all inter-provincial trips (starting or ending within KZN). Only inter-zonal trips have been included i.e. trips between the NATMAP model zones.

Car has the highest share (more than 35%) and its share increases to more than 40 % in 2050, with a peak in 2030. Taxi has the second highest share (more than 30%) and its share declines to 30% in 2050, with a dip in 2030. Domestic air travel has the third highest share (more than 15%) and its share declines over time to below 15 % in 2050. Bus has the second lowest share, below 10 %, and its share increases to just above 10% in 2050. Rail has the lowest share at 2 % and its share remains stable to 2050 with a dip in 2030.

Looking at the long-term trend from 2010 to 2050, and bearing in mind that there is two distinct markets served by these modes, the low- and high-income, there is a shift from air to car, and to a limited extend to bus in the high-income market, and a shift from taxi to car and to a limited extend to bus in the low-income market. These changes are a result of changing land use patterns, resulting changes in travel distances and relative changes in travel times and costs. No changes have been made to modal speeds or unit costs in this scenario.

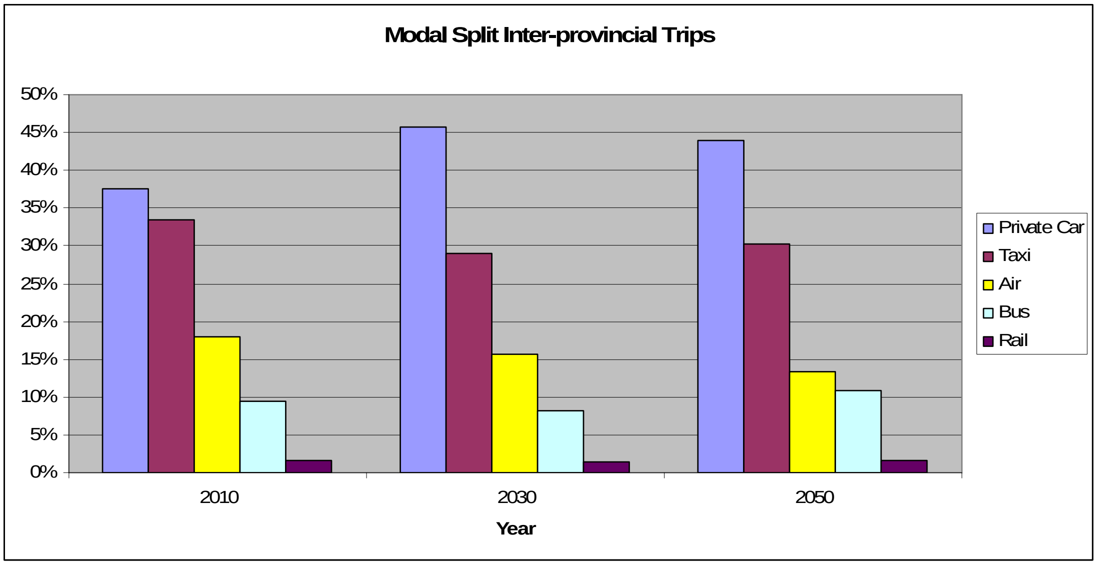


Figure 5.2.A: Modal split by Mode and Year and year for all inter-provincial passenger trips (starting or ending within KZN)

Figure 5.2.A shows the modal split for the Low, Middle and High scenarios for 2030.
Mini-bus taxi shows the highest demand for the Low, rural-biased scenario, even higher than car, compared to the other scenarios, although its demand for the Middle and High scenarios are not much lower. Taxi is more suitable to serve the low-income rural settlements and often the only available mode in these areas.

Demand for car is highest in the High, urban-biased scenario, which coincides with higher economic growth and higher car ownership. Car demand indicates the largest difference between the different scenarios compared to all other modes.

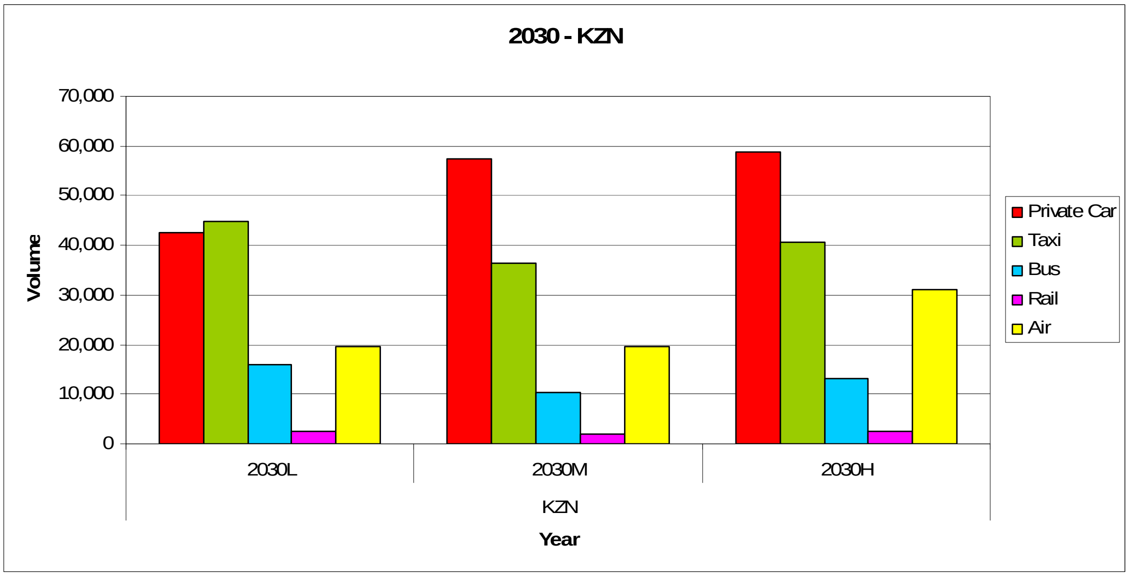


Figure 5.2.B: Modal split for the Low, Middle and High scenarios for 2030.

Air has the highest demand for the High, urban-biased scenario, which is serving the higher-income markets located mostly in urban areas.

Demand for bus is also highest for the Low, rural-biased scenario, and indicates the same pattern than taxi, but with a much lower share.

Demand for rail remains low for all scenarios, but is highest for the High, urban-biased scenario with a small margin. Rail is mainly serving a few urban areas on a limited network, and hence favoured somewhat more in the urban-biased scenario.

5.2.3 Total Passenger Demand to Identify Strategic Public Transport Routes

Maps 5.2.J to **K** give the total public transport potential for 2010, 2030 and 2050. The public transport potential was estimated as the total public transport trips by bus, mini-bus taxi, and rail, as well as a certain percentage attraction from car and air trips. All the public transport trip matrices were combined and assigned to the shortest path road network in order to serve as desired routes. Subsequently, the percentage of car trips on each road link was added to the relevant public transport volume on each link. For 2010 the percentage attraction from car was assumed as 10 %, for 2030 it was increased to 20 % and for 2050 it was increased to 30 %. The same attraction proportions were assumed for air. These must be seen as desired targets for land-based public transport, and the target is increased over time based on the assumption that land-based public transport will have to be improved and extended over time to meet increased demand and increased pressure on energy resources and the environment.

The public transport potential on each link is divided into volume intervals and colour coded according to various modal thresholds in terms of passenger volumes per direction.

During Phase 2 it was found that no research has been done in South Africa on the operating costs of inter-regional passenger transport, similar to that done by C.A. Aucamp and R.F.Del Mistro (2000) for urban travel. The Passenger Working Group agreed on certain modal thresholds for the purposes of NATMAP as a first approximation. These assumptions must be thoroughly researched during the first update of NATMAP next year, so that the passenger transport strategy presented here can be refined.

The following assumptions were made and agreed for all provinces, summarised in **Table 5.2.B**:

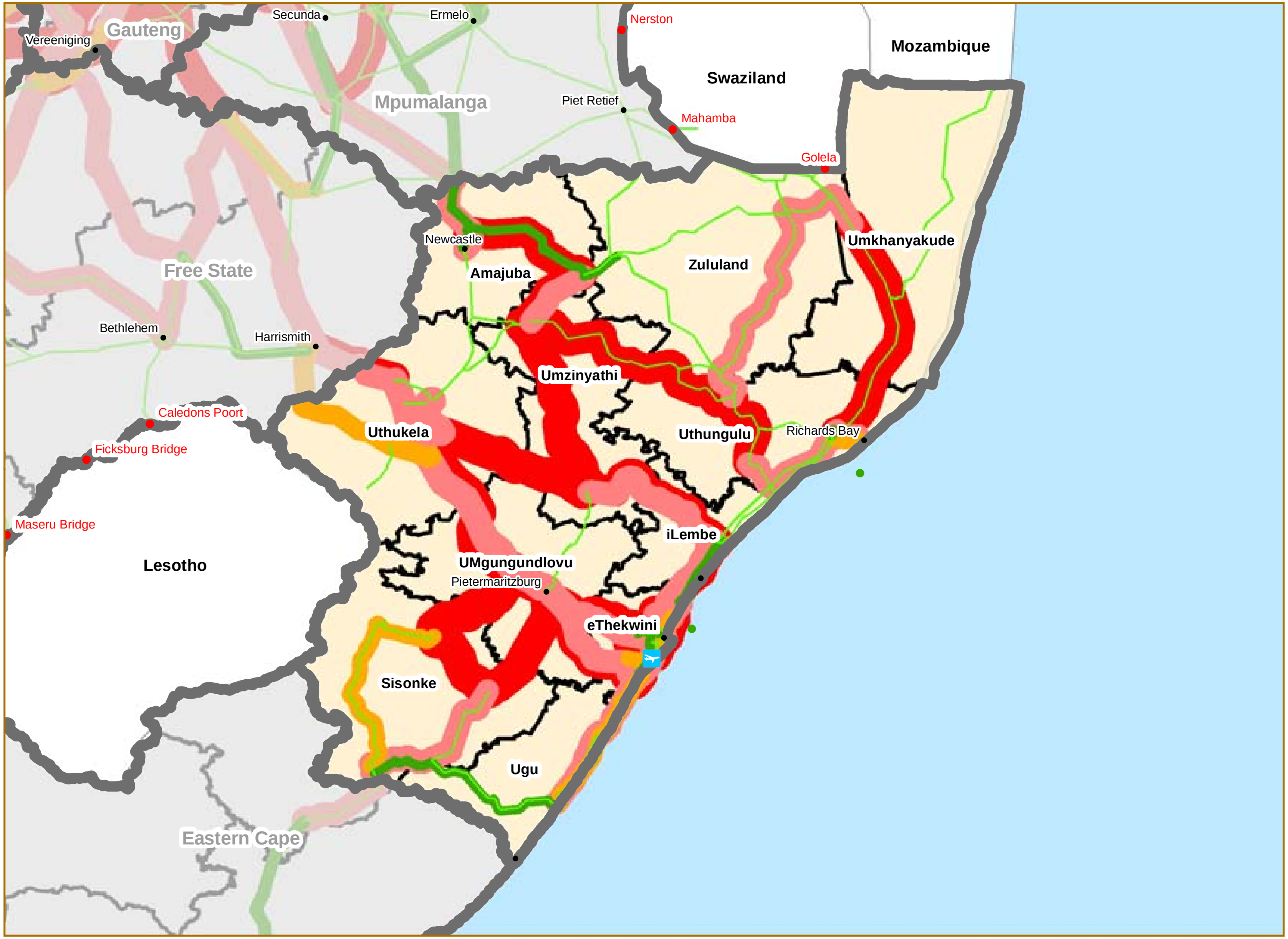
- Assume minibus-taxi services as the default mode.
- Consider inter-regional bus services where one directional patronage exceeds 4,000 passengers per direction per day.
- Consider Priority Bus Systems, such as BRT, Bus lanes, HOV Lanes, on congested corridors where one directional patronage exceeds 6,000 per direction per day. BRT is appropriate for corridors below 100 km in length, especially on congested routes, such as in the metropolitan environment of eThekwini. Normal bus lanes or HOV lanes can be considered in large towns or small cities, such as Pietermaritzburg and Richards Bay.
- Consider inter-city/regional rail where one directional patronage exceeds 20,000 passengers per direction per day.
- Consider high-speed inter-regional rail where one directional patronage exceeds 8,000 per direction and where the distance is between 200 and 600 km, in order to compete with airlines. High-speed rail will require high capital costs to construct standard gauge rail lines, as well as for the rolling stock. High-speed rail can compete with air on middle distance routes, considering access and egress time to and from airports as well as time spent in the airport to check in and to wait for baggage. Hilly or mountainous terrain will make standard gauge very expensive and less feasible. Any high-speed rail for passengers will have to be shared with freight to make it viable, provided that preference is given to passengers to fit their preferred time tables. Chapter 7 on Infrastructure provides a detailed discussion on new rail technologies.

Table 5.2.B: Modal thresholds indicating most appropriate mode for different demand and distance intervals

One Directional Demand (Pass per day)	Distance <200 km	Distance > 200 km
>20,000	Inter-city Rail	Inter-city Rail
8,000-20,000	Priority Bus / BRT (<100 km)	High-speed Rail (200-600km)
6,000-8,000	Priority Bus / BRT (<100 km)	Bus
4,000-6000	Priority Bus	Bus
<4,000	Mini-bus Taxi	Mini-bus Taxi

The Public Transport Demand Potential maps were used to develop a Strategic Public Transport Network as well as to identify appropriate modes along various routes.

Kwazulu Natal Province: TOTAL PUBLIC TRANSPORT POTENTIAL (2010)



AVERAGE DAILY PASSENGER TRIPS

MIDDLE
BUS, TAXI, RAIL & 10% CAR, 10% AIR TRIPS

- <4 000 (Taxi)
- 4 001 - 6 000 (Bus)
- 6 001 - 8 000 (Bus)
- 8 001 - 20 000 (Bus)
- >20 000 (Train)

BASEMAP LEGEND:

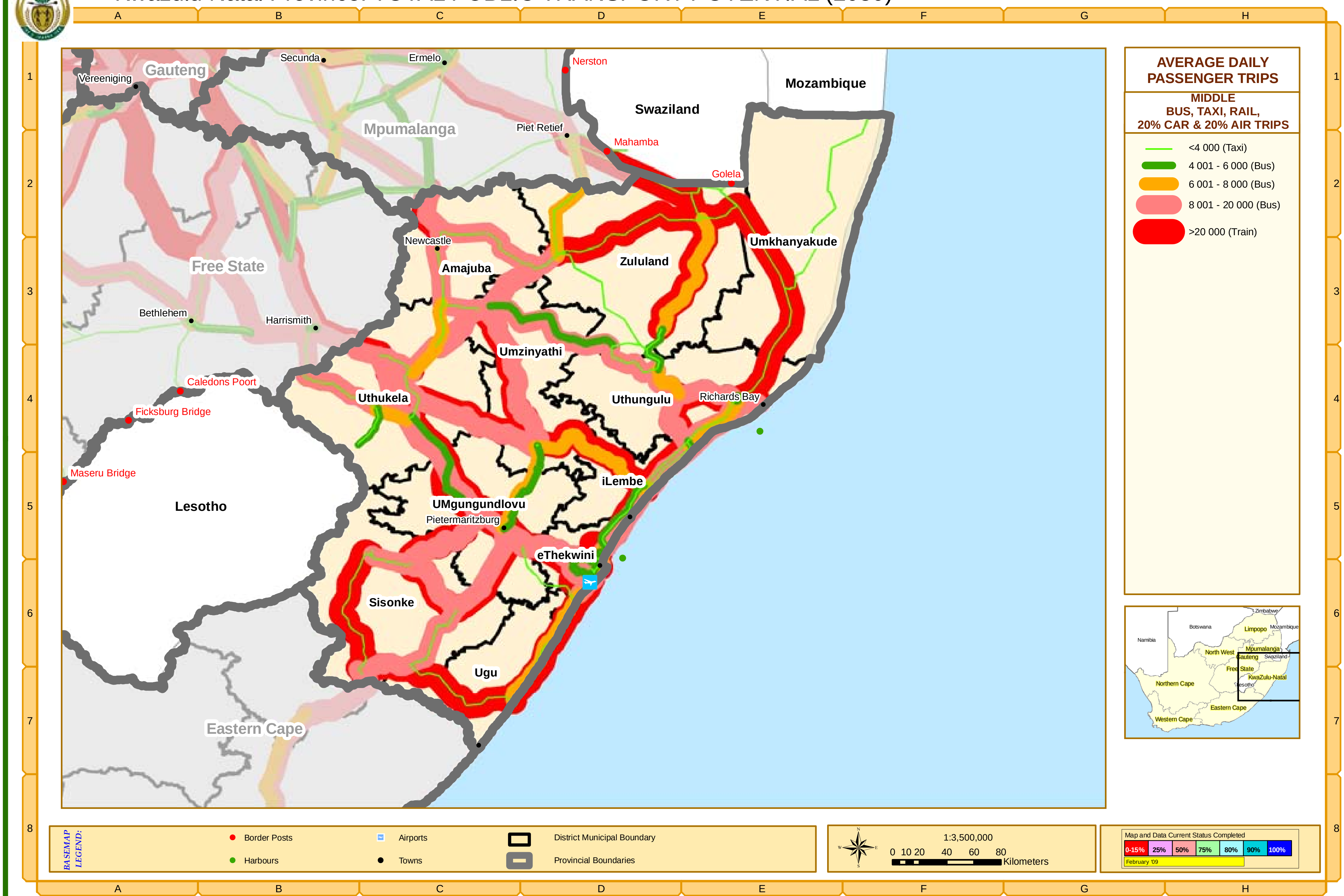
- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000
0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed
0-15% | 25% | 50% | 75% | 80% | 90% | 100%
February '09

MAP 5.2J Total Public Transport Potential 2010 Middle

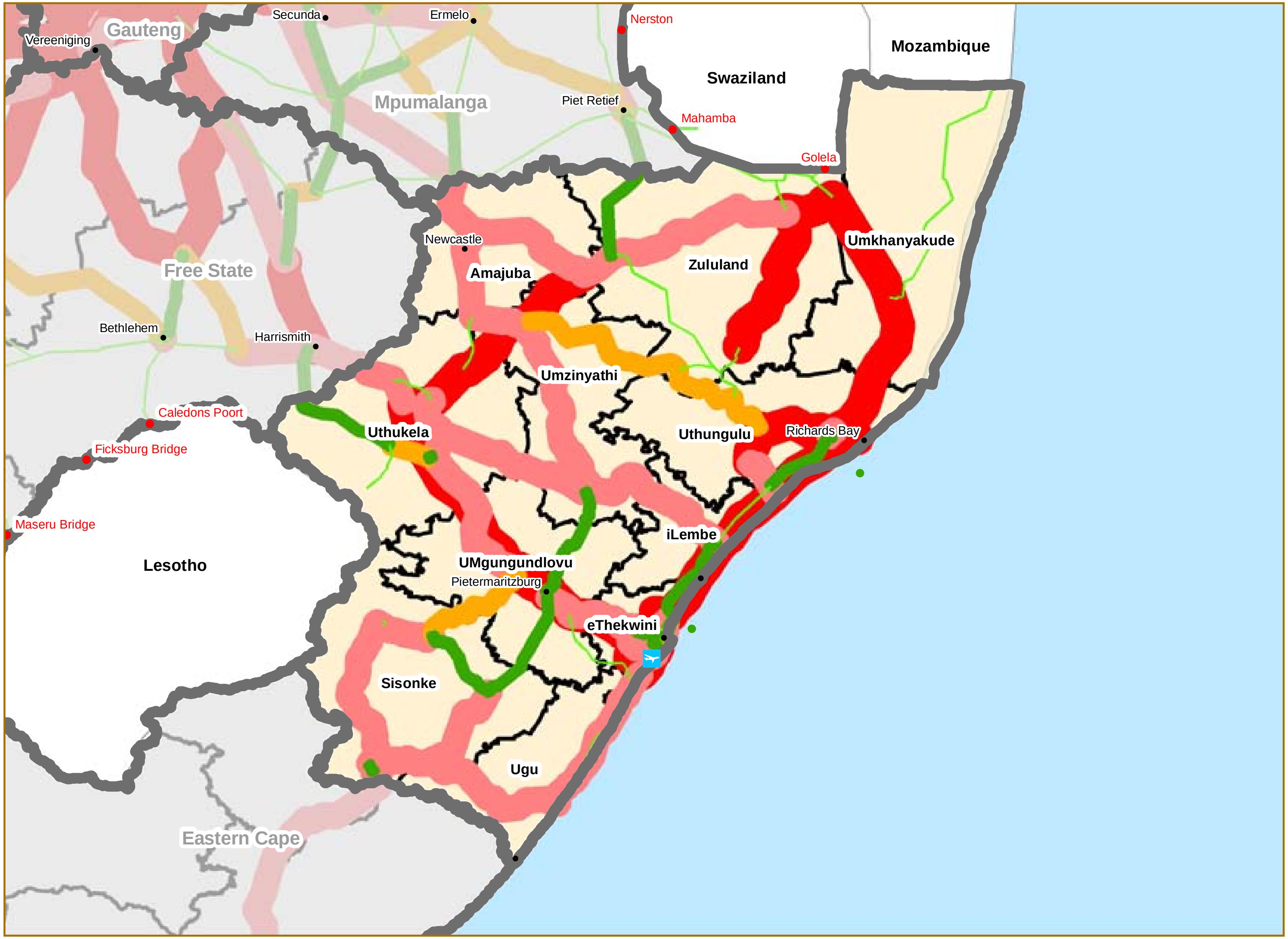
Kwazulu Natal Province: TOTAL PUBLIC TRANSPORT POTENTIAL (2030)



NATIONAL TRANSPORT MASTERPLAN 2050

MAP 5.2K Total Public Transport Potential 2030 Middle

Kwazulu Natal Province: TOTAL PUBLIC TRANSPORT POTENTIAL (2050)



AVERAGE DAILY PASSENGER TRIPS

MIDDLE
BUS, TAXI, RAIL,
30% CAR & 30% AIR TRIPS

- <4 000 (Taxi)
- 4 001 - 6 000 (Bus)
- 6 001 - 8 000 (Bus)
- 8 001 - 20 000 (Bus)
- >20 000 (Train)

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 12.5 25 50 75 100 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 5.2L Total Public Transport Potential 2050 Middle

5.3 Strategic Public Transport Network Strategy

5.3.1 Introduction

In this chapter a Strategic Public Transport Network SPTN) to serve inter-regional, or inter-city, travel is described. The SPTN includes the location of modal transfer facilities and an indication of what are the most appropriate modes for each route. The phased development of the SPTN over time from 2010 up to 2050 is discussed. Other operating characteristics are briefly described, such a levels of service, subsidy policy, and ticketing, etc.

Before defining the SPTN, existing plans of authorities are summarised, which have been incorporated in the SPTN.

5.3.2 Current Passenger Plans of Authorities

As indicated in Phase report, the only government supplied public transport services are air travel provided by SAA and inter-city rail (Sosholoza Meyl) and luxury coach (Autopax) services supplied by PRASA. Autopax trade under the names of TransLux and City–to–City.

SAA operates a commercial service in a very competitive market and their planning is very confidential. It can be assumed that their services are very cost-efficient with little room for improvement.

PRASA conducted a National Passenger Rail Master Plan in 2003, which focussed on commuter rail. A rail strategy for rural areas was also developed. As part of the Rural Rail Strategy, passenger demand corridors were prioritised and potential rural rail corridors were defined.

The following primary and secondary corridors were identified:
KZN

- **Primary Corridors**
  - Gauteng – Pietermaritzburg – Durban;
  - Durban – Bloemfontein;
  - Witbank – Durban;
  - Witbank – Richards Bay;
  - Gauteng – Witbank – Richards Bay and
  - Durban – Richards Bay – Nelspruit

- **Secondary Corridors**
  - Newcastle – Richards Bay and
  - Nelspruit – Newcastle

In terms of operations, PRASA is busy recapitalising its rolling stock, where the greatest need is in commuter rail services. Security is a great concern, and PRASA is busy rolling out railway police and developing SAPS stations at key train stations. Police coaches with cells are also being implemented on long-distance trains.

In addition PRASA is in the process of developing an integrated ticketing and passenger information system.

Finally, the inter-city coach service of PRASA is also a commercial service in a competitive market and their planning would be confidential. Some 500 new coaches have been acquired for the 2010 Soccer World Cup and these coaches can be deployed on the SPTN after the SWC.

5.3.3 SPTN

Concept

The SPTN is similar to the IRPTN's of the 12 cities, which are busy implementing the DoT's Public Transport Plan and Action Agenda. Two categories of routes have been defined for the SPTN, primary and secondary routes. The main function of the primary routes is mobility, while that of the secondary routes is accessibility. The secondary routes serve as collector / distributor routes.

The SPTN will be accessed at primary and secondary modal interchange facilities. Primary facilities are typically located at metropolitan and primary urban nodes, at CBD train stations, while the secondary facilities are situated at secondary nodes and also where the secondary routes intersect with the primary routes.

The SPTN interfaces with the IRPTN's of cities at the CBD train stations, which are also the transport hubs of the cities.

The back-bone of the SPTN is the long-distance passenger rail network, and PRASA's Passenger Rail Master Plan is a key building block of the SPTN.

Whereas the airport to CBD transport links of cities are addressed by the IRPTN's and the ITP's of the cities, they also feature as prominent links in the SPTN.

To summarise, the SPTN is a framework for the development of a high-quality, modern, inter-regional integrated public transport system for SA, which will connect all cities and towns of national significance in SA. It will be served by all public transport modes, and the most optimal modes will be employed to serve each route on the network. Depending on distances and demand, modes may change over time.
Starting at the bottom end, low demand will be served by mini-bus taxis, and as demand increases, by bus and ultimately by rail and air. High-speed train and BRT's will be employed where most feasible.

The SPTN and its various components described here must be seen as a basic framework only, which need to developed and refined over time.

The subsequent sections describe the route network, modal inter-change facilities, appropriate modes, and other characteristics of the SPTN such as service levels, institutional and legal framework and implementation.

Standards and Corridor Profiles

The basis of the proposed public transport system is a set of standards that would guide decisions on the type and quality of passenger services. At this stage only a few key standards are provided which would inform the hierarchy of corridors (primary vs secondary) modal inter-changes (primary vs secondary), and appropriate modes for each corridor. A wide range of more detailed standards need to developed as part of the further development of the SPTN. To assist in the development of the key standards, a profile is given for each of the main inter-provincial and intra-provincial corridors. These are given in terms of such characteristics as total 2050 passenger demand, trip purposes served, national vs provincial routes served, international linkages, modes served, main nodes linked, and support of the Land Use Strategy. Consideration of the total corridor profile informs the decisions on the corridor hierarchy and appropriate modes.

Table 5.3.A gives the profile of the main inter-provincial corridors linked to KZN province, as well as the intra-provincial corridors.

Route network

Map 5.3.A illustrates the primary and secondary route network and the public transport facilities. The route network was developed based on the following considerations:

- Public transport demand potential for 2050 as indicated in the previous sections (Map 5.2L);
- Spatial development framework of the province, as described in the Phase 2 report;
- Human settlement and hierarchy of settlement nodes provided in Phase 2 report; and
- Land Use Strategy indicated in Ch 4 and Map 4.3E.

The demand potential is the total demand of all public transport modes (mini-bus taxi, bus, rail and air) plus an assumed proportion of private transport, i.e. 10 % in 2010, 20 % in 2030, and 30 % in 2050.

As a general principal the primary routes follows national roads and inter-city passenger rail lines, as well as some primary provincial routes, whereas secondary routes follow other provincial routes.

Although the map indicates the routes along the road network, these must be seen as corridors, including the rail lines.

Table 5.3.A: Profile of the main inter-provincial corridors (add landscape table)

Table : Profiles of Corridors relevant to KZN Province

Pmb - Lesotho (via Sani Pass)	PMB Lesotho	KZN	474km	2000-20000	Migrant / Multi-purpose	Yes	Rd	National / Provincial	Yes	3	Primary
Dbn-R Bay via R22 to Mozambique	Dbn- R Bay	KZN	172km	2000-20000	Multi-purpose	Yes	Rd; Rail (potential)	National / Provincial	Yes	2	Primary
N2 Dbn-Port Edward	Dbn-Port Edward	KZN	164km	8000-20000	Tourism	No	Rd;Air	National / Provincial	Yes	4	Primary-Secondary
Corridor Name	**Origin-Destination**	**Provinces Served**	**Length**	**Min- Max Daily Pass 2050**	**Market Segment Served**	**International Linkage**	**Modes Served**	**National / Provincial Route**	**Support LU Strategy**	**Number of Metro/Primary Nodes served**	**Corridor Classification**
Inter-Provincial Corridors											
N3 Corridor	Dbn-Jhb-Pta	Gt; FS; KZN	600 km	14000-20000	Multi-purpose	No	All Modes (Rd, Rail, Air)	National / Provincial sections	Yes	3	Primary
N2 North	Dbn-Swaziland-Nelspruit / Jhb	KZN;MP	1040Km	2000-20000	Multi-purpose	Yes	All Modes (Rd, Rail, Air)	National / Provincial sections??	Yes	1	Primary
N2 South	Dbn-EL-PE-Cpt	WC;EC;KZN	1692km	2000-16000	Tourism	No	All Modes (Rd, Air)	National / Provincial	Yes	9	Primary
Intra-Provincial Corridors											
R34	Rbay - Vryheid	KZN	216km	2000-20000	Agricultural	No	Rd	Provincial	Yes	2	Primary
R74	Stanger - Lady Smith	KZN	229km	8000 - 20000	Multi-purpose	No	Rd	Provincial	Yes	2	Primary
R33	Pmb-New Castle	KZN	259km	7000-14000	Tourism	No	Rd	Provincial	Yes	2	Primary
R56	Kokstad-Pmb	KZN	188km	5000-7000	Commuter;Migrant	No	Rd	Provincial	Yes	2	Primary

Primary routes are:

- N3 from Free State border to Durban;
- N2 south from Durban to Kokstad and the Eastern Cape;
- N2 north from Durban to Ermelo and Mpumalanga;
- N11 from Ladysmith to Newcastle and Mpumalanga;
- R33 from N11 to Vryheid and Mpumalanga;
- R34 from Richards Bay to Vryheid and Mpumalanga and
- Durban International Airport to Durban CDB train station and Airport at La Mercy to Durban train Station from 2010.

Secondary routes are:

- R33 (Dbn-Vryheid-Nelspruit);
- R68 (Melmoth-Dundee);
- R74 (Stanger-Ladysmith);
- R33 (Pmb-New Castle);
- R56 (Kokstad-Pmb);
- R22 (from N2 to Mozambique border);
- R617 (Kokstad – Howick) and
- R66 (Mtonjaneni – Ulundi-Pongola)
- Durban / Pietermaritzburg – Leotho via Sani Pass

The Durban International Airport will move to the new airport at La Mercy by middle 2010. The plans for the current airport has not yet been finalised by ACSA. However, KZN DoT indicated that it was agreed with all role players that the future of the airport should be decided by the KZN Province, to serve the best interests of the province and the country. The current airport will probably serve as a secondary airport for some time. The CBD - airport link will have to be provided to both airports for the time being. Further guidance on the future role of the current airport is provided in the chapter on airports infrastructure.

The primary routes of the N3, N2 north and south of Durban will end at the Durban CBD train station, from where the airports can be accessed and the IRPTN of eThekwini.

<u>Inter-modal transfer facilities</u>

Map 5.3.A also shows the primary and secondary modal transfer facilities.

Primary facilities are located at:

- Durban CBD train station, where inter-city coach terminal is also located;
- Durban International Airport and Airport at La Mercy and
- Richards Bay CBD train station

Secondary facilities are located at:

- Pietermaritsburg;
- Howick;
- Kokstad;
- Ladysmith;
- Dundee;
- Vryheid;
- Blythedeale and
- Mtonjaneni

Minimum standards will have to be developed for primary and secondary facilities. Typically, primary facilities need to be of a high standard similar to airports, where provision is made for easy transfers between modes, public amenities, ticketing offices and passenger information, shops and restaurants, and car rental. Park and Ride facilities also need to be provided. Security must be of a high standard.

Secondary facilities will be of a more basic nature, but they need to provide for ease of transfer, public amenities and high security, clean and well maintained.

The policy and standards of ACSA will have to be addressed regarding provision of inter-modal land-based public transport modes serving airports. Both bus and mini-bus taxi needs to be accommodated at the airport, but with the required controls and operating licenses.

Kwazulu Natal Province: STRATEGIC PUBLIC TRANSPORT NETWORK - 2050

PASSENGER TRANSPORT

SPTN

Modal Transfer Facilities

- Primary
- Secondary
- Airport Transfer Facility

SPTN Corridors

- Primary Corridor
- Secondary Corridor
- Future Corridor

BASEMAP LEGEND:

- SANRAL Road Network
- Railway Network
- Border Posts
- Harbours
- Airports
- Towns
- Provincial Boundaries

1:3,500,000

0 15 30 60 90 120 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

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MAP 5.3.A : Strategic Public Transport Network- 2050

5.3.4 Implications of Transport Infrastructure Plan on Operations

The SPTN is integrated with the Transport Infrastructure Plans described in Chapter 7, and both must be integrated with the future updates of the Provincial and Municipal SDF's, the KZN PLTF and Municipal ITP's.

Any upgrading of road and rail networks, as well as implementation of new roads and railways will require the SPTN to be adapted as and when these are implemented.

New transport technologies proposed in the Infrastructure Chapter need to be incorporated in the SPTN.

5.4 APPROPRIATE MODE STRATEGY

The appropriate modes proposed to operate on the SPTN were derived from the public transport demand potential shown on **Maps 5.2.J to K** for 2010, 2030 and 2050. The demand potential was colour-coded according for each link based on the intervals given in Table 5.2.A.

Figure 5.4.A illustrates the conceptual demand vs distance domains of rail, bus and mini-bus taxi for inter-city travel. The diagram indicates the theoretical model that rail is more appropriate for higher volumes and longer distances, taxi for lower volumes and shorter distances, and bus for inter-mediate volumes and distances. Over shorter distances, bus would require a higher volume than taxi to become more viable, whereas for longer distances, bus would become more viable at a lower volume compared to shorter distances. The same pattern is applicable comparing rail and bus.

The appropriate mode for each route was coordinated across provincial borders according to the following principles:

- Define a mode for a total route between major nodes, such as the N3 from Johannesburg to Durban
- Use the demand most dominant along the whole route
- The different volume bands per direction is an anomaly in the data on which the model was calibrated, and therefore the average demand between the directions must be considered
- The proposed appropriate mode for a certain target year is only an indicator or trigger to conduct a detailed feasibility study of the most cost-efficient mode along the route, and NOT that the mode should be implemented
- Practical considerations such as terrain type (mountainous, hilly, flat, etc)

Map 5.4.A and **Table 5.4.A** give the appropriate mode indicators for the KZN province, which have been interfaced with the other provinces. The map gives the appropriate mode indicators for 2050, while the Table gives the modes for 2010, 2030 and 2050.

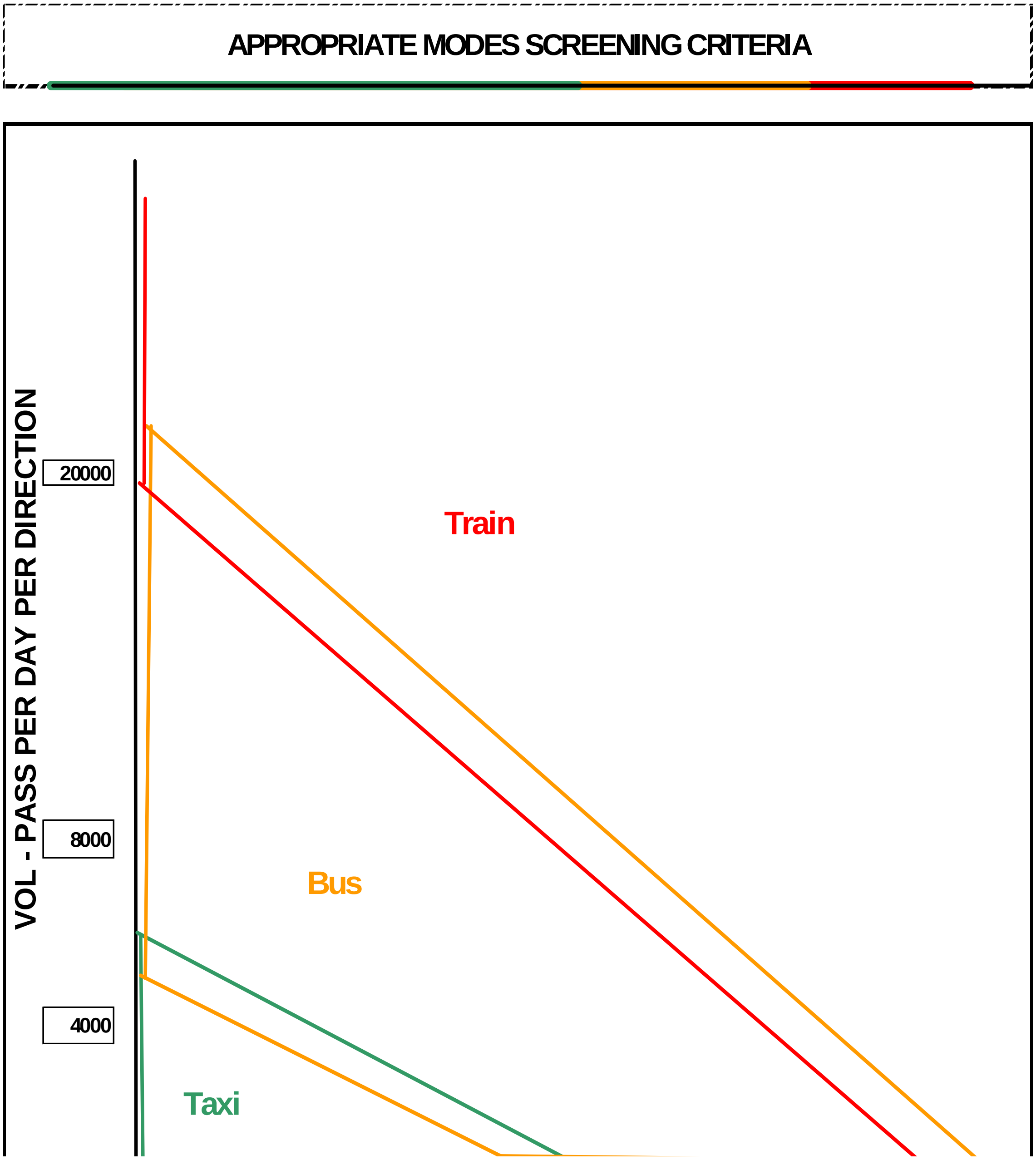
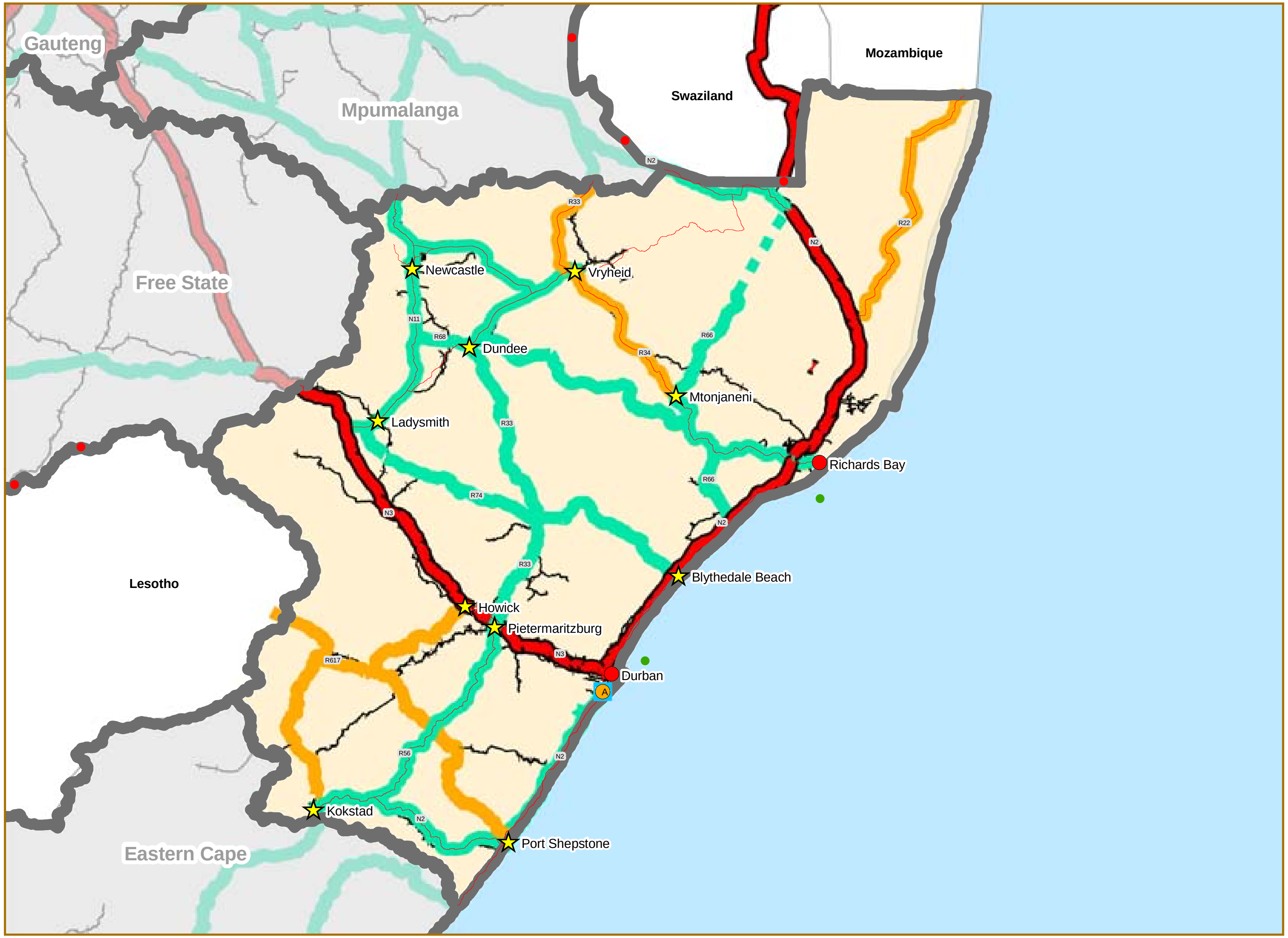


Figure 5.4.A: Conceptual demand vs distance domains for rail, bus and mini-bus taxi modes

Table 5.4.A: Appropriate mode indicators for SPTN corridors

	2010	2030	2050
N3 (Dbn-Jhb)	High-speed Rail	High-speed Rail	High-speed Rail
N2 North (Dbn-RchBay-Ermelo-Jhb/Nelspruit)	Taxi	Bus	Bus
N2 South (Dbn-EL)	Bus	Bus	Bus
N11 Dbn-Ladysith-Polokwane	Bus	Bus	Bus
R33 (Dbn-Vryheid-Nelspruit)	Taxi	Taxi/Bus	Taxi/Bus
R68 (RchBay-Newcastle)	Taxi	Taxi	Taxi
R74 (Stanger-Ladysmith)	Taxi	Bus	Bus
R33 (Pmb-New Castle)	Taxi	Taxi	Taxi
R56/R33 (Kokstad-Pmb-Newcastle)	Taxi	Bus	Bus

Kwazulu Natal Province: APPROPRIATE MODES FOR STRATEGIC PUBLIC TRANSPORT NETWORK -2050



SPTN

MODES

Modal Transfer Facilities

- Primary
- Secondary
- Airport Transfer Facility

Appropriate Modes

- Rail
- Bus
- Future Bus
- Taxi

BASEMAP LEGEND:

SANRAL Road Network	Border Posts	Airports	Railway Network
Main Roads	Harbours	Towns	Provincial Boundaries

1:3,500,000

0 15 30 60 90 120 Kilometers

Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 5.4.A : Appropriate Modes for Strategic Public Transport Network - 2050

<u>Institutional and Legal Implications</u>

The National Land Transport Act of 2009 (NLTA) provides fully for the operating licensing and regulating of the SPTN. The Act provides for a National Public Transport Regulator which is responsible for inter-provincial public transport.
Provincial Regulator Entities are responsible for intra-provincial (services within a province). It is proposed that the initial focus of the SPTN should be on the inter-provincial SPTN, and once this is established and functioning, the intra-provincial SPTN can be established through the KZN Provincial Regulatory Entity.

Tourist Transport Services is regulated by the National Public Transport Regulator, which will form an important component of the SPTN.

In terms of the Act, the SPTN is typically an "Integrated Public Transport Network", which integrates public transport between modes in an area, with through-ticketing and other mechanisms to ensure seamless travel between origins and destinations.

The authorities who need to plan, design and implement the SPTN are:

- The DoT to coordinate all aspects of the SPTN, similar to the IRPTN's of the 12 cities;
- The National Public Transport Regulator to regulate the inter-provincial public transport;
- PRASA to be responsible for passenger rail and Autopax bus services;
- ACSA and SAA to be responsible for air travel and
- The KZN Province and the Provincial Regulatory Entity to be responsible for intra-provincial mini-bus taxi and bus transport

The national FILM report for Phase 3 provides more detail on the institutional and legal matters.

<u>Other Operational aspects</u>

A wide range of operational aspects need to be investigated and defined in detail as part of the SPTN. This is best dealt with in a detailed Operational Plan that must be developed during the refinement and update of NATMAP in 2010. A list is given below of these aspects:

- Appropriate levels of services and specifications for the primary and secondary services;
- Services that would be subsidised and those that would be operated as commercial contracts;
- Operating costs and subsidy requirements;
- Fare and subsidy policy, and fare structure;
- Fare collection systems, considering integrated ticketing and electronic fare collection;
- Passenger information;

- Vehicle specifications;
- Contract specifications;
- Procurement of operators;
- Operating licenses;
- Law enforcement;
- Driver regulations;
- Design standards for different categories of public transport facilities;
- Location of facilities in towns and
- Safety and security on modes and at public transport facilities, etc.

5.5 CONCLUSIONS AND RECOMMENDATIONS

5.5.1 Conclusions Ph 3

The projections of the NATMAP model were used to determine the future public transport demand potential. A Strategic Public Transport Network was developed based on the demand potential, distinguishing a primary and secondary route network. Primary and secondary modal transfer facilities have been identified where the SPTN can be accessed. The public transport demand potential was subsequently used to define appropriate modes, depending on demand and distance intervals.

The key stakeholders that should be responsible for the planning, design and implementation of the SPTN have identified, as well as key operational aspects that must be addressed. The NLTA makes adequately provision for the legal requirements for the implementation of the SPTN.

The SPTN defined here should be seen as a strategic framework for further refinement and development into a full Operational Plan during 2010, which should be implemented in 2011.

Important building blocks of the SPTN are PRASA's Passenger Rail Master Plan and current implementation of various components, projects initiated by the DoT on the management and monitoring of the taxi recapitalisation program, and on public transport grants and subsidies.

Critical gaps in information were identified relating to operating costs of inter-regional public transport and relative cost-efficiencies of different modes across different demand and operating profiles. Urgent research is needed on these aspects.

5.5.2 Implications for Ph 4

Phase 4 addresses the structuring of the Phase 3 plans into various projects, cost estimation of the projects, and prioritisation of the projects according to various criteria defined by the national FILM report. The final output of Phase 4 is a five yearly program from 2010 to 2050 of projects to be implemented. The following qualifications need to be stated regarding the scope of Phase 4:

- Similar to PLTF's and ITP's, NATMAP will have to be updated on an annual basis, providing a rolling 5-year programme for implementation, and updates of the medium and long-terms plans up to 2030 and 2050;
- The definition of the projects will be rather strategic in nature, and cost estimates will only be done at an "order of magnitude" level;
- The project details will become progressively less for the medium and longer term horizons. The most critical projects are those defined for next 5 to 10 years, as projects thereafter will be planned in more detail during following updates of NATMAP;
- Whereas reasonable reliable cost estimate of the Operational Plan and other Plans can be made at this stage, it will be difficult to do reliable cost estimates of the implementation of the SPTN, as this will only be possible following the development of the Operational Plan;
- In terms of passenger operations, detailed planning of the SPTN will be required in 2010, consisting of a detailed Operational Plan, Business Plan and Business Model, Financial Plan, and Implementation Plan;
- Formal implementation of the core elements of the SPTN should commence in 2011, with further expansion during following years and
- The planning of PRASA, ACSA and SAA, provinces and municipalities affected by the SPTN, especially the 12 Cities, should be aligned with the SPTN from 2010 onwards

5.5.3 Recommendations

It is recommended that:

- The DoT and Cabinet approve the principle of the establishment of an inter-regional SPTN as an extension of the IRPTN's in terms of the National Public Transport Strategy and Action Plan;
- That all planning of Planning Authorities, DoT Agencies and Public Enterprises be aligned with the SPTN;
- A detailed SPTN Operational Plan, Business Plan, Financial Plan and Implementation Plan be developed in 2010 in order to establish the SPTN and
- That research is conducted on the operating costs of different inter-regional public transport modes in South Africa, including modern technologies used internationally, and their optimal roles in serving different market segments, as inputs into the SPTN.

6. FREIGHT TRANSPORT OPERATIONAL ANALYSIS

6.1 INTRODUCTION

The first Phase of the National Transport Master Plan Project (NATMAP) provided an overview of the freight transport infrastructure and activities in each province, in relation to industrial development, land use and corridor utilisation.

In Phase 2, the focus of the study was on the operational factors that promote or hinder the efficiency of the freight transport modes and the description of operations in sufficient detail to ensure that the evaluations to be done in later phases of the project are fully informed of current circumstances and practises.

In Phase 3 of NATMAP, the focus is on evaluation of the capacity of all the freight transport modes to satisfy the total national demand for transport of the wide range of commodities produced, imported and exported in South Africa.

Evaluation of capacity must necessarily begin with some sort of estimation of demand, but the estimation of demand for transport is not always straight forward due to the fact that demand for transport is by definition a “derived demand”. Transportation is an integral part of the production and supply of goods and the viability of production is very often dependent on the availability and cost of transport. This means that where transport is unavailable, or too expensive, production does not take place (or is limited) and the demand is therefore cancelled.

As an example, it can be shown that the demand for transport of timber on branch lines is a function of cost, service and the availability of the product in specific areas, with competition between road and rail providing a further consideration. Where transport becomes unavailable or too expensive, foresters cut back on felling and attempt to find other uses for the timber or change to other land uses, such as game farming. It can also be shown that when international prices of pulpwood, chrome or manganese reduce to the point where transportation makes their export too expensive, production ceases and plants are shut down.

In the case of demand for land freight transport of general cargo, a measure of “unsatisfied demand” is the volume that was transported on rail in the 1980s, compared with current volumes that are down by 50% over the past 20 years despite considerable growth of GDP. Another indication of the extent of demand for freight transport on potential rail routes is the growth of long haul road freight during the same period.

In this report the factors that have caused this phenomenon are described as a background to estimation of future trends and volumes as well as the discussion of alternative strategies in the last section of this freight operations report.

As a general principle, the purpose and objectives of freight transport policy must be to satisfy the demand by industry for the necessary services to permit expansion of production, employment, increasing profitability and competitiveness in support of economic growth and prosperity.

The primary role of government is to supply [or arrange] adequate infrastructure and to create the structures and systems to achieve quality regulation in a competitive environment. It should be recognised that "demand management "has almost inevitable cost implications which must be carefully considered before application of measures that produce unintended consequences as the market reacts to restriction.

It is intended that the demand and capacity projections from this freight operations analysis will inform the future needs for infrastructure and provide a basis for alternate strategies and projections of required funding.

A very important consideration to be borne in mind in the definition of "capacity" is that the term does not only relate to tonnes conveyed, but also has important "quality" connotations that cannot be ignored if transport is to be sustainable. Transport quality includes issues of speed, convenience, accessibility, and externalities such as spatial usage, infrastructure destruction, safety, pollution, environmental degradation energy consumption and other factors that impact on society. The evaluation of the present and future capacity of transport modes in this report includes the evaluation of whether these factors are adequately addressed and controlled.

The compilation of this demand and capacity projection must necessarily take cognisance of the current state of the world economy and its impacts on South Africa. Over the past 6 months (2008-2009) Chinese exports have dropped by 20%, and South Africa's manufacturing sector has contracted by 20%; the effects of these events are very evident on the activities of rail and road transport and ports. In defining the long term trends however, the present situation should be projected for a limited period of time after which it is anticipated that economic recovery will be gradual but achievable at more subdued levels during the timeframe defined for the NATMAP project. These issues are discussed in the following section of the report.

In practical terms, the estimation of demand and capacity for specific commodities and industries on the major corridors and main provincial arterial routes must be based on evaluation of production capacities and the propensity for imports and exports of goods.

6.2 FREIGHT MODEL

This Phase 3 report of the NATMAP project addresses the issues of capacity in freight transport, in all modes, as well the projection of future changes and their implications for the provision of transport services.

This process identifies current and future operational capacity constraints and provides the basis for planning of funding and investment in infrastructure, equipment, personnel development, and the concomitant need for development of institutional capacity.

The analyses are of necessity based on national commodity and major route volumes, rather than provincial, as the movement of goods between provinces is not currently monitored in South Africa. The provincial implications are however described for each mode.

It must also be recognised that the NATMAP process has excluded urban distribution tonnage and much of the short-haul rural freight movement, with the emphasis being placed on the main commodity groupings and major national corridors and parallel provincial routes.

The estimates for overall annual road freight tonnes moved in South Africa is approximately 1.4 billion tonnes (CSIR) whereas NATMAP has focused on approximately 363 million tonnes of long distance cargo (181 million on road and 182 on rail) on the main corridors. This limitation will be discussed further in later sections of this report.

It is noteworthy that StatsSA reports approximately 568.5 million tonnes p.a. of land freight with no indication of the proportions by corridor, urban, rural or by mode (P7162 – Feb 2009)

The model of the land freight transport systems of the country has been created from the available data, covering road and rail corridors, ports and pipeline transport has been projected from available information air cargo projections are based on best estimates.

The information has been gleaned from a variety of sources:

- **Rail freight data** was obtained from Transnet, covering all movements for the financial year 2005;
- **Road freight data** has been collated from the various provincial databanks (2005-2007) and then adapted and updated with industry information, press reports, road count information and import-export data;
- **Ports information** has been obtained from Transnet National Ports Authority (TNPA) for all commodity movements through all ports, from 2003 -2008;
- **Pipeline data** was obtained from Transnet for 2006 and has been adapted from press reports of later developments and
- **Air Cargo information** has been obtained from ACSA and various sources.

The information has been integrated into a model of the freight system of the country in which the origins and destinations of cargo movements are defined into a national matrix of 145 areas (zones) that cover the whole country and include transport to and from neighbouring states. A system of 14 major commodity groups has been used for the land transport modes in order to make the model manageable and to provide comparability between the modes.

The commodity groups are:

Grains and cereals	Crops and Fruit	Chemicals	Fuel
Agricultural products	Coal	Cement	Other
Machine and Vehicles	Iron and Steel	Rock and Ores	
Wood and Timber	Containers	Beverages	

The distribution of the commodity groups on the corridors was described in the Phase 2 report on freight transport.

Port projections have been done from analysis of the past and predicted throughputs of import – export commodities, as there is no defined linkage between the volumes of goods that are shipped and landed and the land transport volumes on specific corridors.

Comparison with Other Models

Information and data was obtained (courtesy of Transnet) from the Bureau for Market Research at Stellenbosch University (SU), which provides the basis for Transnet planning.

The econometric modelling technique used by SU produces a distribution of tonnes to corridors for road and rail modes and can then extrapolate the volumes to correspond with a range of assumptions or conditions to provide a flexible tool for testing various scenarios.

The outputs of the SU model that were supplied to NATMAP are shown as the basic volume predictions for different corridors that appear in the Transnet long term plans.
Comparison has been made between the corridor volumes defined in NATMAP and the Transnet /SU data but there are significant problems with comparability;

- overall correlation is not widely divergent but there are significant differences on some corridors;
- SU data is available for 7 corridors, that more or less match the NATMAP model but no data is available for the other 7 NATMAP corridors;
- Transnet Planning framework gives projections from 2006 to 2026 whereas NATMAP requires projections to 2050;
- The time frames are not comparable and
- SU rail data does not cover all corridors

Comparison of the Corridor Volumes is shown in **Table 6.2.A** below.

Table 6.2.A: Comparison between Transnet/Su and NATMAP

CORRIDOR TONNAGE BY ROAD AND RAIL 2007											
	NATMAP						TRANSNET				
	ROAD TONS						ROAD TONS				
CORRIDOR NAME	**2005**	**2010**	**2020**	**2030**	**2040**	**2050**	***2006***	***2011***	***2016***	***2021***	***2026***
GAUTENG - DURBAN	41.5	33.2	37.4	58.1	70.6	83.0	35.0	42.0	50.0	72.9	95.3
GAUTENG -CAPE TOWN	12.7	10.2	11.4	17.8	21.6	25.4	33.3	38.0	44.0	52.0	62.4
GAUTENG - MUSINA	6.5	5.2	5.9	9.1	11.1	13.0	9.5	11.0	12.5	14.0	18.9
GAUTENG -LOBATSE	2.3	1.8	2.1	3.2	3.9	4.6	6.8	8.0	10.0	13.1	16.8
GAUTENG - RESSANO GARCIA	3.2	2.6	2.9	4.5	5.4	6.4	12.2	15.0	19.0	20.0	28.4
CAPE TOWN - PORT ELIZABETH	3.3	2.6	3.0	4.6	5.6	6.6	35.3	42.0	50.0	62.6	73.1
EAST LONDON - BLOEMFONTEIN	1.2	1.0	1.1	1.7	2.0	2.4	6.5	7.5	9.0	10.1	13.7
COLESBURG -PORT ELIZABETH	2.8	2.2	2.5	3.9	4.8	5.6	4.6	4.8	6.0	7.0	8.9
****Gauteng -Richards Bay**							9.2	11.0	13.0	16.0	21.0
Comparative Corridor Tonnes	**73.5**	**58.8**	**66.2**	**102.9**	**125.0**	**147.0**	**152.4**	**179.3**	**213.5**	**267.7**	**338.5**
CAPE TOWN - NAMIBIA	2.5	2.0	2.3	3.5	4.3	5.0					
PORT ELIZABETH - DURBAN	6.5	5.2	5.9	9.1	11.1	13.0					
DURBAN - PONGOLA	6.8	5.4	6.1	9.5	11.6	13.6					
WINBURG - HARRISMITH	5.8	4.6	5.2	8.1	9.9	11.6					
GAUTENG - UPINGTON	2.1	1.7	1.9	2.9	3.6	4.2					
GEORGE - COLESBURG	1.6	1.3	1.4	2.2	2.7	3.2					
GAUTENG - SWAZILAND	2.6	2.1	2.3	3.6	4.4	5.2					
ERMELO - RICHARDS BAY	0.0	0.0	0.0	0.0	0.0	0.0					
SISHEN - SALDANHA	0.0	0.0	0.0	0.0	0.0	0.0					
THABA NCHU - MASERU	2.5	2.0	2.3	3.5	4.3	5.0					
	30.4	**24.3**	**27.4**	**42.6**	**51.7**	**60.8**					
Total Road Corridors	**103.9**	**83.1**	**93.5**	**145.5**	**176.6**	**207.8**	**152.4**	**179.3**	**213.5**	**267.7**	**338.5**
Non-Corridor traffic	**77.4**	**67.0**	**70.0**	**86.8**	**82.8**	**88.0**					
Total Long Haul Road	**181.3**	**202.2**	**224.1**	**232.3**	**259.4**	**271.9**					

	NATMAP						TRANSNET				
	RAIL TONS						RAIL TONS				
CORRIDOR NAME	**2005**	**2010**	**2020**	**2030**	**2040**	**2050**	***2006***	***2011***	***2016***	***2021***	***2026***
GAUTENG - DURBAN	14.0	8.4	11.2	15.4	15.3	21.0	8.3	12.1	17.3	12.0	14.0
GAUTENG -CAPE TOWN	8.0	4.8	6.4	8.8	9.3	12.0	2.6	5.2	7.9	11.0	15.4
GAUTENG - MUSINA	3.1	1.9	2.5	3.4	4.4	4.7	1.9	2.3	3.2	4.8	4.2
GAUTENG -LOBATSE	2.0	1.2	1.6	2.2	3.3	3.0	3.8	5.1	6.2	7.4	9.6
GAUTENG - RESSANO GARCIA	1.9	1.1	1.5	2.1	3.2	2.9	4.2	7.0	9.0	16.1	17.7
CAPE TOWN - PORT ELIZABETH	0.3	0.2	0.2	0.3	1.6	0.5	1.5	3.8	7.2	9.7	20.6
EAST LONDON - BLOEMFONTEIN	1.6	1.0	1.3	1.8	2.9	2.4	0.4	1.1	1.7	3.3	3.6
COLESBURG -PORT ELIZABETH	2.8	2.2	3.2	3.1	3.2	3.5	0.5	1.4	1.6	2.5	3.2
****Gauteng -Richards Bay**							5.1	6.1	8.0	10.2	12.4
Comparative Corridor Tonnes	**33.7**	**20.7**	**27.9**	**37.1**	**43.2**	**49.9**	**28.3**	**44.1**	**62.1**	**77.0**	**100.7**
CAPE TOWN - NAMIBIA	0.0	0.0	0.0	0.0	1.2	0.0					
PORT ELIZABETH - DURBAN	0.0	0.0	0.0	0.0	1.2	0.0					
DURBAN - PONGOLA	6.0	3.6	4.2	5.4	7.2	9.0					
WINBURG - HARRISMITH	0.3	0.2	0.2	0.3	1.5	0.4					
GAUTENG - UPINGTON	0.7	0.4	0.5	0.6	1.9	1.1					
GEORGE - COLESBURG	0.0	0.0	0.0	0.0	1.2	0.0					
GAUTENG - SWAZILAND	0.0	0.0	0.0	0.0	0.0	0.0					
ERMELO - RICHARDS BAY	76.0	68.4	68.4	72.2	77.2	114.0	67.0	88.5		102.8	112.6
SISHEN - SALDANHA	29.0	23.2	20.3	26.1	30.2	43.5	27.5	40.8		74.6	91.1
THABA NCHU - MASERU	0.4	0.2	0.3	0.4	0.5	0.6					
	112.4	**96.0**	**93.9**	**104.9**	**122.1**	**168.6**					
Total Rail Corridors	**146.1**	**116.8**	**121.8**	**142.0**	**165.3**	**218.5**	**122.8**	**173.4**	**62.1**	**254.4**	**304.4**
Non-Corridor traffic	**35.7**	**30.0**	**36.0**	**45.0**	**54.0**	**46.7**					
Total Long Haul Rail	**181.8**	**194.2**	**208.7**	**234.1**	**253.5**	**265.2**					

Note 1: The shaded areas denote corridors for which Transnet data is not reported.

Note 2: In the Transnet data the road and rail tonnes are combined, so that for comparison purposes the extrapolation of the Transnet road and rail total tonnes p.a. has been done in this project, giving approximate volumes for each mode. The extrapolated figures are shown in **red.**

Note 3: There is no defined corridor between Gauteng and Richards Bay and in NATMAP the volumes are reflected on the routes used.

The comparison of the estimated annual totals and the rate of increase in volumes remain relevant, but the major variances are discussed below.

General Comments on the comparative volumes:

Rail Freight

It is suggested that the rapid increase in rail freight tonnes shown in the Transnet plans is unlikely to materialise, due to current constraints and the 20 year history of restricting the development of facilities, reducing rolling stock, cannibalising locomotives, and limited staffing and management. The result has been a continual reduction in the volumes of general cargo, as shown in **Figure 6.2.A** below.

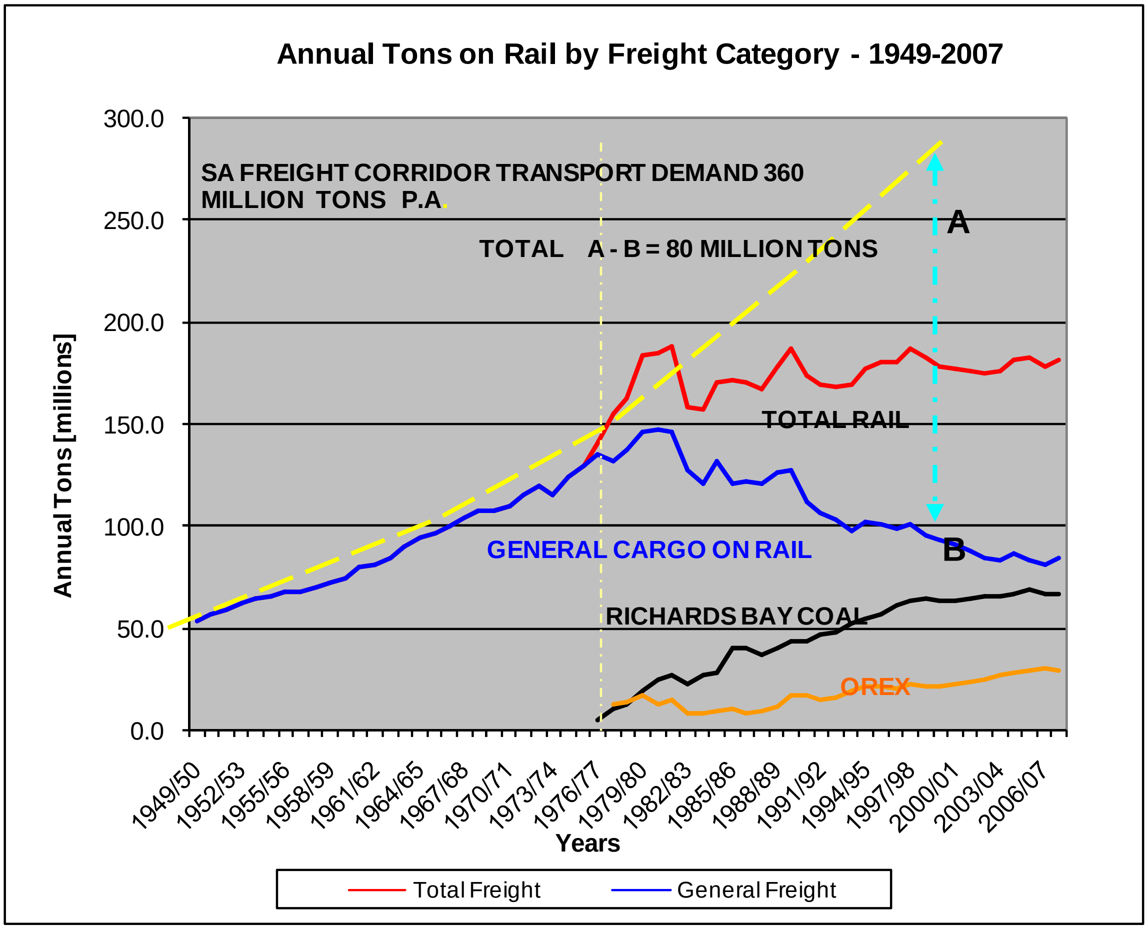


Figure 6.2.A: Annual Tonnes on Rail by Freight Category (1949-2007)

To achieve the indicated volumes it will be necessary to reverse the known current capacity constraints; in addition there are doubts about the availability of funding for the extensive capital expenditure that will be required to upgrade facilities, rolling stock and locomotives.

In order to achieve growth in general cargo it will be necessary to rebuild replacement facilities for many of the abandoned or derelict general cargo installations or introduce completely different systems to encourage intermodal usage of railways for long haul freight.

Projections of future rail freight volumes are discussed in later sections of this report.

Road Freight

It is believed that several of the corridor base volumes for 2006 in the SU data are very high and that the extrapolation of that data creates volume estimates in 2026 for the 8 corridors reported from the Transnet model which is nearly 200% higher than the NATMAP estimate for 2050.

The NATMAP road freight volumes have been compared with the SANRAL data for 2007 and they confirm all earlier figures as shown in **Table 6.2.B** below, allowing for increases since the 2005 base year.

It must be noted that the Transnet plans that form the basis of this analysis were created in a period when different perspectives were prevalent, whereas NATMAP has some of the benefits of hindsight.

Table 6.2.B: NATMAP Road Corridor Tonnes Compared To SANRAL 2007

	CORRIDOR	CORRIDOR NAME	NATMAP 2005	SANRAL 2007 *
1	N3/N11	GAUTENG - DURBAN	41.5	41.6
2	N1 SOUTH / N12	GAUTENG -CAPE TOWN	12.7	14.2
3	N1 NORTH	GAUTENG - MUSINA	9.8	11.1
4	N4 WEST	GAUTENG -LOBATSE	2.3	2.3
5	N4 EAST	GAUTENG - RESSANO GARCIA	3.2	4.2
6	N7	CAPE TOWN - NAMIBIA	2.5	1.6
7	N2 SOUTH	CAPE TOWN - PORT ELIZABETH	3.3	6.4
8	N2 NORTH	DURBAN- PONGOLA	7.4	8.7
9	N2 CENTRAL	EAST LONDON -DURBAN	4.5	5.1
10	N5	WINBURG - HARRISMITH	6.7	7.5
11	N14	GAUTENG - UPINGTON	2.4	4.3
12	N6	EAST LONDON - BLOEMFONTEIN	1.4	2.7
13	N9	GEORGE - COLESBURG	1.8	1.8
14	N10	BRITSTOWN - NAKOP	0.3	0.3
15	N17	GAUTENG - SWAZILAND	3.0	4.7
16	N8	THABA NCHU - MASERU	2.76	2.1
			105.5	118.8
	Note 1: Actual route vehicles/tons -not corridors		100.0%	112.6%

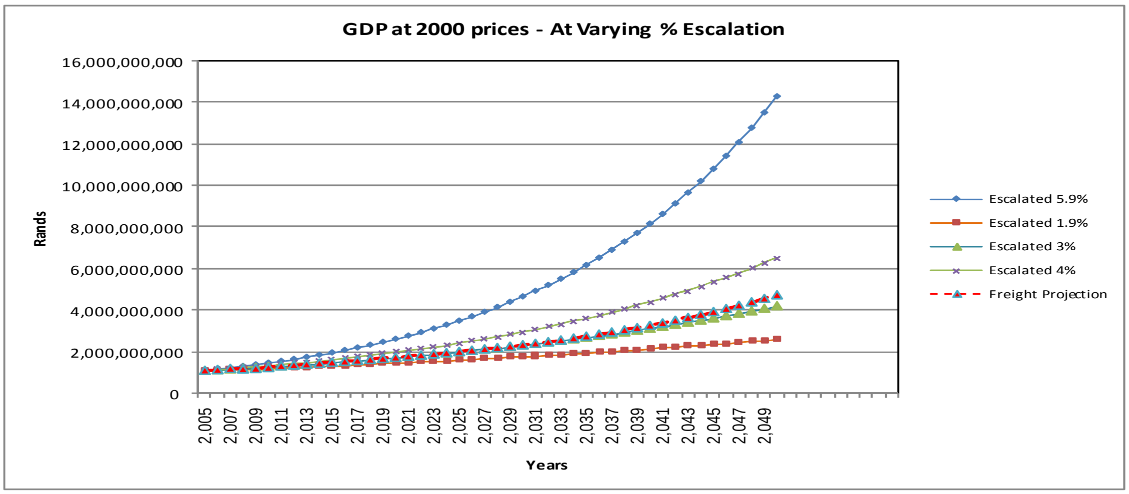
Economic Implications for Freight Transport

In order to make projections of freight transport movements in terms of annual tonnage to be transported by various modes on specified corridors, it is necessary to examine the broad basic economic projections that have been made for NATMAP.

The projected levels of gross domestic product, as reported by Bureau for Market Research (BMR) and Global Insight (GI), shows an average increase of 5.9% at constant 2000 prices.

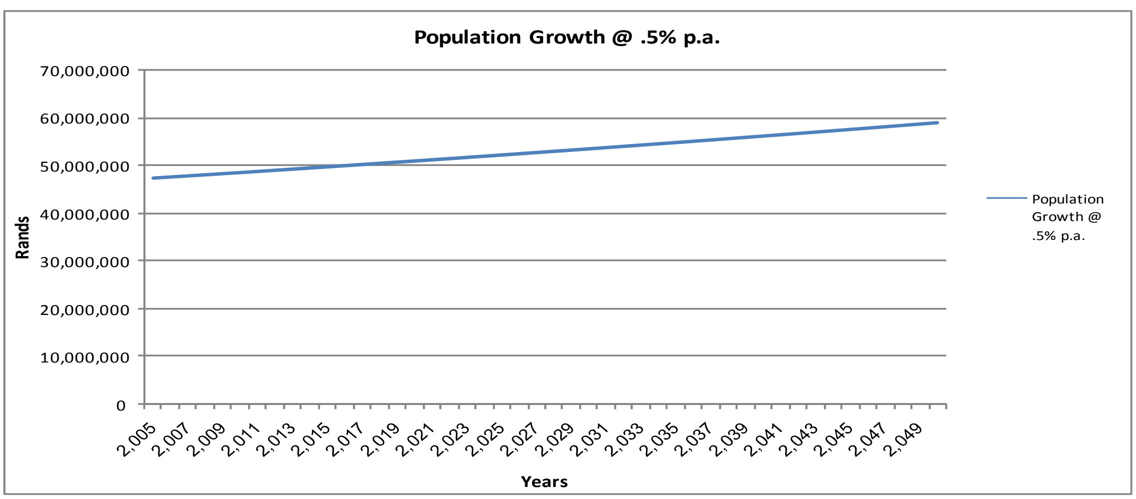
The projected increase in population over the period 2005 to 2050 reported by BMR amounts to an average annual increase of 0.5% compounded.

The implications of projecting GDP at different levels and the projected change in population are shown in **Figure 6.2.B** and
Figure 6.2.C below.



(Source: Adapted from GI-BMR)

Figure 6.2.B: Growth in GDP - 2005 -2050



(Source: GI-BMR)

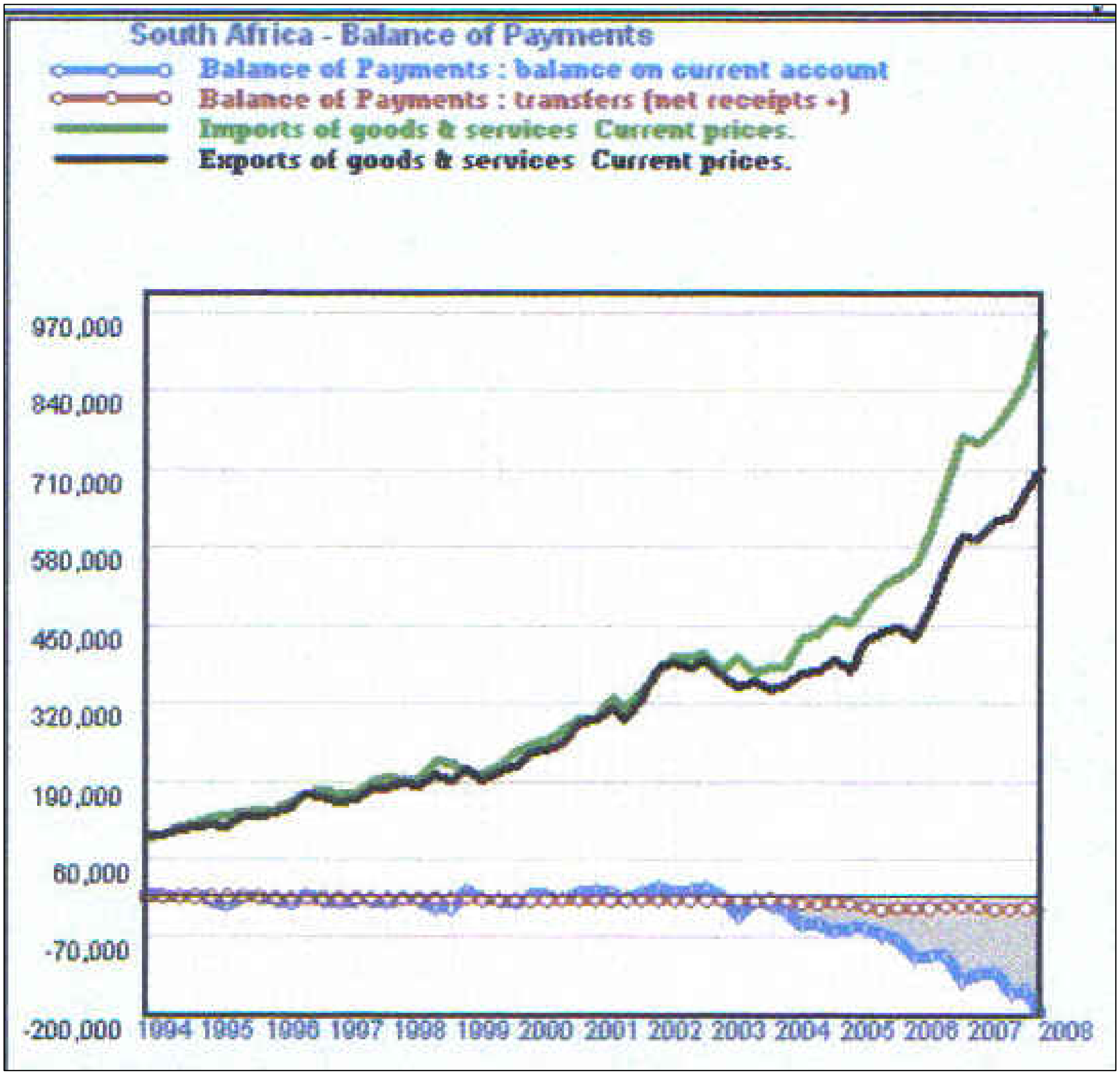
Figure 6.2.C: Population Growth - 2005 - 2050

Estimations of future freight transport volumes can not be simply correlated to either GDP or Population Growth but it can be noted that the above data show a general anticipation of an expanding economy with resultant need for more freight transport in different modes. The future changes in specific commodities and freight categories are difficult to project in terms of tonnage, (and therefore usage of equipment and infrastructure), from the broad based economic data available.

Some commodities will tend to follow population growth, whilst others are more closely linked to import and export potential, which can be the result of industrial activity and can also be motivated by changing population or more likely by changes in population per capita income, credit and spending.

Current South African private sector debt exceeds R3 trillion and the current balance of payments is R20 billion in the red. The estimated deficit in public sector revenue and expenditure for the 2009 fiscal year is R100 billion and It can therefore be assumed that the necessary corrections will restrict import of consumer goods for several years. Other longer term constraints will have impact on the rate of recovery from the current world recession.

South Africa’s trade with the rest of the world since 2003 has shown an increasingly unfavourable value of exports compared to imports with a widening trade deficit that will need to be corrected in the medium term. The trend is shown in **Figure 6.2.D** below.



(Source: DTI)

Figure 6.2.D: SA Balance of Trade (1994-2008)

With all of the foregoing in mind, projections have been made for road transport, rail, ports and pipelines based on some underlying assumptions for the different commodities, which are described in this section of the report.

The longer term projection of overall freight volumes as shown in **Figure 6.2.B** at approximately 3.5% for GDP for industrial freight and 1% for commodities that track population growth.

Road Freight

The volumes of road freight transported on the main national corridors have increased by over 100% in the past ten years. The annual tonnage on main corridors has increased from

43.3 million tonnes in 1996 to 101.3 million tonnes in 2006. This amounts to an annual growth rate of 9%.

This phenomenal growth which is more than double the growth rate of GDP has been largely due to the shift of long haul freight traffic from railways to roads. It can be estimated that if this modal shift had not taken place the annual growth in road freight would have amounted to approximately 5.2%.

The other major reason for the dramatic increases in road transport has been the trend to consolidation in a wide range of industries where large companies have taken advantage of the increased carrying capacity of Longer Combination Vehicles (LCVs) to centralise their distribution operations in main centres and supply branches and retailers directly by road. This trend has displaced a lot of the small retailers in smaller towns and villages all over the country. Chain stores have spread to most small towns with all goods being delivered from regional distribution centres in the main cities. Distribution of fuel, cement, fertiliser, coal, and steel, have also followed this trend.

The amount of general cargo that has been shed by railways over the past 12 years is estimated to be 40-50 million tonnes. General cargo has switched to road, due to withdrawal of rail services for all but block load commodities such as minerals and bulk steel consignments, fuel, containers and some grain. The transport of bulk commodities by road has escalated very dramatically over the past 2 years with commodities such as chrome, manganese ore, fuel, containers and bulk agricultural and forestry products such as timber, meal, fertiliser, vegetable oil and grains all switching to road haulage. The transport of empty containers has also tended to switch to road transport due to terminal costs and the costs associated with short haul distribution to and from rail terminals.

The projected tonnage of land freight by both road and rail for the period 2005 to 2015 is expected to increase more slowly due to the prevailing international economic situation and its effects on the South African economy. Large scale reduction in manufacturing, mining and import of commodities will necessarily have a restricting effect on road freight increases in the short term. The relative rates of increase of road and rail freight will depend on the extent to which general cargo transport by rail can be revitalised and made more competitive.

The implications of this situation are that it can be anticipated that road freight increases in the future will be somewhat closer to the projected rate of GDP growth, which is being predicted by economists to be in the range 3.0 - 3.5% for the medium growth scenario.

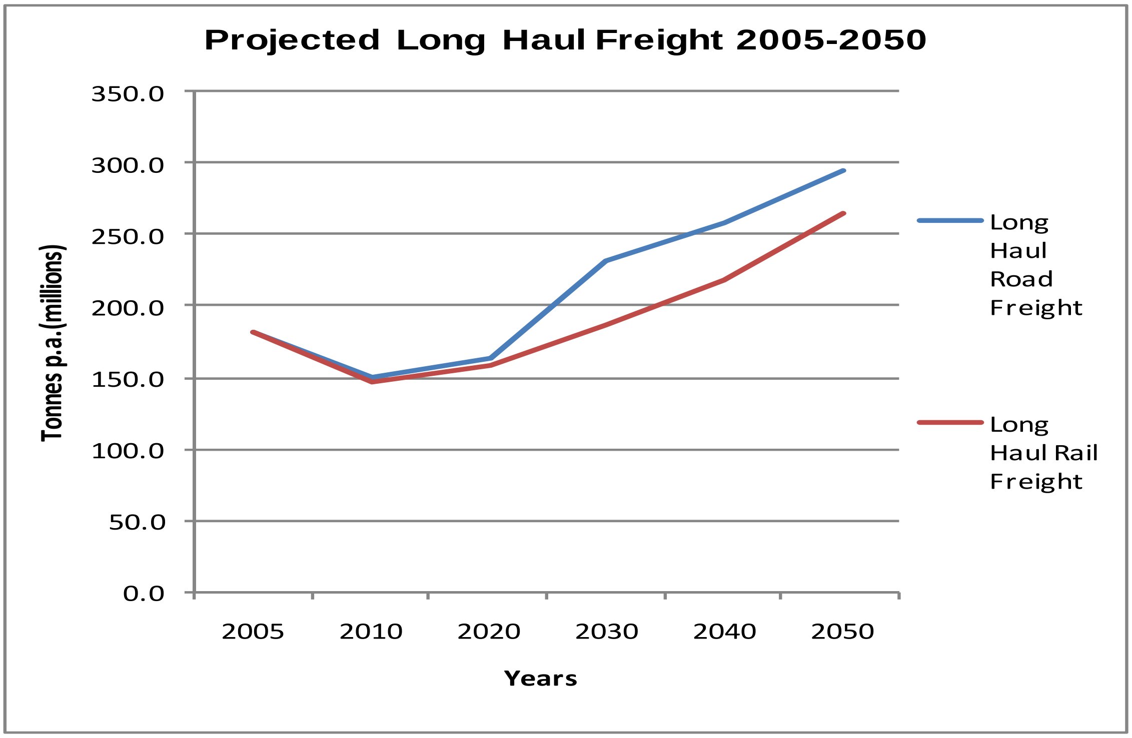


Figure 6.2.E: Future Long haul Land Freight Volumes

The projection of the tonnes of different commodity groups has taken into account whether the commodity has primary correlations with population growth e.g. foods and beverages, or with GDP e.g. chemicals, machines and fuels. With population growth of 0.5% and GDP of 3.5% the estimated growth of tonnes p.a. of the commodity mix will be in the range 1.5 – 2.5% p.a. As shown in Figure 6.5 the road freight tonnage on main corridors will rise from 180 million tonnes to approximately 300 million tonnes (assuming that there will be some uptake of general cargo by railways).

Long haul rail freight is estimated to increase from 182 million tonnes to 265 million tonnes (including 30 million tonnes of general cargo)

The national trend will also be evident in the provincial economies, but specific commodities with origins and destinations in production locations and ports may induce different future levels of road freight transport and projected tonnage in specific areas, e.g. coal transport in Mpumalanga, wheat imports through Durban and coal and chemicals in Limpopo.

To provide a basis for projecting the volumes of specific commodities some base assumptions are provided below.

Commodity Projections:

a) Agricultural Products

Maize: The projection of estimated tonnage of maize on corridors is complicated by the large number of alternate provincial routes from the grain producing areas. This means that the actual tonnage on the national corridors is only a proportion of the total transported by road. There is also the complication that a large proportion is used for livestock feed, either directly or after milling and mixing. The proportion used for human consumption is reducing.

It is projected that the tonnage of maize produced in South Africa will remain almost static or decline somewhat over the period under review, due to increasing alternate usage of agricultural land, land redistribution, growing shortage of water and the favourable cost of imported maize.

It can be projected however that the tonnage transported on road, will increase due to the increasing imports of maize, to match the needs of a growing human and livestock population. Balancing the reducing production with the increase in imports will still result in a gradual overall increase in tonnage.

Wheat: The tonnage of wheat produced in South Africa is insufficient for the current and future populations. Current imports via Durban amounted to approximately 950,000 tonnes in 2008 and this can be expected to increase steadily with a proportion being transported by road and the balance by rail.

Barley: is grown primarily in Western Cape but the annual tonnage is insufficient for the demand of the growing brewing industry with the result that imports increase year on year through Cape Town and Durban and this can be expected to continue.

Rice: is imported primarily through the Port of Durban in break-bulk mode but then repacked for distribution all over the country, primarily by road transport. It can be anticipated that the tonnage of rice (which is not produced in South Africa) will continue to increase throughout the period.

b) Agricultural Crops and Fruit

The tonnage of crops transported on main corridors is not fully documented. Large tonnages of sugar cane are transported on the KZN coast and in the Mpumalanga lowveld. Fruit is transported in Mpumalanga, Limpopo, Western Cape, Zululand, and in Eastern Cape. The overall production of agricultural crops and fruit in South Africa is tending to reduce over time, with reducing numbers of farmers in these occupations, land transfers and problems with municipal rates, water regulations and input costs. Overall tonnages of locally produced crops are expected to decrease slowly over the entire period.

c) Agricultural Products

The transport of agricultural products tends to correlate with the production of crops and fruit but is skewed by the large volumes of imports currently received through the Port of Durban, including soya meal, vegetables oils, and other agricultural products for human and animal consumption.

d) Beverages:

It is anticipated that the tonnage of beverages transported by road will increase steadily in line with population growth.

e) Chemicals

The transport of chemicals by road is dependent on industrial growth and can be anticipated to keep pace with the increases in GDP.

f) Rock and Ore

The transport of primary minerals on road in the form of rock and ore has increased very dramatically over the past 2 years, due to lack of rail capacity. The extent of the future rate of increase will be largely dependent on ability to revitalise rail services and improve their competitiveness. In the absence of rail service for these mineral products, large numbers of extra-heavy road combinations are being used to transport products such as chrome, manganese, granite, and other bulk minerals to the ports, by road.

g) Machines and Vehicles

The road transport of machines and vehicles is driven by the need to move them from ports and manufacturing centres to dealerships that are primarily located off-rail. The speed, safety and efficiency of road transport is difficult to match by rail with the result that car carriers and vehicle transporters have proliferated over the past 5 years. The increasing trend of importing light vehicles makes the use of car carriers attractive as they can deliver directly to dealerships. It is anticipated that the transport of vehicles will reduce significantly until sometime after 2012 when increasing GDP will again accelerate imports and exports of motor vehicles, with imports increasing by more than exports over the period.

h) Wood and timber

Transport of timber by road is largely motivated by the efficiency of road transport in collecting from growing areas and delivering directly to paper and wood chip plants. The withdrawal of branch line and some mainline rail services and rapidly escalating tariffs have aggravated the situation in KZN and resulted in transfer of large tonnages from rail to road. The overall long term trend for timber production in South Africa shows a reduction over time due to production costs, water legislation land transfers and municipal rates. It is predicted that South Africa will become a net importer of building timber within the next 5 years so that it can be anticipated that volumes of timber will be transported from the ports, probably by road.

i) Fuel:

The current levels of fuel transport on road are primarily the result of inadequate pipeline capacity between the coast and the interior as well as the use of road transport for all retail distribution throughout the country. It can be projected that fuel transport on road will decrease slightly after the new Durban to Gauteng pipeline capacity is installed (hopefully by 2012); it will then continue to increase again in line with economic growth, unless more pipeline capacity is installed to transport either imported diesel or crude oil..

j) Iron and Steel:

In the short term, it is anticipated that there will be a downturn in the tonnes of iron and steel transported on road as the result of reduced international demand. In the longer term however, iron and steel production and transport is anticipated to rise at approximately the same pace as the growth in GDP.

k) Coal:

Transport of coal on road is currently driven by several factors that have created unusual demand. The emergency needs for Eskom power stations has created a demand for transport of approximately 40 million tonnes of coal in the Mpumalanga area but it is anticipated that this will reduce as stock levels stabilise. It is projected that approximately 20 million tonnes will continue to be transported in the Mpumalanga area and between the coal fields and industrial areas in the Gauteng and KwaZulu Natal due to railway policy of declining to transport less than 10 truck load consignments (±400 tonnes minimum) and the fact that many industrial areas are no longer served by rail.

One of the complications with projecting future coal transport by road is the fact that the Mpumalanga coal fields will be largely depleted after 2025 and by that time, a considerable number of new mines will have to be developed in Limpopo to cater for Eskom and possibly to provide coal for export. The practicality and profitability of developing mines at increasing distances from the port of Richards Bay will need to be continually reviewed against the international price of export coal. In addition, Eskom’s coal requirements will increase from the present 120 million tonnes a year to well over 170 million tonnes per annum during the period under review as new power stations are commissioned and all old stations have been reopened and this will have a negative impact on the export potential. At present, high quality coal is exported and Eskom uses duff and middlings to fuel the power stations but the production of one category of coal necessarily has impact on the availability of the others with a certain amount of interchange ability (at a price).

The increasing demand for coal for power generation (and increased production of liquid fuels) may have limited transport implications if new power stations and fuel-from-coal plants are located in the coal fields of Mpumalanga and Limpopo and linked by conveyors. There will be a need for considerable transport development (road and rail) if exports are to be increased as reported. Projected transport developments for coal are discussed further in the section on future rail capacity in this report.

l) Cement:

It is anticipated that the demand for cement will diminish considerably after 2010 and will then gradually rise again to follow increasing economic growth. The proportion that is transported by road will be variable depending on where economic development takes place.

m) Containers:

Transport of containers by road is to a large extent dependent on the availability of general cargo to provide flows in each direction. Transport of containers in South Africa is usually performed with standard dimensioned semi trailers (or interlinks) thereby achieving versatility and permitting the integration of container transport with general cargo movements. As noted in Phase 2 a large proportion of containers entering the ports are destuffed in the port cities, with the cargo then being reloaded, (after various processing operations) into high volume road transport combinations, to avoid the costs of transporting the containers. With regard to export containers, there has been an artificial increase in volumes due to the use of containers to export commodities that were formerly handled as break bulk, such as steel, fluorspar, copper and chrome.

The high level of containerised import growth was fuelled mainly by the expansionary credit boom of the last decade and reducing manufacturing production as the result of competition from imported goods. The level of container transport is expected to reduce sharply in the short term due to the reduction in international import-export trade and the resulting constriction of the South African economy. It can be anticipated that the demand for container transport will rise again from 2015 and will then keep pace with the rates of change in GDP, manufacturing growth and income distribution.

6.2.1 Land Freight Link Volumes on Major Corridors, by Mode

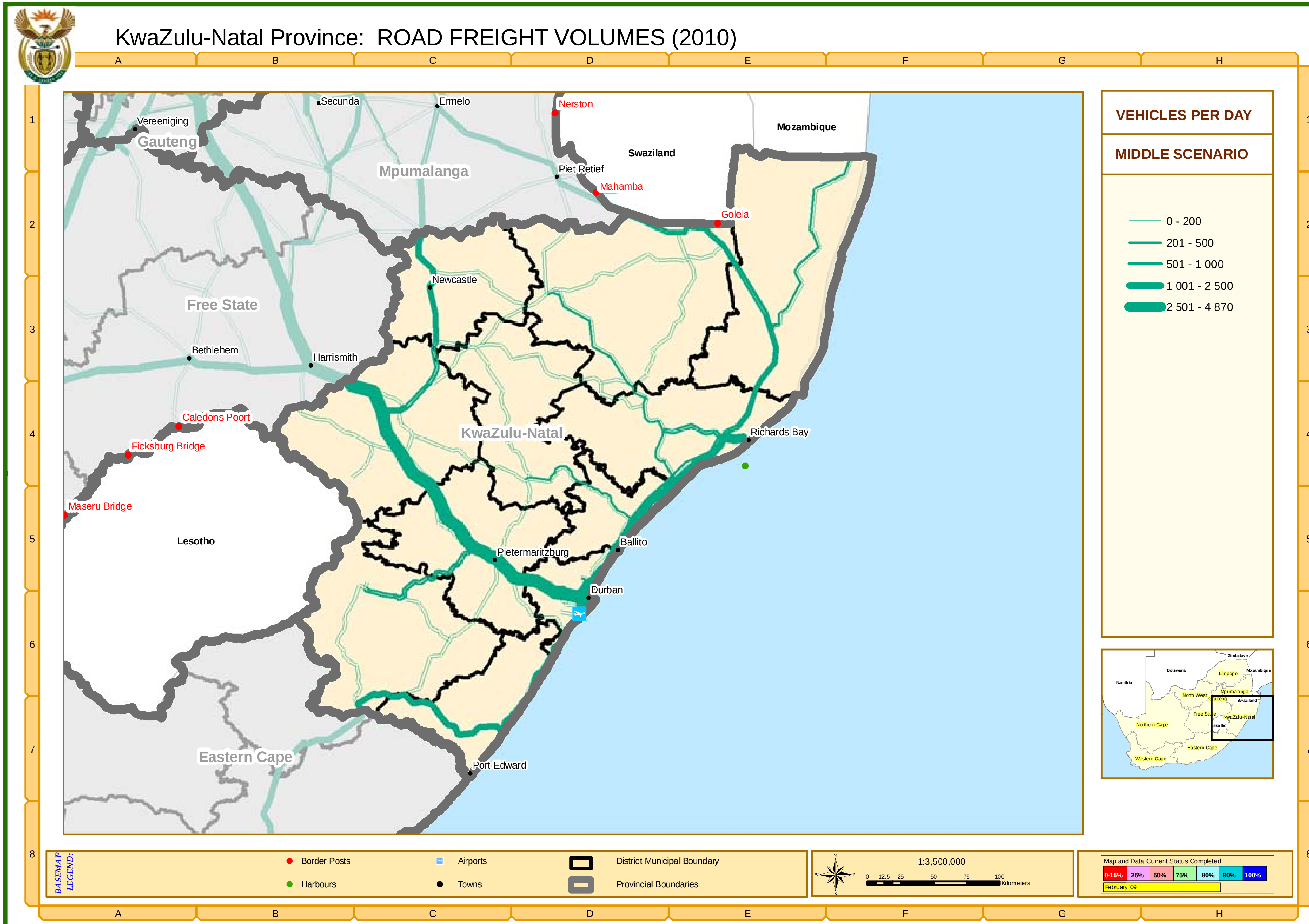
Road Freight

Road freight volumes are expected to change over time, with major corridors handling increased general cargo and some reduction in the localised transportation of coal and crops.

Gauteng tends to be the hub for most of the corridors (N3, N11, N4E, N4W, N1S, N1N, N12, N14, and N17) so that all corridors will be affected by the levels of economic activity in the industrial core of the country, with the largest concentration of population.

In **Map 6.2.A** below, the current situation (2010) is shown for the major national and provincial routes. As shown, most of the provincial routes handled tonnages below 1 million tonnes per annum. The major road corridors are the N3/N11 between Gauteng and Durban and the N1/N12 corridor between Gauteng and Cape Town that currently handle the tonnage shown in Table 6.2 in the previous section of this report.

KwaZulu-Natal Province: ROAD FREIGHT VOLUMES (2010)



MAP 6.2A Road Freight Volumes (Vehicles/Day)-2010

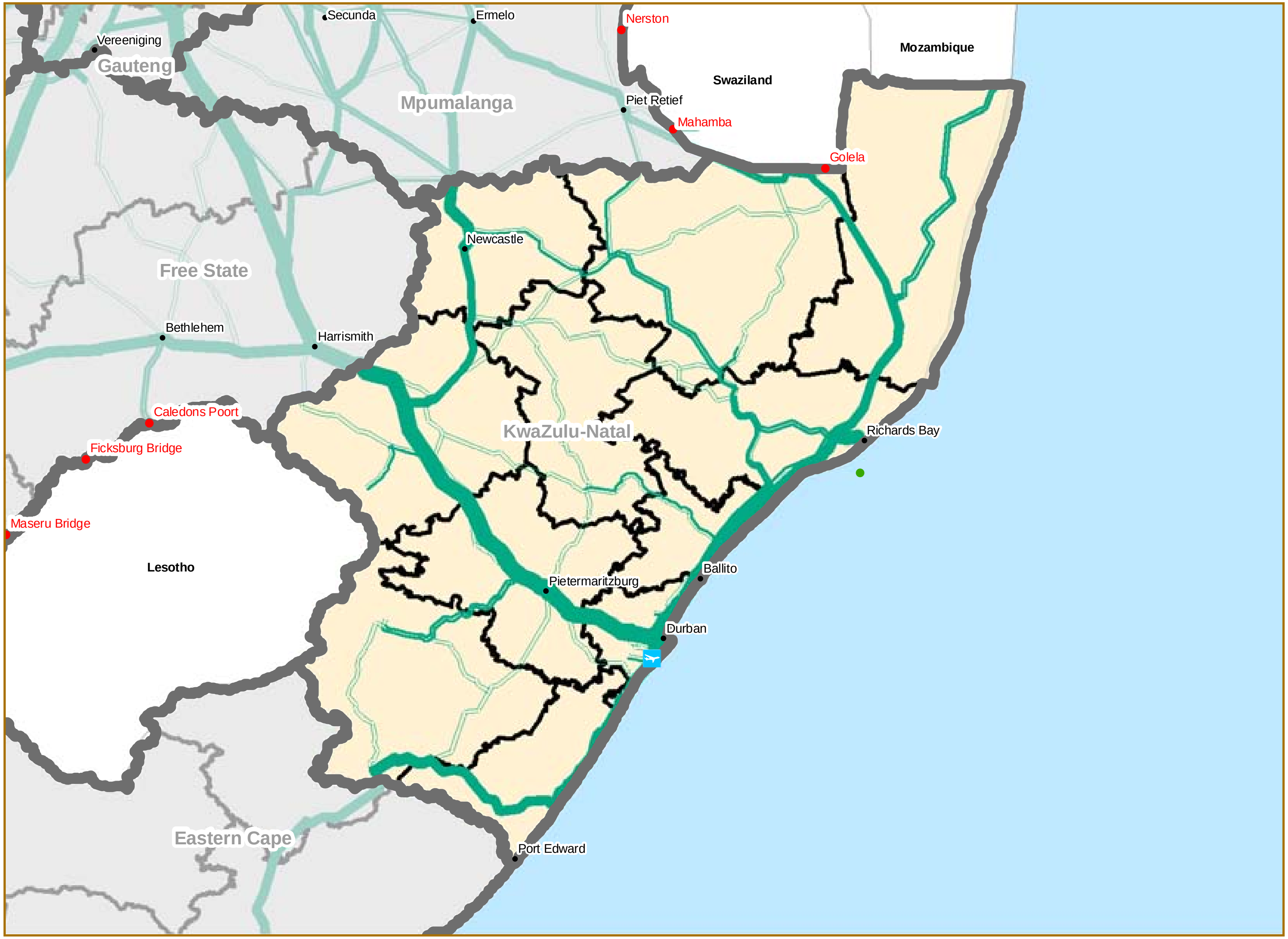
NATIONAL TRANSPORT MASTERPLAN 2050

Map 6.2.B show the anticipated growth in road freight traffic to 2030 and it can be seen that the demand for road freight on most of the national corridors is expected to increase over the period. General cargo will increase on the NI/N11 and N1/N12 corridors due to population and industrial growth.

The N2 via Piet Retief will experience increases in volumes which will include further mineral and timber traffic from Mpumalanga to Richards Bay.

The growth of traffic from the Lephalale area of Limpopo will be due to power generation and mining development in the area. Traffic between Durban and East London will increase the volumes on the N2 Central section. Increased traffic between Durban and Richards Bay will be due to cross traffic between the ports and industrial growth in the coastal area. Some traffic increase is anticipated on the N4 to Maputo due to expansion of the port capacity.

KwaZulu-Natal Province: ROAD FREIGHT VOLUMES (2030)



VEHICLES PER DAY

MIDDLE SCENARIO

- 0 - 200
- 201 - 500
- 501 - 1 000
- 1 001 - 2 500
- 2 501 - 8 845

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 12.5 25 50 75 100 Kilometers

Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 6.2B Road Freight Volumes (Vehicles/Day)-2030

In **Map 6.2.C** road freight volumes to 2050 indicate an anticipated significant increase in the amount of road traffic on the N3 /N11 corridor linking Gauteng and Mpumalanga to the ports of Durban and Richards Bay.

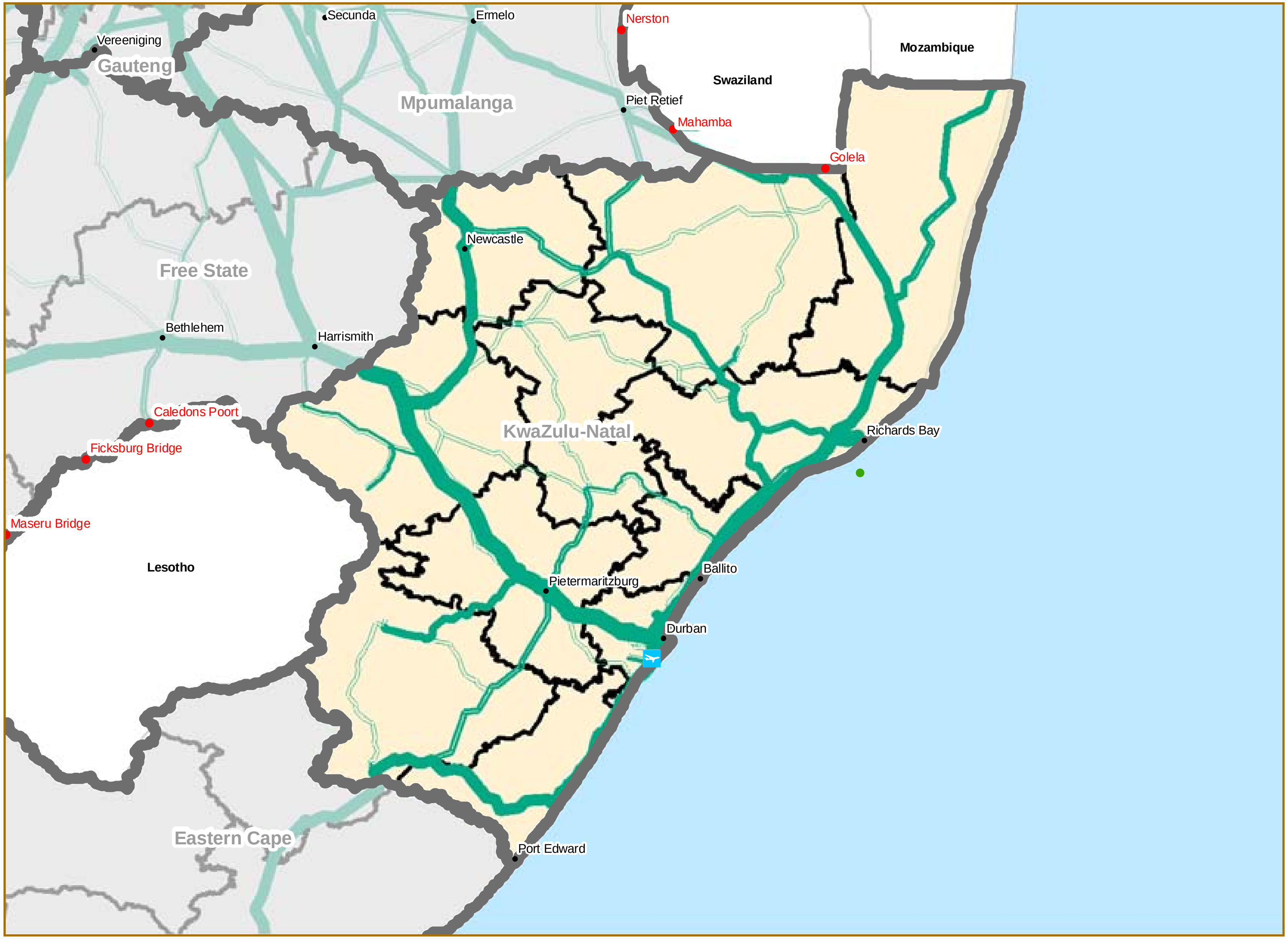
Volumes on the N4 are anticipated to rise to 12 million tonnes per annum, which will include increased tonnage between Gauteng and Maputo.

Coal transport around the central Mpumalanga area is expected to reduce with the gradual depletion of the Mpumalanga coal fields after 2030, but this will result in increased traffic from the Lephalale area of Limpopo.

By this period it is expected that the N2 Central section between Durban and East London will be carrying increased traffic due to construction of a freeway standard road corridor.

Trade volumes with northern neighbouring countries will lead to increased volumes on the N1 north via Musina.

KwaZulu-Natal Province: ROAD FREIGHT VOLUMES (2050)



VEHICLES PER DAY

MIDDLE SCENARIO

- 0 - 200
- 201 - 500
- 501 - 1 000
- 1 001 - 2 500
- 2 501 - 17 138

BASEMAP LEGEND:

Border Posts
Harbours
Airports
Towns
District Municipal Boundary
Provincial Boundaries

1:3,500,000

0 12.5 25 50 75 100 Kilometers

Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 6.2C Road Freight Volumes (Vehicles/Day)-2050

The issue of road infrastructure capacity and constraints are discussed in other chapters of the Phase 3 report.

Rail Freight Volumes

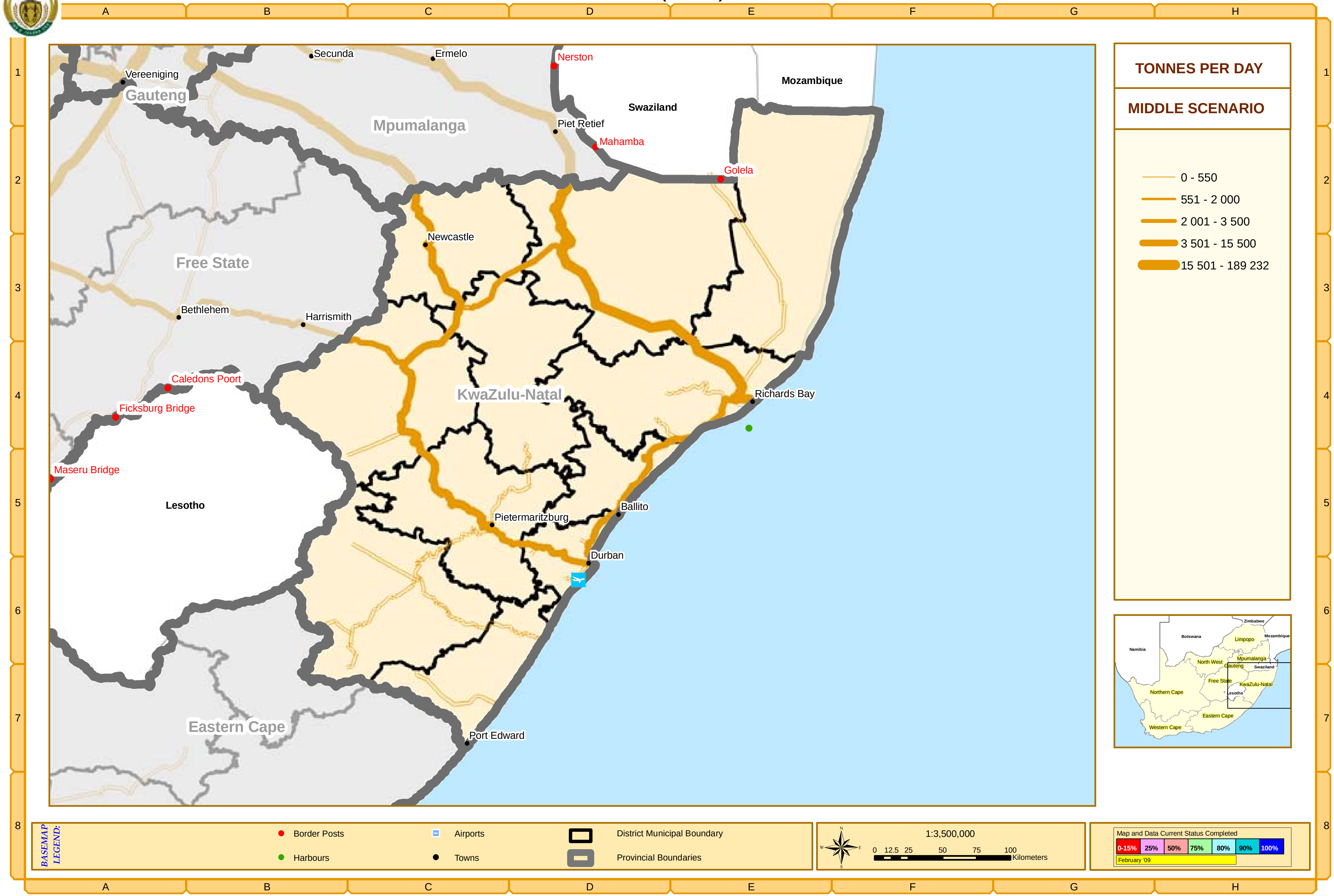
Map 6.2.D below shows rail freight link volumes in tonnes p.a. for period 2010. The Coallink line between Mpumalanga and Richards Bay handles 70 to 80 million tonnes of coal, timber and minerals at the present time.

The Natcor Line between Gauteng and Durban handles a further 8 to 10 million tonnes per annum, and these volumes are anticipated to grow.

The iron ore line between Sishen and Saldanha handles 36 million tonnes of minerals at the present time.

The Cape main line between Gauteng and Cape Town via De Aar handles 21 million tonnes per annum, some of which is northbound mineral traffic from De Aar to Gauteng. Volumes of general cargo between Gauteng and Cape Town are anticipated to grow in line with economic output.

KwaZulu-Natal Province: RAIL FREIGHT VOLUMES (2010)



MAP 6.2D Rail Freight Volumes (Tonnes/Day)-2010

NATIONAL TRANSPORT MASTERPLAN 2050

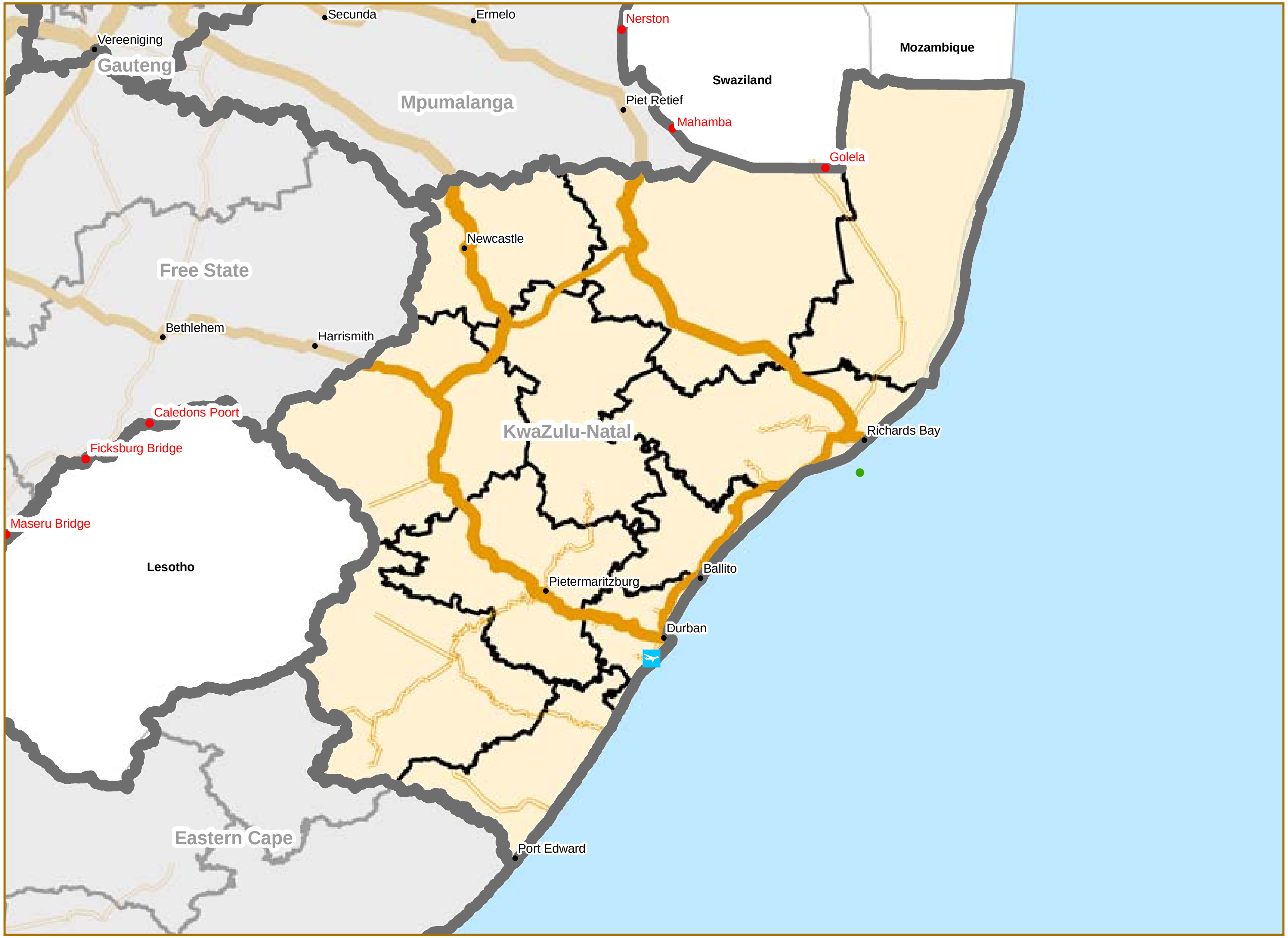
The increases in tonnage are shown in **Map 6.2.E** for the period 2030.

The annual tonnage on rail between Mpumalanga and Richards Bay is anticipated to grow to approximately 95 million tonnes, subject to extensive capitalisation of the infrastructure.

Further expansion of the Sishen-Saldanha iron ore line to 45 million tonnes is planned for this period.

Volume growth on the KwaZulu Natal main lines is expected to be gradual.

KwaZulu-Natal Province: RAIL FREIGHT VOLUMES (2030)



TONNES PER DAY

MIDDLE SCENARIO

- 0 - 550
- 551 - 2 000
- 2 001 - 3 500
- 3 501 - 15 500
- 15 501 - 275 921

BASEMAP LEGEND:

Border Posts | Airports | District Municipal Boundary

Harbours | Towns | Provincial Boundaries

1:3,500,000

0 12.5 25 50 75 100 Kilometers

Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 6.2E Rail Freight Volumes (Tonnes/Day)-2030

Exports on the coal line are expected to level off before 2050, but a significant tonnage will be derived from Limpopo as shown in **Map 6.2. F**.

Further growth in mineral export traffic is anticipated on the line between Phalaborwa, Hectorspruit and the Port of Maputo. General traffic on the line between Gauteng and Maputo will also increase with further development of the port capabilities.

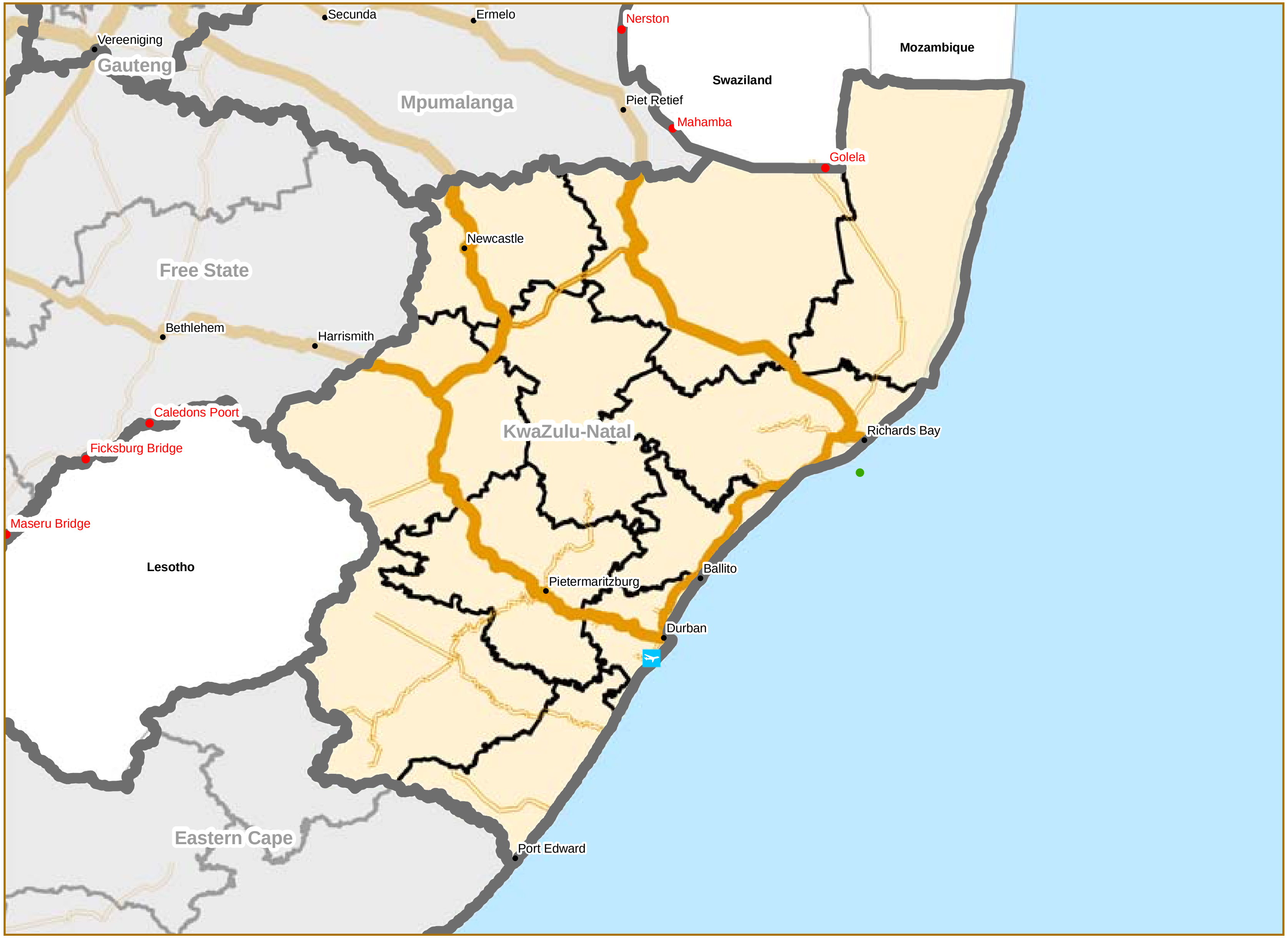
Exports on the iron ore line to Saldanha are planned to increase to 60-70 million by 2050, dependent on the recovery of world iron ore demand.

Cargo volumes on the line between Gauteng and Botswana are expected to rise gradually dependent on the future economic conditions in Botswana.

Traffic on the northern line to Zimbabwe is expected to increase by this period as the economies of Zimbabwe, Zambia and Malawi recover from the world recession.

Further increases in mineral export traffic are expected to Ngqura and Port Elizabeth.

KwaZulu-Natal Province: RAIL FREIGHT VOLUMES (2050)



TONNES PER DAY

MIDDLE SCENARIO

- 0 - 550
- 551 - 2 000
- 2 001 - 3 500
- 3 501 - 15 500
- 15 501 - 297 389

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 12.5 25 50 75 100 Kilometers

Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 6.2F Rail Freight Volumes (Tonnes/Day)-2050

Conclusion on Freight Modelling Issues

As noted above, the exact historical O&D and volumes for ports, rail and pipelines are known. For road freight the corridor traffic volumes and characteristics are known so that estimated long distance tonnage is reasonably accurate. The modelling of O&D for road freight is fairly accurate for main commodities but as with all models, are based on assumptions. Projections have been made on the basis of GDP and Population data.

Based on the available actual data described above, and the reported trends in various industries, assumptions of future changes in modal volumes and patterns of movement are discussed in later sections of this report.

6.3 CURRENT CONSTRAINTS BY MODE

In the NFLS and other studies (CSIR “State of Logistics 2008” etc) there has been a general observation that freight transport in South Africa is inefficient. In this section of the report the current constraints on achievement of efficiency and cost effectiveness of the freight transport system are described in some detail as it is imperative that the basic problems with the current system are urgently addressed to create a platform for the future expansion and improvement of the freight transport and logistics systems of the country.

6.3.1 Current Constraints - Road Freight

Road freight transport in South Africa has developed into a highly sophisticated sector of the land transport system of the country, dominating the long distance movement of freight as well as for urban and rural industries.

Road freight has increased consistently over the past 15 years, but the current situation is not sustainable and the quality of operations is leading to excessive externalities and the under-funding of infrastructure that will eventually impact on the cost effectiveness of the mode.

In reviewing the current constraints being experienced in road freight, the holistic view is taken that the constraints on capacity, quality and externalities are part of the definition of the capacity of the mode. The major constraints, limitations and challenges faced by the road freight sector in achieving both quantity and quality are described in this section of the report

6.3.1.1 Road Usage and Condition

Road condition in South Africa has been deteriorating steadily for the past 20 years. The deterioration is largely due to the reduction in funding for road maintenance following the repeal of the dedicated Road Fund in 1988. Many of the major roads were built 30 – 50 years ago to lower design standards than imposed by current vehicle weights and traffic volumes much higher than those assumed for the 20 year projected design life.

Switch from Rail to Road

The situation has been aggravated by the rapid expansion in the amount of road freight transport and to a lesser extent by the increases in the light vehicle population over the period. A study by RTPS-RAU in 1983 estimated that there would be a transfer of more than 35% of high value rail freight to road haulage due to deregulation of road freight. This has been borne out by the dramatic increases in road freight tonnage on all major routes and the consequent reduction in the use of rail transport for general cargo.

Vehicle Mass

The large increases in road freight, occasioned by transfer of freight haulage from rail to road were aggravated by the authority's decisions in the 1990s to raise the permissible legal axle mass load from 8,200 to 9,000 kgs, and to increase the permissible volumetric capacity (length, height and width) of road vehicles. These decisions increased the competitiveness of road freight transport but also had the effect of increasing road loading by approximately 60% for axles operated at the new legal limit.

The legal axle mass loads (LAM) were increased from 8,200 kgs to 9,000 kgs in 1993, by the Department of Transport, in spite of seven different studies that showed that this would have negative effects on the roads. It was also noted in the studies that the increase in LAM would be of most benefit to rigid vehicles and smaller short-haul combinations.

Using the fourth power rule, it can be shown that the additional wear introduced by the increased axle weight amounted to a 60% increase in the road loading for the same amount of traffic, only <u>if all axles were loaded to the maximum permissible</u>. The impact of the change from 80kN standard to 90kN standard axle load is shown in the graph below. (1,000 kgs exert a force of 1kN at sea level). The blue (upper) line represents the Load equivalency based on 90kN per axle and the red (lower) line shows the equivalency based on 80kN per axle. As shown, the change represents a deliberate official increase of 59% in permissible axle load equivalency.

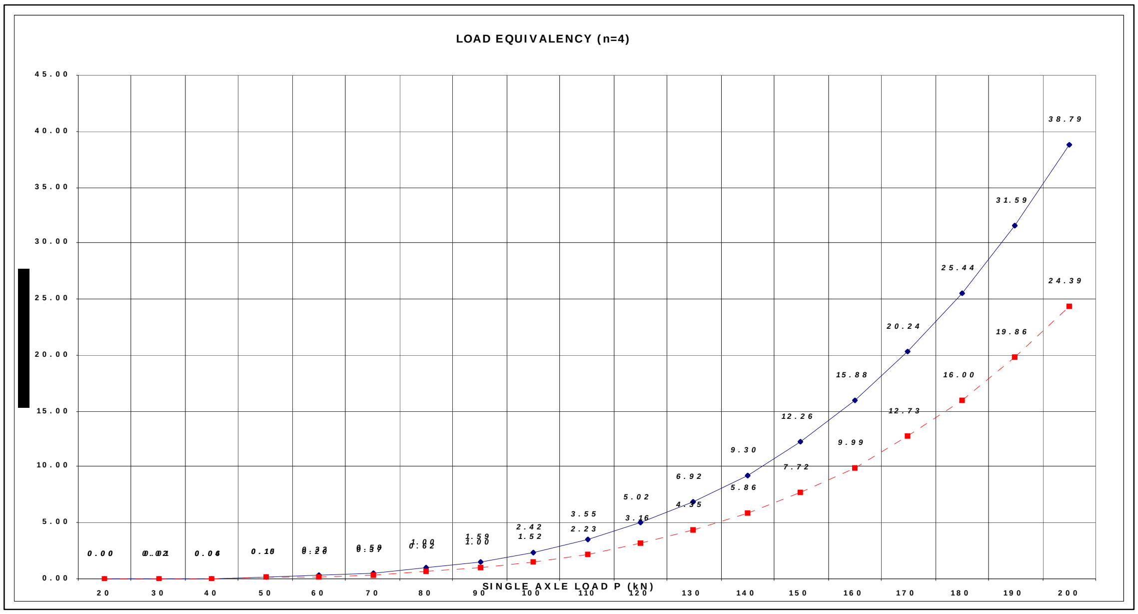


Figure 6.3.A: Permissible Axle Load Equivalency

This decision to increase axle loads was taken in spite of the fact that most South African roads and bridges were originally designed for 8,200 kg axle loads and are therefore universally under-specified for the 9000 kg permissible axle mass load (LAM).

Vehicle Dimensions

The increase in the permissible legal axle mass load (LAM) was accompanied by further legislation to increase vehicle combination lengths (to 22 metres), vehicle widths (2.5 to 2.6 metres) and vehicle height (4.1 to 4.3 metres). The bridge formula was changed to permit the full use of the new dimensions, which would permit a 62 tonne gross combination weight (65 tonnes with 5% tolerance). Then, allegedly at the request of the railways, in a belated attempt to cap the carrying capacity of the new vehicle dimensions, a limit of 56,000 kgs Gross Combination Mass (GCM) was introduced, (unrelated to bridge or axle load limits).

The effect on the biggest long haul combinations of capping the GCM at 56,000 kgs represents a restriction to about 8,000 kgs per axle for a 7-axle rig, thereby largely negating the permissible 9,000 kg LAM for long-haul road freight combinations. Analysis of 188,000 loads weighed in KZN in 2007 shows that 18% of vehicles were overloaded, but by less than 3% of GCM [and therefore less than 9000 kgs per axle].

Tyre Specifications

Another factor that has aggravated the destruction of roads has been the extensive switch from use of cross-ply tyres for heavy vehicles to use of steel belt radials. The tyre pressures for cross-ply tyres are typically 500 kpa and for steel radials 850-1000 kpa. The impact on the road surface has been shown to amount to a 50% increase in point loading compared to the cross-ply tyres for which the roads were designed and built.

The combined effect of larger vehicles and increased numbers of vehicles has placed a severe strain on the road system and resulted in reduced road standards in all provinces. The rebuilding of the sections of the N11 between Newcastle and Ermelo is estimated to cost R1,130 million and the section of the N2 between Pongola and Piet Retief is budgeted at R620 million. (SANRAL)

Vehicle Operating Costs

The deterioration in road condition is now beginning to have a serious impact on the costs of road transport as the continued destruction of the roads is impacting on vehicle operating costs. The operating costs of vehicles travelling on very poor roads can be double the cost of the same vehicle on good roads (SANRAL).

A recent article (Engineering News, 1 May 2009) indicated that research by CSIR in collaboration with one trucking company had indicated that travelling on extremely bad roads increased operating costs by 600 to 1500%.

In general however more moderate increases in cost are incurred on roads that have deteriorated, with reports of 10 to 20% in operating costs being largely due to damaged tyres, suspension and additional fuel usage.

The requirements for infrastructure maintenance are discussed further in the infrastructure chapter of this report.

Primary reasons for Road Deterioration

To summarise, the reasons for the current problems with road usage and condition are:

1. Most roads were built between 1950 and 1970 (40-60 years ago)
2. Roads were then designed for 20 year life at specified levels of road usage.
3. The road usage was assumed to be approximately 1/10th of current traffic levels.
4. Design specifications were based on 8200 kgs axle loads
5. Roads were designed for lower heavy vehicle speeds.
6. Road design standards were based on use of cross-ply tyres.
7. Deferred maintenance amounts to an estimated R 100 billion over about 20 years.
8. There is some overloading of HGVs in uncontrolled areas.

It must be taken into account in debates about solutions to the “road freight problem”, that any “demand management” measures introduced to reduce the “supply” of road freight will have very serious implications for the industrial, mining and agricultural sectors economy.

6.3.1.2 Road Funding

There is a serious capacity problem in the overall road freight system of the country due to the inability to adequately fund the infrastructure usage by road freight vehicles.

The maintenance backlog is estimated to be R100 billion and the estimated annual maintenance requirement is R32 billion (1.5% of GDP). (AA of SA –October 2008)
Failure to develop an adequate funding mechanism will continue to aggravate the cost increases in road freight transport that are in inevitable, with deteriorating road conditions.

Absolute failure in this regard, is best illustrated by the condition of many of the roads in the Southern African region where authorities have been unable to provide funding for adequate road rehabilitation and maintenance. According to the World Bank the condition of transport infrastructure is one of the most serious barriers to economic development on the African continent.

6.3.1.3 Road User Cost Recovery

There is urgent need for review of road user costs and the recovery of these costs from freight vehicle operators (and ultimately transport users) in the interest of ensuring a sustainable road freight sector.

Current arrangements are not sustainable and if left for a further extended period without resolution, are likely to begin to have serious negative impacts on South Africa’s ability to produce competitively, with all the negative implications for economic growth.

The entire process of fund allocation and recovery from users is in need of urgent review as the total dependence by industry on the road freight sector in order to move both input and output materials means that large scale increases in road user cost recovery will have serious implications for the viability of several industrial sectors dependent on road freight transport.

It is not possible to totally divorce the implications of investment in rail and road infrastructure as the two modes compete for long distance freight and there are significant further externality implications from imbalanced supply of the main forms of land transport. As the funding of both modes must be recovered from the economic output of the country the issues are of long term national importance.

6.3.1.4 Impacts of Toll Roads on Road Freight Transport

The use of tolling as an alternative system of road user cost recovery has several conceptual advantages such as the apportionment of costs to specific road users, ease of collection, and generally, the options of free choice by customers.

In South Africa however the tolling of roads has led to several distortions that have negative impacts on different aspects of the road freight system.

The cumulative cost of tolls along some routes gives rise to avoidance by freight hauliers and the use of un-tolled provincial parallel routes. This is particularly evident along the N3, N1 North, and N4 West where considerable volumes of traffic divert onto alternate routes, thereby increasing the costs to local and provincial authorities.

Some tolled routes have such high cumulative costs that they may in fact be exercising a negative impact on specific business developments, and promoting relocation of rural industries.

Toll road developments using existing roads that have been designed to include sectors with high traffic volumes, to ensure viability, are often avoided by freight hauliers whenever possible, as they are seen to be double taxation.

On most of South Africa's toll roads the largest proportion of costs are being borne by the light vehicle classes with rates for heavy freight vehicles deliberately decreased to avoid deterring their use by freight transport operators.

Light vehicle fees (weight 1.5 tonnes) are typically about 25% of the fees for XHV Class 4 (max weight 56 tonnes)

The current toll fees payable on different routes is shown in

Table 6.3.A below.

Table 6.3.A: Toll Fees by Vehicle Category (2009)

	LV	HV	HV	HV
		2 axles	3/4 axles	5 or more axles
N1 (S)	**Class 1**	**Class 2**	**Class 3**	**Class 4**
Huguenot	23.00	60.00	93.00	151.00
Verkeerdevlei	33.00	66.00	99.00	136.00
Vaal	38.00	72.00	87.00	116.00
Grasmere - Mainline	12.00	31.00	36.00	48.00
Total	**106.00**	**229.00**	**315.00**	**451.00**
N1 (N)				
Pumulani	7.20	18.00	20.50	25.00
Carousel	33.00	88.00	98.00	113.00
Kranskop Mainline	26.00	66.00	81.00	108.00
Nyl Mainline	33.00	62.00	76.00	101.00
Capricon	27.00	70.00	83.00	108.00
Baobab	26.00	66.00	94.00	117.00
Total	**152.20**	**370.00**	**452.50**	**572.00**
N2 (S)				
Tsitsikamma Mainline	13.00	33.00	80.00	111.00
N2 (C)				
Izotha (R61)	5.50	9.50	13.00	23.00
Oribi Mainline	17.00	30.00	42.00	68.00
Tongaat Mainline	6.50	13.50	18.00	26.00
Mvothi	80.00	19.50	27.00	40.00
Mtunzini Mainline	27.00	51.00	61.00	83.00
Total	**136.00**	**123.50**	**161.00**	**240.00**
N3				
Mariannhill	7.00	12.00	16.00	24.00
Mooi Mainline	30.00	74.00	104.00	141.00
Tugela	43.00	72.00	113.00	156.00
Tugela East Mainline	27.00	45.00	66.00	92.00
Wilge	41.00	70.00	93.00	132.00
De Hoek	29.00	46.00	69.00	100.00
Total	**177.00**	**319.00**	**461.00**	**645.00**
N4 (W)				
Pelindaba	3.50	6.50	9.00	12.00
Quagga	2.50	5.00	6.50	9.00
Swartruggens	61.00	153.00	186.00	219.00
Marikana	13.00	32.00	36.00	42.00
Brits	9.00	31.00	34.00	39.00
Doornpoort	9.00	22.00	25.00	31.00
Diamond Hill	22.00	31.00	58.00	96.00
Total	**120.00**	**280.50**	**354.50**	**448.00**
N4 (E)				
Middelburg	37.00	80.00	121.00	159.00
Machado	55.00	153.00	222.00	317.00
Nkomazi	42.00	84.00	122.00	176.00
Total	**134.00**	**317.00**	**465.00**	**652.00**
N17				
Gosforth Mainline	7.00	19.00	21.00	29.00
Dalpark	6.50	13.50	18.00	25.00
Total	**13.50**	**32.50**	**39.00**	**54.00**

6.3.1.5 Overloading

One of the primary problems with road freight operations that are a cause for concern in all provinces is the control of overloading of vehicles and the effects of overloading on the quality of the road freight operations in the province.

The control of overloading in South Africa is the responsibility of the Road Traffic Inspectorates of the provincial governments (for provincial roads), municipal traffic police (for some of the larger cities) and on some national roads, the toll concessionaires.

Where overloading levels are controlled, the contribution of overloaded vehicle to the destruction of roads is contained and in many areas is not as serious as the effects of the massive increases in road freight traffic. In specific areas where bulk commodities are prevalent, lack of control promotes increasing overloading. The overloading enforcement process should be an effective deterrent if it is to achieve the objectives of road protection and safety. In KwaZulu Natal approximately 18% of vehicles are overloaded but the average overload is less than 1000 kgs and the overall influence of overloading is negligible except for the few excessive loads that attempt to bypass the control system.

The effectiveness of the overloading control systems is highly variable by region, with widespread under-funding of staffing, vehicles and equipment so that the numbers of vehicles weighed is in many areas totally inadequate to exert effective control of operators. The major problems with the overloading control systems are:

a) Insufficient trained traffic officers to cover extended periods of 24-hour weighbridge operation.
b) Lack of funding at most provincial departments and agencies for adequate staffing, training, motor vehicle operating costs and back-up equipment.
c) Lack of fully integrated data collection and management systems in many areas, resulting in ineffective record keeping and reporting.
d) Lack of a properly designed national operator licensing system with a complete operator register through which to exert enforcement.
e) Lack of detention facilities in many areas to enable impounding of overloaded vehicles in secure areas until loads are adjusted. Vehicles are released, thereby effectively cancelling the enforcement process.
f) Excessive waste of traffic officer time in prosecuting offenders, through inefficiencies in the justice system.
g) Failure by magistrates to impose appropriate levels of penalties and the system's inability to adjust penalties for unpaid offences and continual contraventions.
h) Limited management capability in many areas and lack of commercial capability to contend with operator pressures.
i) General unwillingness of traffic officers to work shifts around the clock.
j) In many areas there are suspect liaisons between traffic officials and hauliers leading to corruption and bribery.

k) Where PPP weighbridge management contracts have been established there has been failure to ensure management capability and inadequate control of the operating standards and level of charges to the funding authority.
l) At PPP weighbridges the level of efficiency is often reduced due to the fact that overloading enforcement is regarded as secondary to other traffic officer functions and officers are frequently withdrawn and deployed to other duties during weighbridge operations. Lack of legal authority to stop vehicles then closes the weighbridge down even if clerical staff is on site.
m) Different levels of admission-of-guilt penalties between provinces and even between weighbridges.

The level of effectiveness of the control of overloading is very different between the provinces as shown in the data from some provinces and the CSIR website (which is unfortunately several years out of date due to lack of a coordinated reporting system).

From the information available regarding the enforcement effort to prevent overloading of freight vehicles, it is evident that the system is not adequate for the uniform control of overloading in South Africa. There are large differences between the levels of enforcement in different areas, but generally speaking the system as it is currently constituted, does not provide adequate control. Current overloading and enforcement levels are described in Phase 1 and 2 reports.

One of the most important reasons for the ineffectiveness of the system lies with the lack of an underlying operator registration system, which would make it possible for authorities to focus on the main offenders.
The fact that the operator registration is only recorded within the vehicle registration process makes it ineffective and aggravates the lack of control.

Lack of personnel and failure to provide adequate resources in the prosecution system (due to pressures on the Department of Justice, aggravate the problems with enforcing legal load standards. The absence of supporting record systems results in avoidance of payment and makes it difficult for the authorities to follow up on repeat offenders.

The necessary processes to reverse this situation are described in the institutional recommendations in .

6.3.1.6 Vehicle Condition

A major aspect of the Road Transport Quality System (RTQS) that was included in the recommendations of the National Transport Policy Study was that the road worthiness inspection system and the on-road inspection of vehicles would be effectively combined to ensure that the standards of vehicle maintenance were maintained.

Due to inadequate numbers of technically competent personnel and staffing skills shortages, the current levels of road side inspection of vehicles is generally ineffective. The low frequency, technical quality and lack of follow-up of road-side inspections make the system inadequate to apply pressure on transport operators to ensure that vehicle maintenance is performed.

Sporadic blitzes by road traffic inspectorates, inevitably reveal that a large proportion of freight vehicles have defective safety systems.

An underlying problem is that the road worthiness inspection system was transferred to private testing stations in the 1990s and there has been wide spread dilution of the testing mechanism due partly to corruption and partly to the loopholes that have been allowed to develop in the system where operators provide for their own inspection and maintenance.

In addition, annual inspection of freight vehicles is inadequate to ensure that condition is maintained. Extra heavy vehicles consistently travel more than 100,000 kms per year, so that maintenance requirements are a major cost factor and annual inspection does little to maintain vehicle quality. Increasing the frequency of road worthiness inspections, would place a severe strain on the present system with its lack of competent technical personnel and would impose a further administrative burden on operators.

The ineffectiveness of the system is partly caused by the lack of a proper operator registration system which would have record of the defined maintenance arrangements of individual operators and note the frequency of technical offences. This will allow the inspectorates to apply pressure on deliberate avoidance of maintenance procedures, and where necessary curtail or revoke operating permits.

6.3.1.7 Personnel and Staffing Skills Shortage

One of the most challenging problems facing the road freight sector is the reducing availability of technical staff to perform maintenance and the growing problem with skills shortages at all levels of transport organisations. The situation is aggravated by the unavailability of suitable candidates for training as technicians, drivers and operations control staff.

The incursions of the HIV epidemic on younger men have had a serious impact on the availability of typical road freight driver candidates who are normally drawn from the 25 to 35 age group, preferably with high school standards of education, and personality characteristics suitable for the task of driving heavy freight vehicles.

The lack of suitable driver trainees is aggravated by the ease with which illegal licences can be obtained, and the large number of operators willing to use whatever staff can be found.

A further issue with regard to driver quality is the lack of a satisfactory system for control of foreign drivers entering South Africa, driving vehicles registered in neighbouring states. There is also a growing number of foreign drivers working for South African companies, relying on the licences obtained in their home countries.

The complexity and delays involved in driver registration and obtaining the professional driving permit aggravates the situation for companies attempting to comply with the legislation.

An ongoing problem with driver quality in South Africa is the fact the system by which drivers are trained is loosely unstructured and mainly in hands of numbers of small driving schools which do not have the equipment typically used in long haul freight transport. This results in half trained drivers being released into the system, adding to accident causation and violation of traffic regulations.

6.3.1.8 Driving Hours and Fatigue

The failure to implement driving hour’s legislation for long distance transport is giving rise to increasing numbers of accidents on the major corridors, which from CSIR research is increasingly due to driver fatigue.

Systems that are being operated successfully overseas are applicable to the South African situation, but no clear efforts have been made to focus on this problem. The issue of driver fatigue is further aggravated by the numbers of drivers suffering from HIV who are permitted to operate Heavy Goods Vehicles even when their deteriorating heath is a potential cause for dangerous driving.

6.3.1.9 Externalities

There is a growing problem with the externalities caused by heavy freight vehicles both on rural roads and in urban areas.

Obstruction of Traffic

On rural roads, all over the country, the size of freight vehicles relative to the available carriageway is a problem in relation to faster moving light vehicles. In many areas, accident situations are created by the obstruction of light vehicles by slower moving heavy freight vehicles, giving rise to dangerous driving practices such as overtaking on solid white lines, and blind rises, shortened lead distances, and other dangerous practices.

Congestion

In urban areas, the size of freight vehicles is a problem causing conflict with light vehicle traffic, there are many areas where road space has become overcrowded (largely due to increases in light vehicle numbers) and where inadequate parking, manoeuvring and overtaking facilities lead to conflict.

Congestion in the industrial areas of several South African cities are also cause for concern, in particular, several main routes in Gauteng are overcrowded with freight vehicles and there is severe conflict between light and heavy vehicle traffic. In Cape Town, the roads approaching the port and within some industrial areas are highly congested. In Durban, the area around the South Durban Basin and back of port area in Maydon Road, Langeberg Road and South Coast Road are all highly congested and there is need for urgent redevelopment of freight corridors, away from the primary N3 entrance/exit to the Durban industrial area.

Pollution

Increasing pollution of the atmosphere by heavy vehicles is becoming evident in the major corridors of the bigger towns in South Africa. In UK research has shown that 82 % of CO2 emissions attributable to freight transport are caused by heavy goods vehicles compared to 9% for lighter goods vehicles.

The issue of pollution by trucks has not received much attention up until now but steps should be taken to monitor the situation before problems develop.

Accidents

The numbers of accidents involving large freight vehicles is increasing in both urban areas and on the major freight corridors. As noted above there are several aspects of the control of road freight operations that are contributing to this situation including driver fatigue, vehicle condition, speeding, overloading, and driver incompetence and ill health.

The various programmes such as Asiphepe, Arrive Alive and provincial campaigns do not appear to be correcting the situation.

6.3.1.10 Operator Registration

One of the cornerstones of the RTQS concept was intended to be operator competence. This was the reason for the support by the DoT of the initiative of the road freight industry associations that led to the establishment of the National Certificate and Diploma Courses in Road Transport Management that were developed at Rand Afrikaans University (and have to date passed more than 30,000 students since 1980).

In the original development of the operator, driver, vehicle, quality control system, it was envisaged that an operator register would be established and that proof of operator competence would be a requirement for registration as a Road Freight Transport Operator. The designation “Competent Person” was intended to refer to the Certificate held by graduates of the approved training courses, to ensure the standard of the “operators” of the road freight systems.

The intention was that drivers would be controlled by the development of the professional driving permit (PrDP) system. The PrDP was implemented (although not adequately controlled) but operator registration was diluted by merely including the name of a nominated person in the vehicle registration system. This has proved to be largely ineffective as there is no element of competence or registration of responsible individuals.

In most countries where operator control is effective, an operator registration system is linked to a responsible person who is required to prove professional competence in the business of managing road freight transport. Failure to introduce this requirement has resulted in total lack of control, severe lack of competence in many areas and the development of a road freight industry that has all the hallmarks of lack of quality control.

6.3.1.11 Road Freight Transport Legislation

AARTO

The Administrative Adjudication of Road Traffic Offences Act (AARTO) is intended to decriminalise road traffic offences and to provide for a direct and efficient process for penalising infringements.

One of the features of the legislation that is likely to pose severe challenges for enforcement agencies is the assumed liability of consignors and consignees for the actions of the road transport operator in relation to legal loading of vehicles. The supposition is only likely to hold where assized weighbridges are available in the transport of specific commodities e.g. coal, sugarcane, timber. There are however, distinct and as yet unresolved difficulties with transport of multi-drop loads, mixed commodities etc where it will not be ethically possible to place liability on consignor or consignee.

A further problem that will give rise to potentially complicated enforcement and legal challenges is the inability of the NATIS system to track the employment, resignations and relationships between responsible persons (who may be responsible for numbers of vehicles), drivers (who may change jobs at will), and operators (which may assume a number of corporate forms), in relation to vehicle offences, as there is no high speed administrative system for recording and updating all these relationships so as to release individuals from liability and transfer responsibilities in real time.

The design of the NATIS system does not provide a sufficiently dynamic and focused matrix of information about road freight transport operations to support effective management and control by the authorities. There is need for development of a separate system for the specific purpose of road freight operator registration and control, as described in Section 6.8.

6.3.1.12 Road Transport Management System (RTMS)

A current initiative involving sugarcane and timber haulage in KwaZulu Natal and coal haulage in Mpumalanga is helping to apply pressure on road freight operators to comply with load standards. The RTMS process relies on the intended application of the terms of the AARTO to impute liability for overloading to consignors and consignees. Industries with assized weighbridges are induced to apply sanctions to overloaded vehicles and operators.

The operators are persuaded to exercise "voluntary compliance" and to obtain "accreditation" for their standards of operation. The system has been successful in the localised environments of the above mentioned industries, but its universal applicability may not be achievable in the case of mixed loads, sites with no weighbridges, indeterminate consignors (e.g. containers) cross-border transport and multi-drop deliveries. It is noteworthy that of 200,000 vehicles weighed in KZN in 2008 18% were overloaded, but by less than 3% of GVM, indicating a high level of "voluntary compliance", but monitoring by official weighbridges is still essential.

The success of RTMS does however underscore the recommendations in this report, that road freight quality is dependent on;

- Operator Registration, (linked to vehicles, drivers, and competent person);
- Professional weighing systems management;
- Competent operations management and
- Effective monitoring and reporting and analysis

All of these are elements of the RTQS and are reflected in the National Road Traffic Act and other legislation, the challenge is to implement a national system that achieves these goals across the whole spectrum of road freight operators.

6.3.1.13 Performance Based Standards (PBS) Vehicle Designs

In the KwaZulu Natal timber industry experimental introduction of the Australian concept of PBS vehicles is proving the cost effectiveness of the concept for long haul bulk freight movements.

The PBS concept is based on the scientific evaluation of performance of vehicles designed with a range of safety and performance features such as air suspension, ABS braking, GPS positioning, load sensing, anti-jacknife, speed limiting, on-board monitoring etc. The standards set for each aspect of the vehicle performance are higher than those currently required by the Road Traffic Act and the inclusion of all the design features produces a vehicle that is larger [27 metres long], has higher payload [48.5 tonnes] better turning radius, and is reportedly as safe as a conventional rigid and drawbar combination. The vehicles are confined to designated routes and monitored for operating performance.

The PBS designs are cost effective, reducing the cost per tonne kilogramme without additional road wear. Universal development of the concept could however have further implications for intermodal competition in several commodity markets, such as grain, manganese, chrome, coal, containers etc.

6.3.1.14 High Cube (HC) Containers

South Africa has experienced the world wide switch to the use of High Cube 12 metre ISO containers by the international shipping industry. There are an estimated 500,000 HC containers in use in the country and the numbers are growing and will not reduce in the future.

The transport of HC containers on the typical South African flat deck semitrailer is currently illegal as overall height is approximately 4.6 metres and the permissible legal height is 4.3 metres. HC containers can be transported legally if accompanied by an Abnormal Load Permit issued by provincial authorities. Permits are issued free of charge without any qualification or conditions. Provincial authorities have ceased to prosecute operators as the presence of the HC containers is now universal on road and rail.

There is need for legalisation of the transport of HC containers as the present situation places transport operators at risk of denial of liability by insurers if loads are not accompanied by permits. If permits were to be obtained for all movements it would impose a severe cost to operators and the authorities and the presence of the permit does nothing to contribute to the safety or efficiency of the movement of the containers.

6.3.1.15 Cross-Border Freight Transport

South Africa has common borders with six neighbouring states and more than R 150 billion of cross-border trade passes through these border crossings each year. The inefficiency of the border processing facilities, systems and infrastructure and the high levels of corruption contribute to the very high cost of transport and logistics on these corridors.

Typical transit times at Beit Bridge are 2-3 days compared to 45 minutes at a USA-Canadian border and 3 hours at Malaba (Kenya-Uganda). There is need for development of common systems that are acceptable to all countries in the region and on the South African side there is an urgent requirement for reorganisation and redefinition of the responsibilities of the many departments involved in the cross-border process.

The freight forwarders, exporters and importers, transporters as well as the border "customs agents" must be coordinated into a system that pre-clears all loads before they are actually presented to customs for clearance. The border posts should be redesigned to permit one-stop processing by both countries, and different categories of vehicles [and pedestrians] must be channelled to permit customs processing without the cluttering effects of large scale parking and queuing by trucks, cars, buses and taxis.

It is also necessary to take into account that there are many stakeholders in the overall business of border crossing that have vested interests in maintaining the status quo, including whole towns of traders, "customs agents" , hospitality providers, facilitators and even some customs officials.

The cost of the current inefficiencies is not known, but has been estimated to amount to R172 million p.a. for Beit Bridge alone.

6.3.1.16 Road Freight Constraints in KwaZulu Natal

In KwaZulu Natal, the major corridors have considerable spare capacity from an operational perspective although; there are aspects of quality control which is problematic for the provincial authorities.

The transport of several bulk commodities in the province such as maize, timber, sugar cane, coal and minerals from the interior led to severe overloading in several fairly specific areas such as the N2 from the north, the major arterials in the sugar belt, provincial roads providing access from the timber growing areas of the KZN midlands to the main N2 coastal corridor on which most of the processing facilities are located.

The control and enforcement capacity in KwaZulu Natal is significantly better than the rest of the country but there is a continual need for further coverage and development of the weighbridge system.

The new weighbridge established at Gingindlovu is designed to control movements of overloaded vehicles on the R103 which runs parallel to the N2. Further weighbridges are planned on the N2 at Mtubatuba and the N3 at Ashburton.

The provincial capacity for monitoring vehicle condition is somewhat constrained by difficulty in obtaining fully qualified inspectors and examiners.

The fact that KwaZulu Natal provides the major freight routes to the two largest ports in South Africa is a major factor in the overall road freight movement of the province. The continual decline in branch line traffic for timber and other committees is aggravating the usage of provincial roads in some areas.

One area in which restrictions apply, in relation to volumes of heavy freight traffic is the Van Reenen's Pass which at times of inclement weather, mist and snow, becomes dangerous, and is sometimes closed to traffic. The construction of the alternate route from Warden via De Beers Pass rejoining the N3 at Keeversfontein will provide some relief to the provincial authorities in the management of this dangerous section of road.

The continued escalation of bulk cargoes in interlink tippers, such as manganese, chrome and grain add considerable volumes to the major corridors and main provincial routes in the province.

The major constraints being experienced in the province, from an operational perspective, are associated with the extreme congestion of the South Durban Basin road corridors in the urban area. The volumes of traffic that reach Durban via the N3 and then diffuse into the urban street system, has already reached the capacity of many of the city streets and is currently giving rise to extreme congestion, delays, pollution, and is apparently not receiving any major attention from the combined municipal, provincial and national authorities. The construction of the Khangela Bridge has relieved some congestion from Bayhead Road but the relief is likely to be short lived as there are further restrictions in several areas along the routes to the port.

The situation was described in some detail in the NATMAP Phase 2 report on Freight transport, and is one of the most urgent requirements for revitalising the efficiency of road freight transport on the N3 Corridor between South Africa's major ports and the interior.

There is also a 20 km section of the N3 immediately around the outskirts of Pietermaritzburg which is nearing capacity. Current plans for diversion of the N3 route from the Ashburton area via Otto's Bluff, connecting back to the N3 roundabout Merrivale, may need to be expedited if there is resurgence in the volumes of road freight traffic around Pietermaritzburg in the near future.

6.3.2 Current Constraints - Rail Freight

In the analysis of current railway operational capacity constraints, it is important to isolate the theoretical potential from the current actual performance as there is wide divergence between theoretical capacity and actual current service levels, from the customer perspective.

As shown in **Figure 6.3.A** there has been significant reduction in the tonnage of general cargo hauled by railways over the past 20 years. The demand for land freight transport of general cargo on the main corridor routes has increased over that period to more than 250 million tonnes p.a. As railways have failed to capture this demand it must be apparent that capacity limitations exist and that these can be identified.

A basic problem with current debates about railway capacity is the unrealistic premise that one parastatal company can be expected to meet the demand for 40-50 million tonnes of general freight all over the country, whereas the road freight industry is composed of thousands of competing firms that perform millions of transactions each day.

In particular, it is clear that although there is in many areas, sufficient theoretical capability to move specific volumes of different commodities, in practice the performance is such that industrial users have largely chosen to abandon railway service in favour of road haulage.

The major reasons for under capacity in relation to the provision of satisfactory or superior service relate to the following aspects of customer-supplier relationships.

6.3.2.1 Reliability

The issue of reliability is absolutely critical for many undertakings. Industrial manufacturing concerns regard supply continuity as an absolute imperative as the costs of downtime for large scale processing operations is such that transport cost considerations are often relatively irrelevant.

Another area where transport cost considerations are less important than reliability and commitment to specific delivery schedules is the export of commodities as it is absolutely critical that delivery to the ports is done in time to meet shipping stack closure dates, prior to berthing of specific vessels. An industry that on one or two occasions is let down by the transport supplier in whatever modes will immediately seek an alternative transport supplier in order to ensure that there is no repeat of the very expensive experience of paying for shipping capacity that is unused or even worse, paying demurrage to hold a ship at a berth while commodity is transported to make up an order. In many cases the cost of missing all or part of a consignment is the loss of the customer's business as unreliable supply for whatever reason is unacceptable to customers whose business is negatively affected by supply failures.

The fairly consistent failure of the railways to supply sufficient wagons and to move commodities according to the demand schedule of industrial customers is one of the primary reasons why the railway is regarded as an unsatisfactory and ineffective means to move cargo. The reason for unreliability and inability to supply consistent service, are not limited to unavailability of rolling stock but include staffing problems, locomotive break downs, scheduling inefficiencies, train planning and scheduling and sometimes an apparent lack of management and operational motivation to achieve the requisite service levels.
Until the management and operational organisation is radically revitalised, it is unlikely that any amount of infrastructure and rolling stock acquisition will make significant impact on the current perceptions of the industrial customers.

6.3.2.2 Accessibility

The limited accessibility of the current railway service is another negative feature of the mode, by comparison with road transport. The deliberate closure of stations and the continual reduction in the availability of sidings that have fully operational support systems (shunting and marshalling) has meant that more and more industrial undertakings are technically, separated from the railway system.

It is often mooted that railway services could be provided by using Intermodal containers but the reality is that transhipment of containers from one mode to the other, is most effectively done in large terminals, and is problematic at the plant of most industrial concerns due to unavailability of equipment to handle loaded containers.

In practice, where containers are delivered to industrial premises, they must be left on board a semi trailer in order to permit movement within the warehouse property and this implies that somebody must provide a logistical service of placement and removal of containers as they are loaded and unloaded. Whilst this is technically possible, it is difficult to make economic arrangements when small volumes of containers are involved. Extensive international experimentation has taken place, to try to resolve this problem, notably the Steadman system in Canada and several European demountable systems.

Several attempts have been made at designing and introducing Intermodal transportation systems that would allow road trailers to be placed on rail cars for long haul transit traffic but the railway administration has apparently been somewhat indifferent to the suggestion of coordinated transport. It is recognised that intermodality on the South African railway system will imply the development of a specific set of road-rail rolling stock for the purpose as South African road vehicle dimensions are far too large for transport by rail and railway gauge limitations and historical tunnel and overhead limitations make it impossible to match the current road transport vehicles with current railway equipment.

None of these problems is insurmountable but will take an extensive amount of research and development and will of course imply very significant capital expenditure in facilities, rolling stock, terminals and possibly purpose made handling equipment.

The deliberate closure of railway stations all over South Africa has meant that the consignment of less than truck load traffic is virtually impossible and the railway policy of declining to transport less than 5 or 10 wagon batch consignments precludes the use of rail transport for a very large proportion of industrial cargo.

It must also be noted in passing that future construction of a “standard gauge“ main line will pose further problems for accessibility as it would create a technical barrier between the main line and the rest of the network, and probably promote further switch to road haulage.

6.3.2.3 Safety and Security

A further major constraint to the use of rail transport is the wide spread occurrence of pilferage and the apparent inability of the enforcement agencies to ensure the safety of rail freight in transit.

The poor security system makes it virtually impossible to use rail transport for valuable goods and an additional negative feature has been the complexity of procedures for registration of claims for losses by the railways.

The poor security situation applies to almost all aspects of rail transport, with reported losses of items such as timber, sugar in bulk, bagged animal feed, fertiliser and steel.

The disbandment of the railway police, and limited replacement of security cover has led to largely uncontrolled marshalling yards and terminals and rail based theft and vandalism are often treated as minor crimes by the over worked South African Police Services.

A further cause for concern is the increasing frequency of derailments and consequent damage to cargoes. This is closely related to the relative inexperience of train operating staff and the foreshortened training periods and unsuitable trainees as drivers.

6.3.2.4 Packaging Requirements

A negative feature of railway freight transport requirements is the need for superior packaging of goods in order to avoid damage in transit and to minimise losses due to pilferage.

By contrast, it is possible to load road freight vehicles from a warehouse loading dock, seal the vehicle and to receive the load intact, at a delivery point anywhere in the country. Road freight hijackings are regular occurrences but the total proportions are relatively small.

6.3.2.5 Tariffs and Rates

For many commodities railway tariffs effectively encourage users to explore the use of road transport where backhaul cargo can be used to reduce road freight rates.

It is likely that proposed increases of 14 to 18% in 2009, by the railways, would be sufficient to divert most timber and several other commodities to road freight. A comparison of chrome haulage tariffs from Mpumalanga to Richards Bay is given in **Table 6.3.B** below.

Table 6.3.B: Comparative Rates for Chrome Haulage

	Rail	**Rail Return**		**Road one way**	**Road two way haul**	
					Front haul	**Back haul**
Origin	Pendoring	Richards Bay		Pendoring	Pendoring	Richards Bay
Destination	Richards Bay	return empty		Richards Bay	Richards Bay	Gauteng area
Tonnage p.a.	163800	0		163800	163800	163800
Product	Chrome	-		Chrome	Chrome	Bulk Products
Lead kms	833	0		736	736	736
Rate per ton	244	0		432	216	216
	Notes	1	note the lead distance is greater for rail			
		2	In this case there are sufficient road back haul tons			
		3	Road is competitive only if more than 75 % backhaul			

Land Freight Modal Rate Comparison

Calculation of the achievable comparative rates between the land freight modes is illustrated in **Figure 6.3.B** below.

The rates shown in the "BEFORE" section are the prevailing rates, that are currently charged to users of the different freight modes.

The "AFTER" rates are the rates that should apply if efficiency were improved and margins adjusted to remove the monopoly premiums.

Note: The comparative rates for pipelines that would result from reduction of the monopoly rate premium are shown in **Figure 6.3.B: Comparison of Present and potential Future Modal** Rates by way of comparison with road and rail rates.

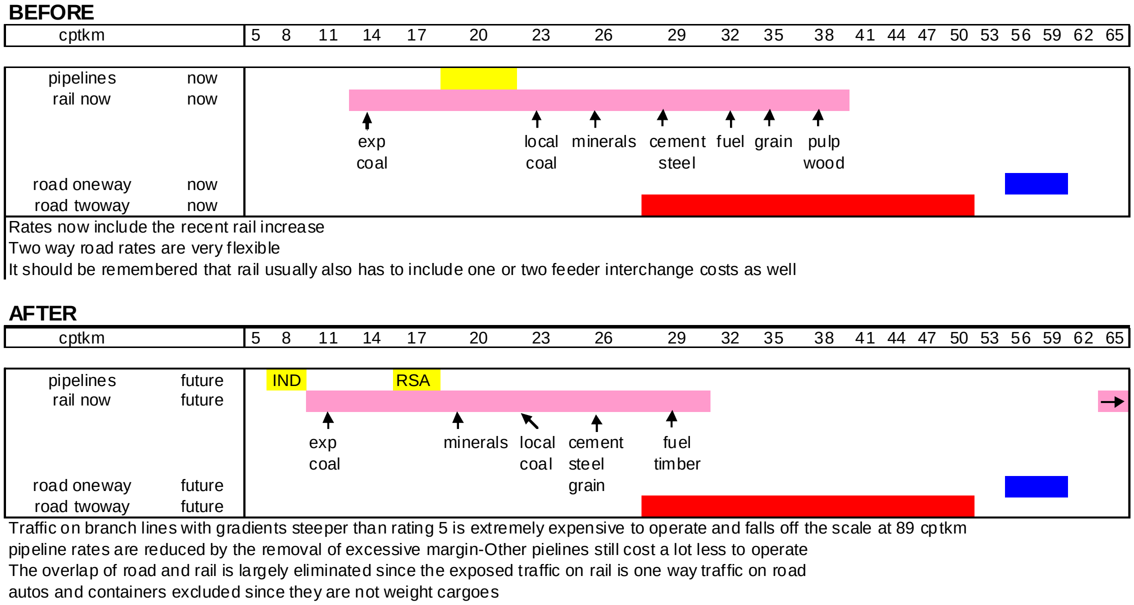


Figure 6.3.B: Comparison of Present and potential Future Modal Rates

As shown, the skew of tariffs between modes would be removed by introducing competitive efficiencies and reducing monopoly margins.

By using rate tables such as those shown above would be possible to calculate the BEFORE and AFTER costs for all long haul freight, and by using the O&D pairs information developed in NATMAP Phase 2 It will be possible to evaluate the extent of the additional cost to the country of running a monopolistic rail freight transport system.

Table 6.3.C below shows a very rough, but conservative calculation of the magnitude of the additional costs that are being incurred by industry from being forced to use road haulage for 50 million tonnes of potential rail freight.

Table 6.3.C: Estimated Additional Costs of Cargo Transferred to Road Haulage

Reason for Transfer	**Annual Tonnes**
Not Carried due to Lack of Competitive Servi	35,000,000
Not Carried due to Strategic Withdrawal	15,000,000
Total Annual Tonnes	50,000,000
Average Distance	625.00
Average Rail Cost / TKm - 2008	27.48
Average Road Cost / TKm - 2008	55.66
Variance - Cost / TKm	28.18
Additional Cost of Transferring 50 million tonnes p.a. of Rail Freight to Road Haulage	**R 8,806,250,000**

One of the issues that offers potential for future concern is that the extensive planned recapitalisation of the railways may result in significant tariff increases as has happened to electricity

6.3.2.6 Double Handling

An unavoidable negative feature that always impacts on railway ability to compete with road freight is the requirement to transport cargo by road to and from the rail point of contact (sidings, stations, terminal or loading area). The cost of the short haul road transport and the transhipment from road to rail is in many cases sufficient to justify use of direct long haul road transport, from load to unload point.

6.3.2.7 Technology

In South Africa, the railways face severe problems in competing with road freight due to the fact that most of the railway equipment is obsolete (20 to 30 years old) compared to “state of the art” modern road freight technology employing internationally designed truck tractor and trailer equipment with a range of efficiency features such as hydraulic loading, tipping, onboard weighing, vehicle tracking, radio communications, higher transit speeds and high quality customer interfaces and systems integration.

6.3.2.8 Customer Orientation

One of the most serious problems facing the railway, in recapturing any general freight tonnage, is the need to redevelop a customer orientation amongst operating staff. The current rigid definition of railway policy, makes little provision for customer needs and several of the organisation’s policy changes such as the minimum wagon batch size, the ordering procedure for wagons, the response to non delivery of wagons, and the reaction from the railway management to serious industrial dissatisfaction, are all major problems and obstacles for future development of a customer oriented railway system.

The extreme centralisation of decision making also adds to the remoteness of the organisation's response from the customer supply requirements and local staff are apparently unable to increase the levels of service due to inability to influence the central planning process.

The general lack of responsiveness to customer demand and the denial of unsatisfactory service add to customer dissatisfaction and disaffection and promote the switch to road transport.

The recent trend of announcements by railway management that capacity for strategic bulk cargoes will only be provided after guarantees of volumes is likely to accelerate the trend to other solutions, such as a switch to Maputo or use of road haulage.

6.3.2.9 Electrification

The rail system of South Africa consists of approximately 20,000 kms of track, including branch lines and some urban commuter lines. All the main lines and heavily used secondary lines are electrified, but not all at the same voltages. In several areas the voltage differences and un-electrified sections of track impose operational limitations. Shunting operations in un-electrified sidings and transfers between lines require diesel locos, which are often greatly under-utilised.

The total length of electrified lines, at various voltages, is 8,425 kms as shown in Table 6.6 below.

Table 6.3.D: Electrification of Rail Lines in South Africa (2008)

Section		Km	System	Owner
Cape Town Suburban Area*	a	115	3 kV DC	TFR/SARCC
Cape Town – Beaufort West		546	3 kV DC	TFR
Beaufort West – De Aar		257	25 kV AC	TRF
De Aar – Kimberley		242	25 kV AC	TRF
Kimberley – Johannesburg		563	3 kV DC	TFR/SARCC
Kamfersdam – Hotazel		338	25 kV AC	TFR
Sishen – Saldanha		862	50 kV AC	TRF
Reef Suburban Area*	a	291	3 kV DC	TFR/SARCC
Potchefstroom – Houtkop		84	3 kV DC	TRF
Reef Freight Lines	a	190	3 kV DC	TRF
Johannesburg – Pretoria*		70	3 kV DC	TFR/SARCC
Pretoria – Pyramid		24	3 kV DC	TFR/SARCC
Pyramid – Polokwane		262	25 kV AC	TRF
Pyramid – Middelwit and Lephalale		257	25 kV AC	TRF
Pretoria – Komatipoort		473	3 kV DC	TRF
Derwent – Roossenenkal		101	3 kV DC	TRF
Phalaborwa – Kaapmuiden		220	3 kV DC	TRF
Pretoria Suburban Area*	a	110	3 kV DC	TFR/SARCC
Germiston – Witbank		142	3 kV DC	TRF
Delmas – Hawerklip		21	3 kV DC	TRF
Ogies and Wonderfontein – Ermelo		115	3 kV DC	TRF
Ermelo – Richards Bay		301	25 kV AC	TRF
Germiston – Bloemfontein		409	3 kV DC	TRF
Kroonstad – Ladysmith		346	3 kV DC	TRF
Union – Durban		698	3 kV DC	TRF
Glencoe – Vryheid		89	3 kV DC	TRF
Durban Suburban Area*	a	101	3 kV DC	TFR/SARCC
Durban – Empangeni		178	3 kV DC	TFR/SARCC
Durban – Port Shepstone, Simuma		124	3 kV DC	TFR/SARCC
East London – Springfontein		472	25 kV AC	TFR/SARCC
Port Elizabeth – De Aar		526	25 kV AC	TFR/SARCC
Total Route Kms		**8527**		
Summary				
3 kV DC		4 918		
25 kV AC		2 645		
50 kV AC		862		
TOTAL		**8 425**		

*Note : * The South African Rail Commuter Corporation manages 2 859 km of track, of which 97% is electrified. Some of these lines are shared with TFR.*

Note : [a] Represents an approximate figure.

The implications of having a large proportion of the rail system dependent on diesel fuelled locomotives needs to be addressed in relation to future fuel supplies and the potential of the rail system to compensate for any limitation of road freight capacity in the future.

6.3.2.10 .Branch Lines

There are currently 81 branch lines in South Africa, covering approximately 10,000 kms of track and a providing potential rail services to a large part of the rural hinterland of the country.

The branch line system is South Africa was at one time a significant element of the overall rail system, providing feeder services to main lines. The inroads of road transport into the formerly rail commodity markets has left railways with unviable operations in many areas as branch line tonnages have been reduced. The present situation with all branch lines is covered in the Phase 1 and 2 reports.
For a variety of reasons the branch line services have been allowed to decline to the point where there are now 33 lines in operation, 14 lines that are currently closed or disused but potentially usable and approximately 8 lines that have been closed due to very poor prospects of future cargoes.

Some of the branch lines are important for current services and will almost certainly be regarded as part of the core network in any future rationalisation. The continued withdrawal of branch line service can be regarded as an ongoing restraint on the overall rail service that is promoting the switch to road haulage.

The recent announcement by the Minister of Agriculture that efforts will be made to revive the branch line services in agricultural areas, is further evidence of government's wish to revitalise rail services in rural areas, but the implementation is likely to require total reorganisation, restructuring and certainly involved some elements of government subsidisation in order to restore many of the lines which have been allowed to deteriorate to the point where resuscitation is going to be very expensive.

If a general reorganisation includes privatisation and the establishment of a satisfactory interline cooperation environment between branch line operators and the mainline service provider, there may be potential for revitalising some sections of the branch line system. The coordination of responsibilities between government departments is essential as the current separation of responsibilities is ineffective.

It must be noted that any trend to changing the rail gauge of main lines will have negative implications for coordination of branch line traffic.

6.3.3 Current Constraints – Ports

6.3.3.1 Lack of Market Orientation

The current constraints affecting the efficiency of South African ports relate to the past policies of the government, as applied by Transnet National Ports Authority (TNPA). The major constraints from an operational perspective relate to the restricted levels of investment in modernising the ports. This includes container handling equipment, which has left the container terminals in the country with inadequate equipment in some areas, reduced capacity (due to low crane movement rates, partly due to equipment and partially due to staffing constraints) and for break-bulk, port facilities that have failed to keep pace with the needs of import and export industries.

Some new terminal development has taken place over the last 10 years, notably the wood chip facilities at Richards Bay and Durban, coal handling equipment at Richards Bay and the development of the new Point area car terminal and the multi products terminal in the Point area in Durban, but much of this development has been restricted by existing spatial limitations and has resulted in sub-optimal resource allocation.

6.3.3.2 Facilities and Equipment

Constraints have been experienced in almost all trades due to lack of facilities and relatively slow working at South African ports. This has led to increased costs (which are aggravated by the monopoly situation of the ports service providers) and reduced export competitiveness for South African goods.

6.3.3.3 Skills

A constraint on the port environment has been the failure to develop a South African merchant marine with a result that there are very few trained South African maritime personnel available to the port environment or for any other purposes.

Government policy in relation to training and development of technical staff, management and even operational staff has resulted in sub-standard operations and the need to rely on foreign nationals for many of the skills required in the port environment. Where these skills are unavailable, the use of under qualified personnel aggravates the inefficiencies in the operations.

6.3.3.4 Planning

A further major reason for constraints in the port environment has been the isolation of port decision making from the peripheral logistics environment of the port (due to TNPA monopoly) with the results that the external supporting infrastructure development necessary for an effective logistics industry, has necessarily been extraneous to the port planning.

Examples of this are the indecision regarding manganese exports which have led to road haulage of manganese from Northern Cape to Durban, and failure to develop rail services for containers at sustainable rates, which has led to diversion of container traffic to road. The extreme congestion and lack of coordinated planning of the back of port access and logistics environment in Durban has been reported in Phase 2 of this project.

6.3.3.5 Costs

The port charges that are levied by TNPA (as the ports are their major source of revenue) in relation to international port costs is reportedly, a major constraint on effective use of South African ports.

6.3.3.6 Operations

Container terminal handling speeds have generally been sub-standard in relation to international practice although some improvements have been made in recent years. The subject of port operations was reported in some detail in Phase 2.

6.3.3.7 Berth depths

The port of Durban suffers limitations from the depths available at container and break bulk berths, in relation to the increasing size of international container ships. The recent widening and deepening of the entrance to the port of Durban, was a significant step towards improving this situation, but there do not appear to be current plans to increase berth depths with a result that the entrance will be somewhat deeper than the available berthing depths. This anomaly effectively negates the usefulness of the entrance deepening process. Current budget constraints are also believed to be threatening the completion of the port entrance widening process.

6.3.4 Current Constraints - Pipelines

The market demand for petroleum fuels in the inland market is over 12 billion litres per annum whilst the estimated capacity of the current pipelines are; the refined fuel line 3.5 billion litres and the crude oil pipeline (Durban to Coalbrook) approximately 7.0 billion litres.

This raises concerns that any disruption of production causing reduction of refining capacity at the inland refineries will be an immediate threat to the industrial hub of South Africa's manufacturing and mining sectors.

One obvious result of the delayed expansion of pipeline capacity is the 3.0 million tonnes of fuels that are transported by road and 1.5 million tonnes by rail between Durban and the interior and the fact that all distribution of petroleum products is done all over Southern Africa by road. The current process of planning and building quayside and back of wharf storage and handling facilities at the port of Durban, by the petroleum industry, to support the pipeline development is being complicated by planning obstructions and indecision.

An additional complication is that diesel is anticipated to run short in South Africa in the near future if there is no significant investment in refinery capacity. The demand for diesel already outstrips the capacity of South African refineries and there are, as of 2009, no definite plans to increase capacity in the near future. From the petroleum industry perspective, it is more cost-effective to import diesel than to refine it from imported crude oil due to the relative price of imported versus locally refined diesel and the fact that any expansion of refining capacity automatically increases the volumes of petrol, for which there is insufficient immediate market.

Over the past two years, South Africa has imported more and more diesel and the supply could well be constrained in the near future by lack of pipeline capacity. The year on year growth in demand has over the past 10 years averaged approximately 4.5% per annum but the last year this rose to 12.5%. It might be possible to produce diesel in South Africa but inland refineries will still need to access crude oil via the pipeline system so that shortages are still likely to occur.

Increasing electricity shortages have also aggravated the situation by promoting a surge in the use of diesel fuel generators. A number of passenger vehicle manufacturers have also started to offer diesel fuelled models, following their success in Europe, thereby increasing pressure on the supply in South Africa

Capacity projections are complicated by the current planning for PetroSA to build a refinery Increasing imports of fuel at higher international prices will be directly transferred to the operating costs of industry and farming and will reflect in the balance payments. For inland users, there is a looming danger of shortages as pumps run dry due to supply constraints.

The pipeline network between Durban and Gauteng is already overloaded and current construction on the R11.2 billion multi-products pipeline will not bear fruit until 2012 or later.

The new pipeline from the port of Maputo to Kendal in Mpumalanga will presumably assist in alleviating the looming fuel shortage in inland areas, in the short term.

6.3.5 Current Constraints - Intermodal

The current constraints on Intermodal transport in South Africa, relate mainly to the movement of maritime ISO containers. The major constraints at the moment are the limitations of the railway facilities at the Durban Container Terminal, limitations of the rail services between Durban and the City Deep Terminal and the congestion and restraints that apply to the City Deep operations, as well as the cost and speed of container movements by rail.

All of the above factors have led to extensive diversion of intermodal container traffic to road transport. It is estimated that approximately 500,000 containers per annum are transported by road and about 300,000 by rail. Constraints on the development of further rail transport of containers, relate to rail tariffs, terminal charges, speed and efficiency of delivery, and the fact that road transport operators are able to use containers to achieve backhaul loads at reduced rates.

The failure to develop any intermodal systems, between road and rail means that the modes remain totally competitive and there is no point of cooperation for long distance cargo and no intermodal movement apart from short haul delivery transport by road from container terminals.

The diversion of containerised cargo to road by destuffing the containers and reloading onto high capacity road freight vehicles, means that Intermodal services remain uncompetitive in terms of price per tonne of cargo (as explained in the Phase 2 report in this project).

The current constraints on intermodal cargo movement are unlikely to be resolved, until institutional arrangements between rail and road have been addressed and resolved.

6.3.6 Current Constraints – Air Cargo

The current constraints on internal (domestic) air cargo in South Africa, relate primarily to the unavailability of belly-hold capacity of the current airline services which are predominantly passenger orientated. The very limited tonnages of potential air cargo generated in the provinces, make it unviable for freighter aircraft operations, to any of the major centres in the country.

The current operation of overnight road freight services from all main centres to OR Tambo Airport in Johannesburg alleviates the need for most air cargo services from regional centres and means that nearly all international cargo is flown to and from ORTIA. It is unlikely that this situation will change significantly in the immediate future.

The Dube Trade Port linked to the new airport at La Mercy is an alternative air freight hub, which will start to generate air freight from and to KZN.

6.4 FUTURE OPERATIONAL CAPACITY CONSTRAINTS BY MODE

This section of the report describes the most pressing future constraints that will have impact on the effectiveness of each mode. It is assumed that the issues described under “current constraints” in the previous section, will be resolved. Failure to address the issues described will mean that they continue to impose further constraints in the future. The conservative estimate is that overall freight transport volumes will change during the period 2005 to 2050 by the amounts below;

Table 6.4.A: Total Annual Freight Tonnes by Mode

	2005	2050
Rail Freight	182	265
Ports (including containers)	246	600
Pipelines	20	45
Road Freight Urban-	777	1500
Road Freight -Rural	630	1100
Road Freight - Corridors	103	220
Total Road Freight	1510	2820
	1958	**3730**

Within these data there is the fact that the demand for container handling at the port of Durban will increase almost 300 % from the present 3.0 million p.a. to approximately 9 million p.a. Motor vehicle imports and exports will rise to approximately 600 000 units p.a.

Urban road freight movements will swamp the existing road system and rural movements will pose serious challenges for the road systems and the enforcement authorities and the agencies charged with maintenance of roads.

Additional rail cargo of 30-40 million tonnes of general cargo (including containers) will require massive investment in rolling stock, locomotives, terminal facilities and upgrading of the main line systems.

Imports of diesel will require another pipeline to handle more than 40 million tonnes p.a. and there may be need for construction of a completely new liquid fuels handling system in Durban or Richards Bay, with attendant pipeline capacity to the interior.

6.4.1 Future Operational Capacity Constraints – Rail

In the analysis of future constraints in the rail sector it is important to define whether the institutional structure will be changed or the current “model” of service provision retained.

If the current situation is unchanged the following constraints can be identified.

6.4.1.1 Policy Constraints

The current operational constraints on the transport of goods by rail are largely the result of the deliberate policy directions taken over the past 20 years. The principal policy decisions taken during this period were:

a) That rail transport will remain a government parastatal monopoly;
b) Rail service would be constrained by parliamentary budget allocation initially, and later by governmental restraint on railway capital generation;
c) deliberate reduction of the skills and experience base of the railway company;
d) Failure to attract, train and develop adequate technical skills and management capacity in relation to the national demand for freight transport;
e) Failure to maintain rolling stock and provide for adequate maintenance capability;
f) deliberate closure of access points (rail stations and sidings) thereby excluding the transport of large proportions of general freight;
g) Deliberate concentration on captive cargoes and industries without alternative mode;
h) Deliberate ignorance of freight customer demand;
i) Abandonment of significant proportions of the rail system and centralisation of management and planning and
j) Failure to develop operational managerial capability for transport of general cargo.

The result of all of the foregoing has been ongoing reduction of capacity to handle complex general cargo operations, which will require very high future expenditure and redevelopment to replace and expand. In order to take up 30-40 million tonnes of general cargo (or more) and revitalise services to all areas there will be a need for very large capital expenditure over the next 10 years, as well as large scale increases in operating capability. As this is almost certainly beyond the available resources the result is likely to be further restriction of rail freight capacity.

The future capacity of the rail system, if it continues to be confined to the operations of one parastatal company, is at this point unpredictable, as it is highly unlikely that the current staff, management and systems can be stretched to cover extensive general cargo operations and there is very limited available expertise in the country apart from some ex-railway personnel.

A problem with projecting future railway performance lies with the fact that there are limited authoritative alternative opinions to effectively evaluate the announced plans and policy directions of the railway administration and attempts by NATMAP at obtaining the data on which plans are based has proved problematic.

The future lack of capacity is particularly apparent in the following areas:

6.4.1.2 General Freight

a) Customer access points (stations, sidings, terminals, intermodal systems access, etc) and

b) The deliberate closure of contact points with the customer interface and lack of facilities to handle general cargoes mean that the potential for redeveloping the general cargo market is very severely limited by lack of facilities. Most factory and industrial development since 1990 has failed to make any provision for rail transport due to the policy of withdrawal of rail services for general cargo.

The limited handling facilities that are available at the ports and industrial plants are currently inadequate to achieve the volumes that are proposed by railway plans and budgets.

The current Transnet capital proposal suggests that R26 billion of expenditure by TFR would result in 64 million tonnes of general cargo, but that may not materialise.

As an example of the capital constraints faced by railways in redeveloping general cargo services, Table 6.8 shows an estimate of the amount of additional equipment that would be required to move selected rail friendly cargoes that are currently transported by road on the Durban-Gauteng corridor.

These commodities, amounting to about 16.5 million tonnes p.a. are considered to represent the immediate potential freight that could be attracted back to rail.

The calculations are based on purchase of new equipment on the assumption that if sufficient equipment was currently available, this tonnage would already be using the rail mode and if it is not already on rail, it is because there is lack of the necessary equipment.

Table 6.4.B: Estimated Capital Equipment to Rail 16.5 million tonnes p.a

Wagon Requirements for 16 500 000 additional tons of traffic on Durban - Gauteng main line

Commodity	Tons per annum	Wagon Type	Loads per annum	Revised turnaround time	Loads per annum (348 days) *	Total New Wagons + 10%	Wagons per train	Trains	Cost /Unit	Capital Required Rands
Inland										
Container	4,500,000	SMLJ	150,000	7 days	49	3367	50	3,000	700,000	2,356,900,000
Fuel	2,000,000	XP	50,000	12 days	29	1,897	40	1,250	1,100,000	2,086,700,000
Grain/Maize	1,000,000	FZ	22,727	14 days	25	1,000	50	455	750,000	750,000,000
Vehicle	1,000,000	SC	62,500	6 days	58	1,185	50	1,250	850,000	1,007,250,000
Other Liquids	500000	X, various	12,500	16 days	22	625	40	313	1,100,000	687,500,000
Other Dry Blk	500000	FZ, X	10,000	10 days	35	314	40	250	800,000	251,200,000
	9,500,000		307,727			8,388		6,518		7,139,550,000
To Coast										
Container	3,000,000	SMLJ	100000	see above	s/a	s/a	50	s/a	700,000	See inland total
Coal	1 000 000	BAD, CAL	19231	10 days	34	622	50	385	780,000	485,160,000
Steel	1 000 000	DAJ, DLJ	18519	12 days	29	703	50	371	750,000	527,250,000
Rock/Ore	1 000 000	CR-1	17241	8 days	43	441	50	345	780,000	343,980,000
Other	1 000 000	X, various	19 231	10 days	34	622	50	385	780,000	485,160,000
	7,000,000		154,991			2,388		1,486		1,841,550,000
		Total Wagons				10,776				8,981,100,000

s/a - See above

* This is an arbitrary figure. A normal full year is 365 days, or 52 full weeks and and 1 day, except in a leap year.

A 50 week year is 350 days and the use of 348 days is to allow for extra contingencies.

Locomotive Requirements: Class 18E or equivalent

	Trains per Annum (1)	Locos per train	Trips per week	Trips per Annum (2)	Loco sets per annum	Loco Required (3)	Primary Route	Sec. Route (4)		Capital Required Rands (5)
Inland										
Container	3,000	4 Class 18E	2,5	125	24	96	Dbn - GP	To north		
Fuel	1,250	3 Class 18E	2,5	125	10	30	Dbn - GP	To north		
Grain/Maize	455	4 Class 18E	2,5	125	3,64	15	Dbn - FS	Branches		
Other Liquids	313	3 Class 18E	2,5	125	2,50	8	Dbn - GP	To north		
Other Dry Bulk	250	3 Class 18E	2,5	125	2,0	6	Dbn - GP	To north		
Total	1486					155				4,760,000,000
To Coast										
Container	2,000	4 Class 18E	2,5	s/a	s/a	s/a	GP - Dbn	Fm north		
Coal	385	4 Class 18E	2,5	s/a	s/a	s/a	GP - Dbn			
Steel	371	4 Class 18E	2,5	s/a	s/a	s/a	GP - Dbn			
Rock/Ore	345	4 Class 18E	2,5	s/a	s/a	s/a	GP - Dbn			
Other	385	4 Class 18E	2,5	s/a	s/a	s/a	GP - Dbn			
Total to Coast	3,486					s/a				
Total Locomotive and Wagon costs (Rands)										13,741,100,000

Notes:

Re locos: Sets of locos to complete three round trips per week between Durban and Gauteng or Kroonstad.

This is 149.1 round trips per year but in practice only about 2,5 round trips per week are achieved, or 124.25 per annum

1. Rounded to highest number
2. Based on 2,5 round trips per week over a 50 week period between Durban and Gauteng or Kroonstad. Excludes branch line and extended main line requirements.
3. It is assumed that return workings will be in the capacity of forward working requirements.
4. Additional locomotives will be required for services beyond Kroonstad and Gauteng. For grain traffic, this will include locos operating on branch and main lines using electric and diesel locos for example. Such requirements have not been calculated in this spreadsheet.
5. Estimated cost of 'new' 18E or Class 10E is R 28 million per unit for 155 units. To cater for repair and maintenance times, 170 locos will be required at a cost of R 4 760 000 000 (4.76-bn)

As shown in **Table 6.4.B**, providing capacity for an increase of 16.5 million tonnes of general cargo to be transported by rail on the Durban–Gauteng main line would require capital expenditure of approximately R13.7 billion on rolling stock and locomotive power on this corridor. In this exercise, the amount of additional equipment required to move the tonnage between the origins and destinations and the main line have not been included. Some additional expenditure may also be necessary for shunting and materials handling equipment. The operating cost of such an exercise has not been calculated.

A further issue not under general discussion at present is the tariff implications of large capital injections into the state railway system, when recent and current proposed tariff increases are already deterring use of railways in many areas.

6.4.1.3 Coal

The transport of coal is the railway's biggest single commodity in South Africa so that projections of future usage and capacity must necessarily focus on the likely future demand and supply potential for this commodity. **Table 6.4.C** below shows a projection of the likely future transport demand for coal by various major industrial groupings as well as the likely changes in source of coal supply.

Table 6.4.C: Projected Sources and Users of Coal by Mode – 2005-2050

Projected COAL usage by User	Province/Area	Units	2005	2010	2015	2020	2030	2040	2050	Remarks
	MPUMALANGA		M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	
Planned ESKOM Power generation from COAL		kW	27780	29780	29780	34000	34000	31000	27000	life expired stations/coal in decline after 2030
Projected COAL Usage ESKOM - CONVEYORS		Tons p.a.	72	82	82	93	93	81	74	millions of tons
Projected usage ESKOM - ROAD [to power stations]		Tons p.a.	20	20	11	11	11	11	11	
Projected Usgae ESKOM -RAIL [to power stations]		Tons p.a.	4	4	13	13	13	13	13	rail captures road to majuba after cut off open
Total ESKOM		Tons p.a.	96	106	106	117	117	105	98	low qlty coal towards the end-more tons burned
Projected tons COAL - to SASOL [conveyors]		Tons p.a.	20	20	20	20	20	20	20	secunda steady throughout
Projected tons COAL - to Industry - RAIL		Tons p.a.	10	12	11	11	11	11	12	small growth-coal substitutes found
Projected tons COAL - to Industry - ROAD		Tons p.a.	12	11	12	12	13	13	12	
Total Tons to Industry [all over SA]		Tons p.a.	42	43	43	43	44	44	44	
Tons for Export - RAIL to Richards Bay		Tons p.a.	66	68	80	80	70	65	60	resources beginning to run out
Tons for export RAIL to Durban		Tons p.a.	2	2	2	0	0	0	0	terminal to Richards Bay
Tons for export Rail to Maputo		Tons p.a.	2	2	2	2	2	2	2	growth from Limpopo coal
Tons for Export		Tons p.a.	70	72	84	82	72	67	62	
	LIMPOPO		M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	
Planned ESKOM Power generation from COAL		kW	3990	3990	8000	12100	16500	20500	24500	Lephalale coal field growth
Projected COAL Usage ESKOM - CONVEYORS		Tons p.a.	12.8	12.8	25	25	37	48	48	
Projected usage ESKOM - ROAD [to power stations]		Tons p.a.	0	0	0	0	0	0	0	
Projected Usage ESKOM -RAIL [to power stations]		Tons p.a.	0	0	0	0	0	0	0	
Total ESKOM		Tons p.a.	12.8	12.8	25	25	37	48	48	Replaces declining Witbank field
Projected tons COAL - to SASOL [conveyors]		Tons p.a.	0	0	20	20	20	20	20	chemical plant at Lephalale
Projected tons COAL - to Industry - RAIL		Tons p.a.	1	1	1	1	2	2	2	
Projected tons COAL - to Industry - ROAD		Tons p.a.	0	0	0	0	0	0	0	
Total Tons to Industry [all over SA]		Tons p.a.	1	1	21	21	22	22	22	
Tons for Export - RAIL to Richards Bay		Tons p.a.	1	2	10	20	30	40	50	replace witbank field-some tons from Botswana
Tons for export RAIL to Durban		Tons p.a.								
Tons for export Rail to Maputo		Tons p.a.	0	0	1	2	2	3	3	new flow from northern fields
Tons for Export		Tons p.a.	1	2	11	22	32	43	53	
	FREE STATE		M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	
ESKOM and OTHER Power generation from COAL		kW	3708	3708	3708	7700	7700	7700	4100	1 new station-then letabo coal runs out
Projected COAL Usage ESKOM - CONVEYORS		Tons p.a.	12	12	12	24	24	24	12	
Projected usage in SA - ROAD [to power stations]		Tons p.a.	0	0	0	0	0	0	0	
Projected Usage in SA -RAIL [to power stations]		Tons p.a.	0	0	0	0	0	0	0	
Total Power Generation OTHER		Tons p.a.	12	12	12	24	24	24	12	
Projected tons COAL - to SASOL - CONVEYOR		Tons p.a.	20	20	20	20	20	20	20	sasolburg continues
Projected tons COAL - to Industry - ROAD		Tons p.a.	0	0	0	0	0	0	0	
Total Tons		Tons p.a.	20	20	20	20	20	20	20	
Tons for Export - RAIL to Richards Bay		Tons p.a.	0	0	0	0	0	0	0	
Tons for export RAIL to Durban		Tons p.a.	0	0	0	0	0	0	0	
Tons for export Road to Durban		Tons p.a.	0	0	0	0	0	0	0	
Tons for Export		Tons p.a.	0	0	0	0	0	0	0	
			M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	M/Tp.a.	
Projected Usage in SA -RAIL [to power stations]		Tons p.a.	4	4	13	13	13	13	13	
Projected tons -COALINK		Tons p.a.	67	70	90	100	100	105	110	first overvaal tunnel double,then lephalale
Projected tons NATCOR		Tons p.a.	2	2	2	0	0	0	0	upgrade, then new wagons
Projected tons-Maputo line		Tons p.a.	2	2	3	4	4	5	5	[Note : until these happen tons
Projected tons to industry -RAIL		Tons p.a.	11	13	12	12	13	13	14	will stay below 70 mtpa.
Projected tons by RAIL		Tons p.a.	86	91	120	129	130	136	142	
Projected tons by ROAD		Tons p.a.	32	31	23	23	24	24	23	

The anticipated depletion of the Mpumalanga coal fields over the next 30 years and the development of new mines in Limpopo will have implications for the demand for rail transport of coal both to industry and to export ports. The actual proportions that will be used for different purposes will depend on a complex interaction of export prices, cost of developing new mines, local demand for power station coal, production costs and rail tariffs. In the table above it has been assumed that about 25% of power generation will be derived from nuclear power stations.

It is apparent that considerable capital development will be required to achieve the suggested levels of export, (if Limpopo coal is to be exported there will be a need for upgrade of the line from Ogies to Lephalale for 30 tonne axle loads), but if the costs are ultimately to be funded by the exports of the coal mining industry there will be the need for evaluation of the tariffs that will be required to cover the developments. The strategic fragmentation of the mining industry has reduced the potential for TFR to obtain forward commitments without which the developments may not take place.

The proposed 95 million tonnes p.a. to be exported through Richards Bay will require very extensive re-engineering, re-equipping and upgrading of the Coallink line as it was built in the 1970s and current performance has reduced over the past 5 years to about 62 million tonnes p.a. due to derailments, cable theft and operational problems. The re-engineering will need to include rationalisation of power supply around Ermelo (standardise current and replace sections worked by diesels) doubling of the Overvaal tunnel, increased passing loops and integration of through lines for traffic from Limpopo.

6.4.1.4 Iron Ore

The Sishen–Saldanha Line handles approximate 39 million tonnes per annum of iron ore from the mines in the Northern Cape. The 861 kilometre line was built by Iscor and opened in 1976 with a capacity of 17,5 mtpa. The line has 10 crossing loops for train crossings spaced 80-90 kilometres apart. Spoornet took over the line in 1977 as a 15 year run-out project; the plan was that the line would revert back to Iscor after 15 years. Assmang started exporting iron ore over the line from Beeshoek (70 km south of Sishen) in 1978.The capacity of the line was increased in 2002/03 by installing intermediate loops increasing these to 20.

Current plans are to expand the line capacity to 45 million tonnes p.a. as a first stage, using a range of operational and infrastructural developments, including revised train configurations, more, longer crossing loops, distributed power locomotives and revised operating schedules. The first stage is in progress and within current budget allocations.

The plan is then to increase the capacity to keep pace with assumed resurgent demand for iron ore exports, which will hopefully take place over the next few years.

Port development will also be necessary to keep pace with the increasing line capacity.

6.4.1.5 Manganese

Current limitations of the bulk terminal at Port Elizabeth are the major cause of the diversion of manganese by rail from Northern Cape to Durban. The terminal has a capacity of 2-3 million tonnes per annum and although rail capacity could handle the excess tonnage the terminal cannot.

There are 9 trains per week scheduled on that route and there is capacity for more, but the receiving terminal cannot handle additional tonnage so in 2008 approximately 660,000 tonnes was handled at Durban. The estimated volume for 2009 of about 300,000 tonnes per annum are a reflection of the reduced export demand.

Until more terminal capacity is developed at Port Elizabeth or Ngqura, rail or road haulage to Durban will continue if export prices justify the additional costs.

6.4.1.6 Timber

The current pressures by TFR for tariff increases in the transport of timber are likely to result in diversion of significant tonnages of timber from rail to road in the immediate future. The capacity of the rail services on branch lines is highly questionable, as erratic service, slow delivery and increasing costs are being experienced by timber growers in all areas.

A recent announcement by Sappi that they intend to abandon rail in favour of road transport is indicative of the dissatisfaction of the major users, with the rail services provided.

A further development that will change the future situation is that South Africa is likely to experience a reducing output of export roundwood and pulpwood over the next 10 years, with increased emphasis on production of building and construction timber, locally grown or imported.

Pressures on water supplies by the authorities, municipal land valuations, land redistribution, and rising costs are all likely to induce the timber producers to reduce the area of their operations.

6.4.1.7 Maize

The switch of maize traffic from rail to road continues due to the limited services offered by the railways on branch lines, from the maize silos which are the primary storage points for farm deliveries.

In many areas, the silos (which are all located on rail lines) are served totally by road, with no attempt to use rail transport due to erratic services and high tariffs. This is particularly evident in northern KZN.

6.4.1.8 Cane

The sugar industry in KwaZulu Natal has generally abandoned the use of railways over the past 20 years, with the last line transporting significant quantities of sugar cane (Nkwalini 450,000 tonnes per annum) being abandoned in 2009. Mills that were specifically designed to receive rail transport such as Felixton, have had to adapt to reliance to road haulage and in the north eastern KZN areas, large tonnages of sugar cane are being hauled by road in various directions between mills that compete for the sugar cane produced by growers.

The transport of sugar by rail (which used to be the standard method), now only takes place between two sugar mills (Amatikulu and Felixton) and the terminal in Durban. Sugar haulage has switched to road at all other mills in the industry, due to rail tariff and service limitations apart from a small volume between Noodsberg and Germiston.

6.4.2 Future Operational Constraints - Road Freight Transport

6.4.2.1 Operational Capacity

The future operational capacity of road freight transport is largely unlimited, over most of the road network for the period under review, subject to resolution of the issues described as “current constraints” in the previous section of this report.

It is important to note that the brief and scope of NATMAP has precluded significant observations about the future extent of the overall road freight sector in South Africa, including urban, rural and cross-border freight issues.
It must be anticipated that during the period under review the numbers of road freight vehicles will rise from about 400,000 to over 1,000,000 causing chaotic conditions on already congested roads in industrial areas and around the ports.

The cost of road freight transport (at 2009 prices) will rise to over R400 billion p.a. (or much more if fuel shortages result in very large increases in prices).

Cross-border traffic will rise to more than 1 million freight vehicle border crossings per year, and as the current border arrangements are already inadequate they will definitely not be not be able to handle traffic flows.

There will be extensive dilution of quality of operations, driving, technical and maintenance skills. It is for this reason that it is essential to regain control of the quality management of road freight by introducing the processes needed to implement the RTQS as described in this report. Failure to act on these issues will result in wholesale destruction of roads and increasing impacts of externalities from the mode.

6.4.2.2 Infrastructure Restrictions

Growing problems with infrastructure deficiencies to serve the road freight and logistics systems pose challenges to efficient operations. There specific areas of infrastructure under-capacity around the major urban and industrial areas and the ports that are in need of urgent upgrading. Provision must be made for parking, staging, handling facilities, terminals and access routes.

From an operational perspective, the infrastructure constraints result in congestion, lack of efficiency, accidents, pollution and general restriction of the ability of the road freight mode to deliver efficiently and cost effectively. The infrastructure constraints are described in more detail in another chapter of this report.

6.4.2.3 Externalities

It must also be recognised that the externalities created by road freight transport, are in need of urgent attention, as the capacity to move tonnage must be accompanied by the capacity to limit externalities such as accidents, road damage, pollution, road safety (speeding, driving hours, load securement) and the transport of hazardous goods with all due safety precautions. Successful implementation will depend on introduction of effective systems as described elsewhere in this report.

6.4.2.4 Operator Quality

The capacity of road freight transport operators to operate efficiently, safely and within the standards for externalities defined in the legislation, requires specific level of training experience and managerial ability. Failure to provide for the efficient management of freight transport, (as with other modes of transport) inevitably leads to inefficiency and an increasingly negative impact from the externalities of the mode.

There is urgent need for revision of the road freight transport operator licensing system to introduce an element of responsibility, competence, registration, and control to reduce the future impacts of the inevitable growth in road freight transport

6.4.2.5 Enforcement Capability

The quality standards of the road mode in South Africa are ineffectively regulated due to lack of capacity by the enforcement authorities, hampered by failure to introduce an effective regulatory system that will permit offenders to be constrained and controlled.

6.4.2.6 Fuel Shortages

There is anticipation that when the world economy recovers from the present recession there will again be pressure on the supply of carbon based liquid fuels that are the essential power source for current road freight vehicles. The increasing cost of diesel fuel will place severe pressure on users of road haulage and in the absence of alternative electrified rail services the cost of long haul freight transport may severely limit industrial growth potential and could threaten food security in the longer term.

6.4.3 Future Cargo Projections and Operational Constraints – Ports

The projections of future volumes to be handled by ports has been developed from review of past and current performance, examination of the Transnet Cargo Traffic Demand Forecast 2007, evaluation of global trends, and industrial reports received.

The projected volumes of different cargo categories are included in this section to facilitate the description of the identified potential operational constraints for the future of each port. Individual port projections have been summed by cargo type and presented in graphic format

6.4.3.1 Richards Bay

Trends in the movement of commodity categories at Richards Bay are shown in the figures below.

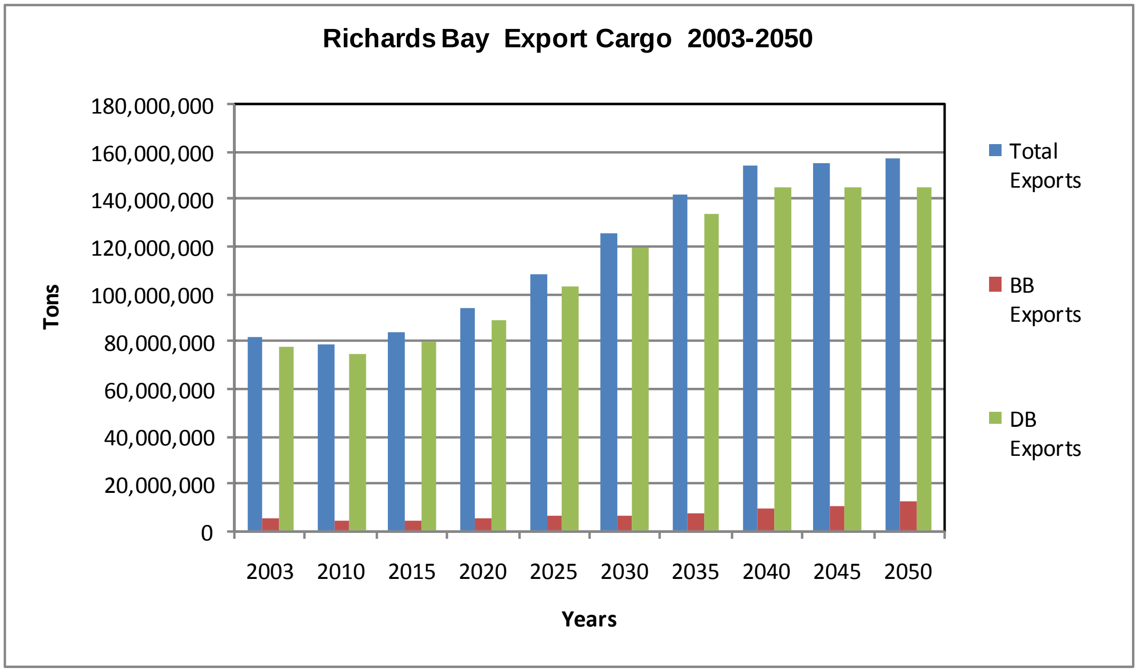


Figure 6.4.A: Richards Bay Export Cargo 2003-2050

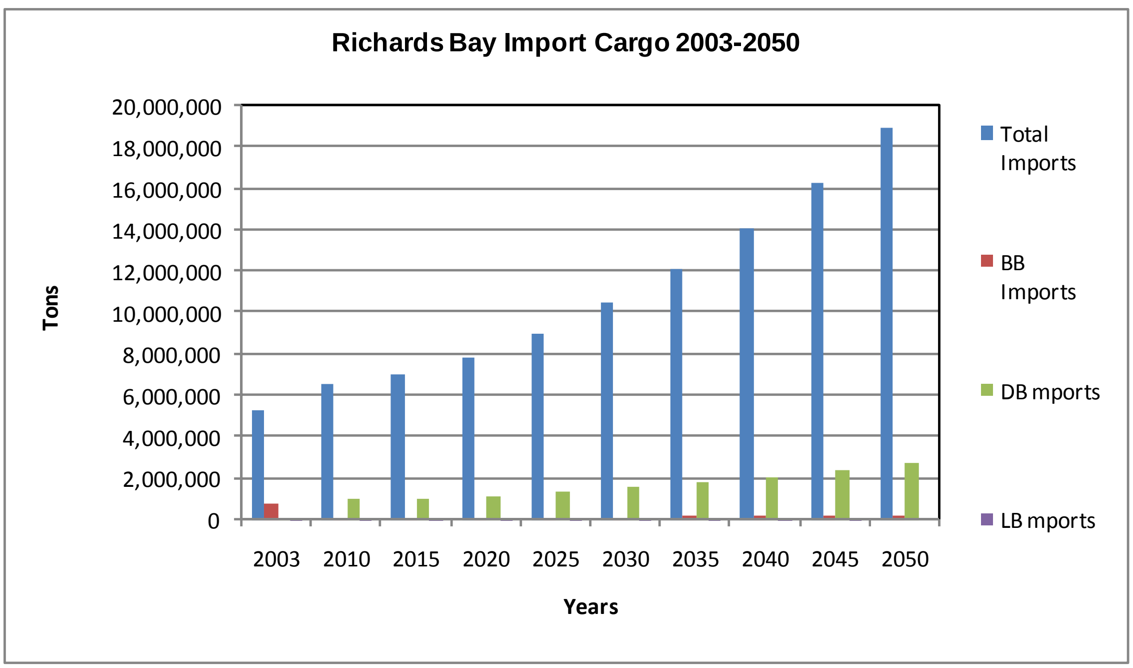


Figure 6.4.B: Richards Bay Import Cargo 2003-2050

As shown in the above graphs the dry bulk exports (mainly coal) and imports have reduced since 2007. Projected future growth is based on the assumption that coal exports will recover by 2020 and that imports will continue to grow.

Future constraints on the port of Richards Bay, relate primarily to the speed of development of Richards Bay Coal Terminal (RBCT). The development of the coal terminal is largely dependent on parallel development of the capacity of the rail line from the interior and as there is some doubt about Transnet Freight Rail (TFR) intentions, the terminal has in 2009, allegedly shelved expansion plans until some clarification is received.

It is also recognised that the proliferation of small mining companies is prejudicing the efficiency of terminal operations and necessitating development of capacity to handle the 34 categories of coal which may increase further as more mining companies attempt to differentiate their products in the market. All of the coal development will depend on the capacity of the rail system.

Import of raw material for aluminium production is also uncertain as the future of the industry is largely dependent on the ability of Eskom to provide power at commercially viable price or the use of imported Mozambique gas for the smelting furnaces.

Mooted plans to create ship building or repair capacity in Richards Bay appear to have been shelved but as Transnet Port Authority appears to be indecisive about the commercial potential, little has been published.

The continuing unresolved debate about a possible container terminal expansion as well as or instead of expansion in Durban is also leading to uncertainty.

The potential for development of further operations at Richards Bay in terms of available space and the area of water are unlimited within the time period but the continued debate about development of container terminal or other capacity has led to indecision and delay.

6.4.3.2 Durban

Future constraints on the port of Durban appear to be mainly based on the likely expansion of the container volumes but there are also possible operational constraints on other commodity terminals such as the car terminal and fruit pre-cooling (if and when the imports and /or exports resume and increase).

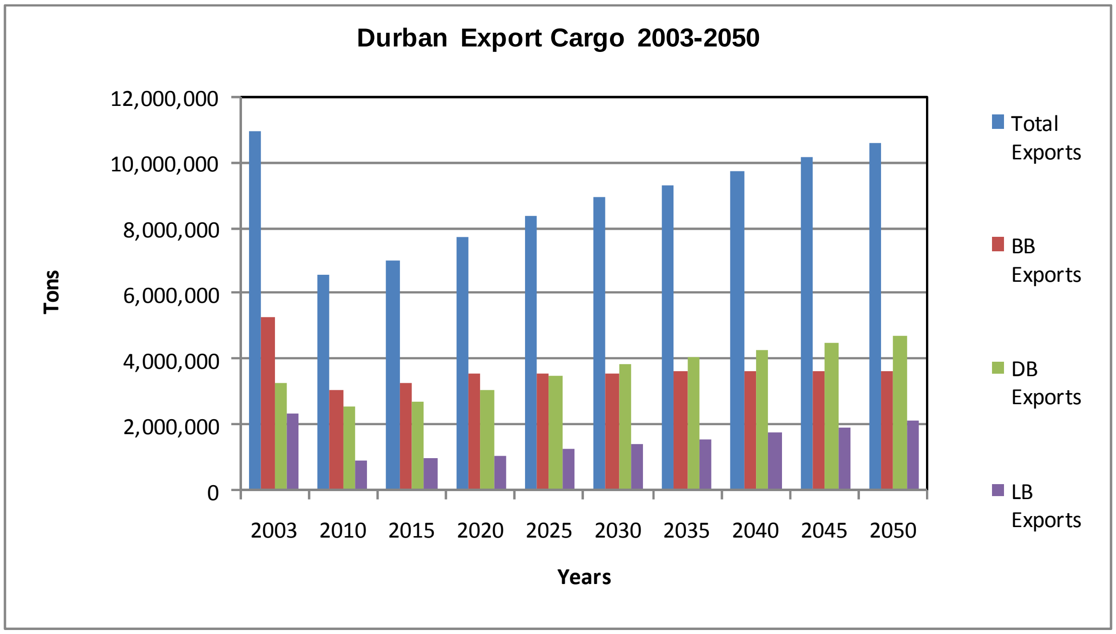


Figure 6.4.C: Durban Export Cargo 2003-2050

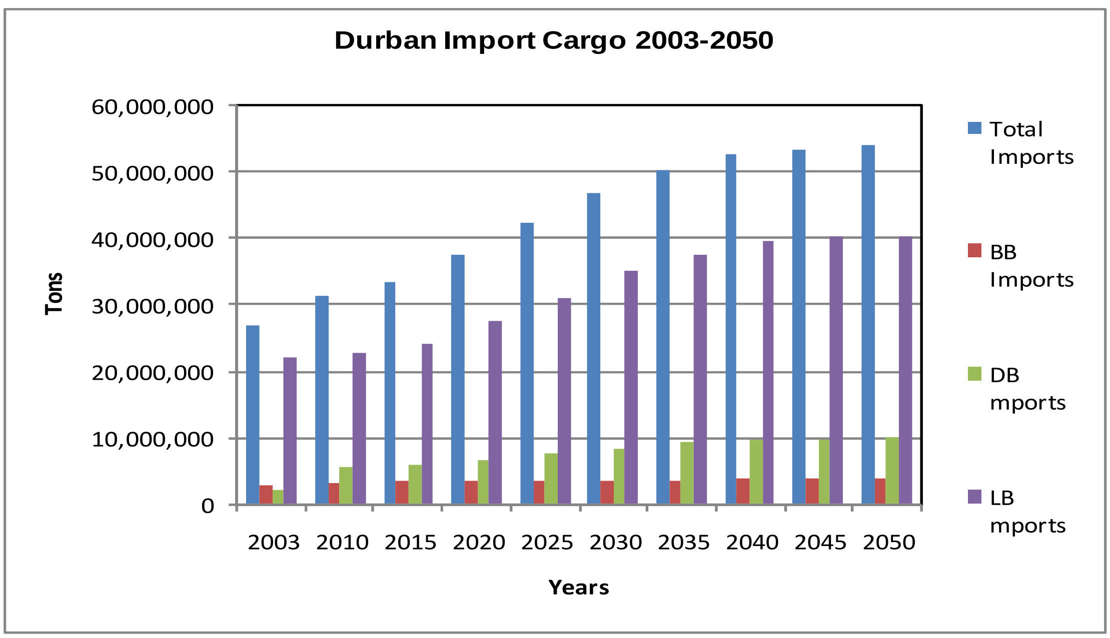


Figure 6.4.D: Durban Import Cargo 2003-2050

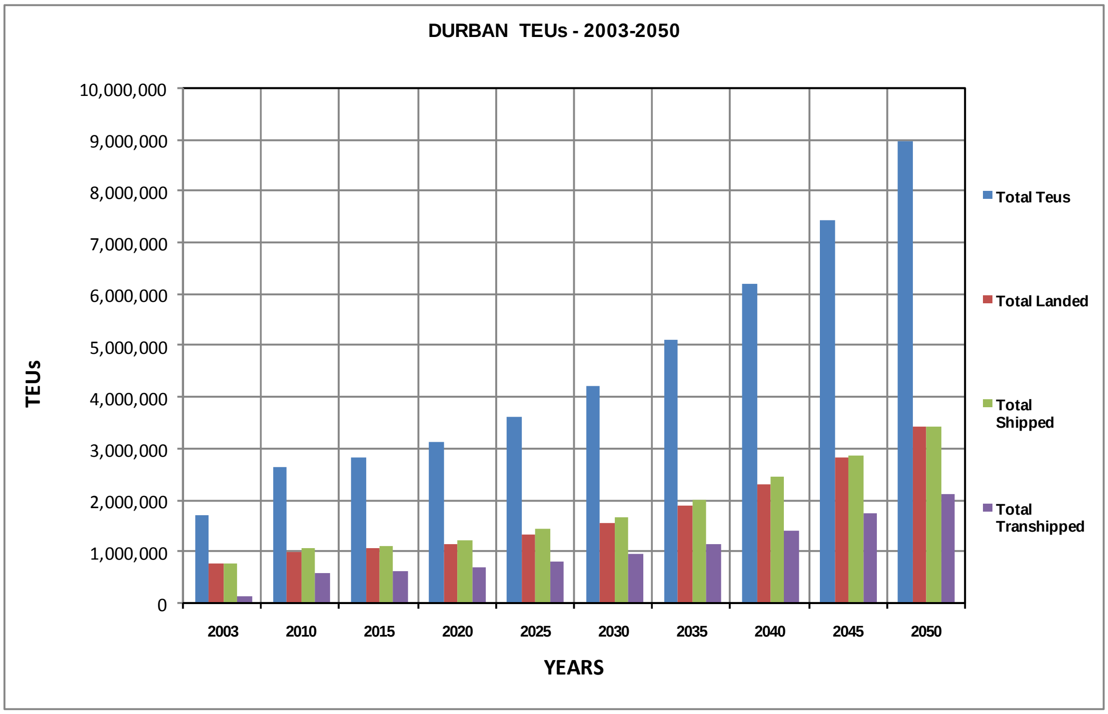


Figure 6.4.E: Durban Containers 2003-2050

The future capacity of the Port of Durban is largely dependent on the decisions by Transnet National Port Authority (TNPA) regarding the development of a second container terminal.

The proposed development of a second terminal at Bayhead would provide for a further 4 million TEUs per annum and with improvement in operating speeds, replacement of existing cranes, and redevelopment of the existing container terminal, the capacity that could be created would be sufficient to provide for the entire timeframe through to 2050, with the development of one additional terminal. Thereafter decisions will be needed regarding development of capacity at Richards Bay or the dig-out port.

The capital requirement will be very extensive as existing rail lines will have to be moved, extensive excavations done, realignment of channels and deepening of berths throughout the port. From the operational perspective additional capacity will be achieved by the redesign of the new and existing terminal access routes and the provision of more modern equipment, which will improve operating speeds and reduce delays.

For break bulk and bulk commodities the port is very close to capacity. Re-development of more modern terminals in the Maydon Wharf area will give additional capacity but the potential loss of the point area to urban development (as proposed by Ethekwini Municipality) will severely reduce the capacity of the port to handle break-bulk cargo.

There is an urgent need for a study of the entire port and its approach routes for road and rail as well as the inclusion of a land use planning exercise to incorporate the old Durban airport and to review the spatial requirements of the petro-chemical industry in relation to future development of the port. The constraints on port efficiency can be overcome with planning but due to current inertia and a fragmented planning authorities, very little appears to be in process. It is critically necessary for revision of past operational analyses and projections to precede infrastructure planning and to include options for private sector capital One of the major constraints facing the development of the port of Durban is the need for a strategy to clear the environmental objections to development of the Bayhead area.

Alternate strategies will need to be reviewed to replace the fish breeding and ecologically sensitive areas in around the Bayhead with similar facilities or environment at some other investment in the provision of facilities and equipment. Failure to do this will almost certainly result in failure to meet demand for port capacity.

Future constraints are likely to include the need for additional pilots, tugs, dredgers and some of this development will be constrained by the lack of locally available maritime staff.
A parallel constraint which has impact on port staff availability is the South African policy regarding maritime registration and the lack of a South African maritime fleet. The lack of South African flag vessels in the South African trade, loses foreign currency revenue, fails to take advantage of employment opportunities and results in not enough locally trained staff for maritime occupations in South Africa.

Dependent on the future developments in the petro-chemical industry, it is likely that during the period under review, additional capacity will have to be created at the single buoy mooring through which crude oil is currently discharged, directly to the refinery. Alternately, additional capacity will have to be developed in the Island View area for the import of diesel fuel. The congestion in the area could be alleviated by providing for some storage back of the wharf, with a pipeline to larger storage facilities in the old airport area (possibly making use of the existing SAAF storage tanks). Future development should tie in with the currently planned routing of the pipeline from Durban to the interior.

The major operational constraint on the future potential for development at the port of Durban, does not relate to the port but to the transport connections from the port and the south Durban industrial basin to the interior. The railway system, although underutilised, is unsatisfactory in relation to future developments and the road system is very seriously congested. The need for a thorough and wide ranging investigation of the entire logistics environment around the Port of Durban is absolutely critical and urgently required. The tender awarded in 2006 for the investigation does not appear to have yielded any usable results.

Due to the fragmented nature of the decision making processes however, and the vested interests of current stakeholders the process required to change this environment into an effective support system for the port activities, is being very ineffectually managed.

point in the Bayhead area or ameliorating technology will be required, if the blocking of further development is to be resolved.

Failure to address the current and future development constraints on the Port of Durban will effectively continue to promote excessive costs and will ultimately result in diversion of traffic from Durban to other ports such as Maputo and Beira.

6.4.3.3 Conclusions on Future Port Constraints

The port environment in South Africa is dominated by the company policies of Transnet National Ports Authority which currently exercises the landlord function at all ports on behalf of the national government. The TNPA is, as a commercial company necessarily bound to provide the returns required by shareholders and to exercise its duties, for the best advantage of the company. In many instances these constraints make it contradictory for TNPA staff to be objective in relation to the national public interest.

A further problem in the port environment is that TNPA also has an operating division, Transnet Port Terminals (TPT) which is the operator of most of the large terminals in all the ports. The conflict between the landlord function and the operational service provider is a further cause for concern and is generally regarded as one of the reasons for inefficiency and high costs in South African ports. These policy issues are at the root of a lot of the current indecision, planning confusion, lack of cohesive development, minimal private sector investment and isolation of planning processes from the greater logistics environment that provides the external support for port operations.

From an operational perspective, the monopoly position of TNPA is one of the major issues to be resolved in relieving future operational constraints in the South African port environment and for developing competitive logistics services, promoting South African shipping, training of maritime personnel.

The most pressing reason for changing the port structure relates to the need for widening the investment base to enable more effective development of the port environment, without the current supply limitations imposed by reliance on the fiscal authorities. There are many international terminal operators that would be very willing to develop South African port facilities and provide improved competitive services, probably at reduced cost.

Decisions have already been taken (and legislated); by government to change the role of TNPA and the structure of the Ports Authorities, but this has not been implemented and does not appear to be high on the current agenda.

6.4.4 Future Operational Capacity Constraints - Pipelines

The currently constrained pipeline environment, between Durban and the interior, should be alleviated by the new 10,000 kilolitre per annum pipeline which is being built between Durban and Coalbrook in the period 2009 to 2012. However, because the pipeline is severely overdue it is likely that when commissioned, it will alleviate the amount of bulk liquid transported by road and rail but will in a very short period become inadequate in supplying the demands of the interior provinces for additional imports.

This situation could be changed, if development of further refining capacity in South Africa proves to be impracticable due to the availability of cheaper refined fuels (mainly diesel from import sources).

The implications of building a state owned refinery in the Eastern Cape, with a possible pipeline to Gauteng, will also skew the viability of further pipelines developments from KZN ports. The proposed development appears however to be questionable due to the lack of any local hinterland, the distance from Gauteng, and the known impracticality of creating refining capacity in South Africa for the production of diesel, as the capacity will automatically result in over production of petrol, for which demand may not be available or may not materialise. The creation of additional capacity by a government owned company in a regulated industry will also create negative perceptions in the international petroleum industry.

The construction of a new pipeline from Maputo to Kendal, which is scheduled for completion by 2010, will possibly alleviate some of the problems that are currently being caused by delays to the construction of the Transnet pipeline from Durban. This situation is currently under investigation by the Department of Minerals and Energy, but that investigation appears to be fixated on a national government owned pipeline network.

In the longer term, the reduction of reliance on government funding for pipeline development should become a serious national objective as there are many interests in the petroleum industry that have sufficient investment capacity to alleviate the pipeline deficiencies of the country, and provide commercially viable services at costs considerably lower than those that are currently charged by Transnet pipelines.

6.4.5 Future Operational Capacity Constraints – Intermodal

The future constraints on intermodal transport in South Africa are generally the result of the current institutional framework and the monopoly situation of the railways. The development of truly intermodal competitive cargo services depends on the ability to negotiate open competitive procedures and the introduction of modern equipment.

Private sector operators are unlikely to invest in intermodal services as long as they are faced by a monopoly partner with the current powers accorded to the national rail transport operator. This limitation on private investment in intermodal transport means that the road and rail sectors will continue to operate in isolation, in competition, without any attempts at developing what could be effective intermodal services.

There is need for an urgent review of the rail line monopoly as this is a priority in relation to the total future logistics systems development in South Africa. Intermodal development will follow if an environment is created permitting the use of the rail line system by multiple competing logistics providers.

6.4.6 Future Operational Capacity Constraints – Air Cargo

It is assumed that current volumes of air cargo will decrease over the next 5 years and then recover as the global and national economy gradually overcome the effects of the global economic crisis.

The rising cost of fuel will have impacts on the viability of air transport for many freight commodities in the future.

The development of the new airport at La Mercy in KwaZulu Natal has been cited as a development with the potential to increase air cargo from the province. It must however be accepted that the volumes of air cargo that are likely to be generated in the foreseeable future, make it highly unlikely that long haul international freighter aircraft will operate from this point. There are no other indications of development of air cargo potential in the country, apart from the existing facilities at the major airports.

It can be anticipated that the development of the air cargo industry in South Africa will still continue to be largely based on ORTIA and that this will not change significantly over the review period unless future industrial development strategies are more conducive to international investment.

6.5 EVALUATION OF ALTERNATE OPERATIONAL STRATEGIES

Various studies over the past 10 years have noted that the South African freight transport and logistics systems are inefficient. The stated objectives of transport policy are the achievement of regulated competition in the freight markets.

The major issues that recur are;

- The need for competitive transport markets for services in all modes;
- The need for improved control of externalities;
- Funding models to achieve infrastructure sustainability in all modes;
- The need to improve efficiency of cross-border operations;
- Need for human development in the transport and logistics industries;
- Large scale investment to expand rail and intermodal services and
- Promotion of alternative fuel technology and systems

Expansion of the overall freight transport system to meet the demands for economic growth and employment will require very extensive capitalisation, technical, operational and managerial skills development (or importation) and the development of a competent regulatory system.

Government must focus the limited available resources on:

- Sustainable provision of infrastructure;
- Effective regulation of competition and externalities;

- Supporting operational capacity where market forces do not justify service. e.g. rural branch lines and
- Training and human development in all modes

It is absolutely critical that actions are taken to address the current limitations on the operational effectiveness of freight transport in all the modes before making further massive capital investments.

The major strategy options are discussed further in the following sections of this report.

6.5.1 Rail

Current railway operations make use of all available rolling stock, locomotives, staff and facilities to move current volumes, but do not fully utilise the rail track in all areas.

It is unrealistic to expect the single present railway company to develop and manage the complexity of an additional amount of 30-40 million tonnes p.a. of general cargo operations to and from all areas of the country. By contrast the road freight industry consists of hundreds of firms dedicated to providing similar services. Retaining and expanding the current rail freight operations will not serve the overall demand for freight transport in the future.

For further expansion of rail freight services it is essential to introduce a wide range of logistics service providers in all fields, as well as more train operating companies. There will be severe competition for personnel and a probable need for international recruiting of technical and managerial staff. This expansion will in turn place responsibility on the authorities to create a workable framework for full and free competition in the mode, as described in Section 6.8.

Transnet Freight Rail will almost certainly remain the biggest operating company and will have considerable scope for further expansion in the future, within the competitive environment.
In the consideration of various possible strategies to revitalise the railway system of South Africa in order to expand its role into general cargo transport from a primary focus on bulk minerals, there is need for extensive organisational change, skills development, promotion of competition and systems and equipment modernisation.

Various strategies have been suggested, including the following:

6.5.1.1 Restructuring and Reorganisation

Restructuring and reorganisation of the national parastatal rail transport company [Transnet Freight Rail (TFR)]. Over the last 15 to 20 years, various efforts have been made to restructure the national railway operator and it has gradually morphed from “South African Railways and Harbours (SAR&H)” to “SA Transport Services (SATS)” to the current

“Transnet” with the rail division having progressed from SAR&H via SATS to Spoornet to Transnet Freight Rail (TFR).

All of this restructuring history has failed to make any significant difference to the operational aspects of the railway company. The process has however enabled a transition from a monopoly service provider, supported by government subsidy with a strong social service motivation to the current Transnet which operates as a commercial company and has a mandate from government to be profitable and to finance its own operations and capital requirements.

In the course of this transition the extensive employee pension fund deficit which existed in the 1980s has gradually being reduced to the present situation where the corporation has managed to free itself from the burden imposed by the pension fund.

From the operational perspective the transition has not made significant apparent difference to the service provided to customers.

Suggestions have been made that TFR should be restructured to enable the railways to be freed from the balance of the Transnet transportation operations, but the problem is that TFR is probably not profitable with its present management structure, cost structure, deferred capital requirements and market share. The widespread deterioration of the assets including the rail system, branch lines, rolling stock and locomotives has resulted in a need for very large capital investments, merely to recover the operational capacity that has been lost over the last 15 years.

From an operational perspective the company is technically speaking in decline, with reducing tonnages of the major commodities and a decreasing capability in terms of the expansion potential in all but a few areas such as the iron ore line to Saldanha and a small amount of additional capacity that will be created from the R 80 billion replacement budget that is proposed to be spent over the next 5 to 10 years. The impact of that capital expenditure on the tariffs in the immediate future has yet to be disclosed.

6.5.1.2 Disaggregation of the Railway Sector

A proposed restructuring strategy, currently under consideration, is the disaggregation of the railway sector in South Africa with partial removal of specific aspects from the control of Transnet (or possibly not).

Current proposals involve the separation of track and fixed assets (including stations, sidings and other operational facilities) from the train operating division.

One proposal, which is described in some detail in the report included in the bibliography, suggests that this disaggregation could take place within Transnet. There appears to be very little point in attempting to do this as all of the current constraints and limitations would remain. There may however be merit in starting the process by “Ring-fencing” the infrastructure, locomotives and wagons as a first step to permit the calculation of the costs and revenues of the different sections of the organisation.

As noted in the report on a “New Institutional Structure” mentioned in the bibliography, the restructuring in this fashion will not necessarily achieve any improvement in operational efficiency or market competitiveness.

It may also be a practical alternative to permit TFR to retain ownership and operations of specific sectors such as the Coallink and Sishen-Saldanha lines and for it to compete on the other lines.

Total or partial disaggregation of the rail sector would imply the separation of operational authorities and responsibilities into:

- A track management company(including all physical facilities);
- Train operating companies;
- A railway economic regulator’
- A railway safety regulator and
- A capacity allocating authority

Some of these entities have already been established, and their mandate could be aligned very simply to whatever structure is developed.

6.5.1.3 Disaggregation and Commercialisation

A further potential strategy to revitalise the railway sector would be to effect the disaggregation described in the previous strategy option, with the difference that the various entities would be established, as separate competitive commercial entities operating within a controlled network and a regulatory structure that provided for competition between <u>train operating companies</u> under the control of the <u>economic regulator</u> and the <u>safety regulator</u>.

In such a structure there is a need for a <u>capacity allocator</u> with a mandate to ensure that all potential train operators operate according to safety standards and within the capacity of the network facilities offered by the track management company. The capacity allocator would then motivate further track developments where market demands appeared to require services and train companies were prepared to provide them.

In such a structure, the railway operations of the country might well be disaggregated into several smaller train operating companies offering services to general cargo, and one or two large companies (one of which would be Transnet Freight Rail) that offer extensive bulk haulage services and will probably dominate some track sections.

The disaggregation process would provide incentives for private sector investments in railway rolling stock and facilities, and would certainly create sufficient interest for current logistics, and train user companies to evaluate the potential for running their own train operations on the national track network.

The deregulation of train operations could also be expected to provide a basis for development of intermodal services by specialist logistics companies.

6.5.1.4 Strategic Evaluations

All of the above options, need extensive, quantified, independent, professional analysis and evaluation, in order to decide on the future direction of the rail sector in South Africa, but it is important that these decisions are seen to be urgent, in order to halt the current decline in the efficiency of the railway system and the continued switch from railway to road haulage, for cargo that really should be retained on rail, in the national interest.

A basic problem with current debates about railway capacity is failure to recognise the unrealistic premise that one highly centralised, parastatal company can be expected to meet the current demand for 40-50 million tonnes of general freight all over the country (and possibly growing to 100 million tonnes in the period under review). By comparison the road freight industry is composed of thousands of competing firms that perform millions of transactions each day, interacting with customers and making rapid commercial decisions at the market interface with every transaction.

In particular, it is clear that although there is in many areas, sufficient theoretical railway capability to move specific volumes of different commodities, in practice the performance is such that industrial users have largely chosen to abandon railway service in favour of road haulage

Creation of an effective competitive dynamic and customer orientated railway system would promote private sector investment, industrial development and create opportunities for expansion and employment and would improve the country's import and export competitiveness whilst reducing logistics costs and creating an environment where skills development, training and managerial development in the rail sector could be provided and promoted.

The operational perspective on the need for revision of the structure and mandate of the Department of Transport and the institutional changes that are needed is described in more detail in Section 6.8.

6.5.2 Road Freight

The road freight sector in South Africa is the major private sector contributor to freight operations with a large number of operators using the road system of the country, operating within a framework that has been allowed to evolve in the period since the 1980s when road transport was deregulated.

The historic development of road transport is described in some detail in Phase 1 and Phase 2 of Natmap so that repetition is not required.

The constraints on achievement of improved road freight operations in the future involve the following issues and necessary strategic actions.

6.5.2.1 Road Transport Quality System – Operator Dimension

There is universal agreement that the quality control of road freight transport operations must be improved to limit the rising externalities and to achieve “quality regulated competition”

The fundamental deficiency in the regulatory structure of the RTQS is the failure to create a registry of competent, licensed road freight operators in which the identities, locations, facilities, staffing and vehicles are recorded so that they can be controlled by the authorities.

The permission to perform road freight operations should be contingent on proof of competence (and employment of a competent person who holds a certificate recognised by the authorities), financial capability, suitable operating premises, a maintenance and management regime that offers hope of quality control, and a demonstration that the organisation has a specific management structure, purpose and registered intentions described in an operational plan that is acceptable to the registration authorities.
In addition to the above, registered operators would be required to submit brief monthly reports detailing drivers, competent persons, vehicles operated, any changes of address, and a statistical report that provides non commercial information about operations. The system should be developed to permit minimal cost electronic reporting.

As a first step in establishing operator quality, the Operator Registration System is essential to obviate the current devious practices which make enforcement almost impossible in this sector.

It must be recognised that inclusion of an “operator dimension” with the NATIS system is an inadequate method of ensuring a dynamic regulated environment for the road freight mode. The system must have records of all competent persons, drivers with PrDP, companies registered as road freight operators [and their management and other details], maintenance records, as well as records of inspections and accidents etc.

As it is essential that movements of any of the registered persons between operators is recorded continuously to ensure compliance and allocation of responsibilities. A separate Road Freight Operator Registration System is required, to be managed by a division of the Department of Transport, as described in detail in Section 6.8.

6.5.2.2 Road Freight Quality System – Operational Dimension

The (RTQS) includes vehicle quality, using a complex system of testing station accreditation, registration and control, road side inspections of vehicle condition, control of overloading via an effective weighbridge network, driver quality control via a professional driver permit (PrDP) and driver licensing and subsidiary legislation regarding road traffic operations, transport of dangerous goods, transport of abnormal loads, all of which are in compliance with the National Road Traffic Act.

The elements of the RTQS are defined and covered in the National Road Traffic Act, but the enforcement institutional structures, staff technical capabilities, funding and control and management of the system results in unsatisfactory quality control.

As demonstrated by localised development of the Road Transport Management System (RTMS) system in some industries, identification of operators and staff, adequate weighing equipment, monitoring of performance and reporting of variances results in greatly improved compliance levels and enhances the quality of operations.

The demonstration of the effectiveness of these principles should provide motivation for their application to an overall Freight Transport Operator Registration and Management System, initially for Road Freight Operations but ultimately for all modes to give the Department of Transport an overarching regulatory and information system covering all aspects of freight transport.

6.5.2.3 Road User Cost Recovery

One of the major issues in relation to the road freight transport sector is the issue of payment for the road infrastructure used, relative to the cost incurred by the railways in provision of infrastructure for their rail freight transport operations.

A continued debate about the proportions of cost recovery from road freight operators (and by implications their customers), has not been satisfactorily resolved with a result that the competition between road and rail is perceived to be skewed in favour of road.

The issue of usage of road infrastructure by road freight transport is however highly complex due to the fact that road freight has become such an integral part of the national production capacity that any significant changes in road user recovery from freight vehicles, will have severe inflationary effects and for some industries, may prove to be fatal.

There is need for a professional investigation into all the costs, both direct and indirect arising from the road freight sector. This should include the cost of operations, and the analysis of all externality costs and the costs of providing infrastructure. The resulting cost matrix should then be weighed against the current recovery of taxation from the road transport operators and their customers. It is essential to include the issue of taxation received from industries due to the fact that transport is an integral part of the industrial cost structure; the transport operator is one single element in the industrial logistics environment, and any taxes and levies applied to operators are immediately transferred to their customers (or owners).

Resolution of this issue is critically important to provide for sustainability of the road freight sector as there is already a backlog of deferred maintenance of road infrastructure of very serious proportions that will become a major constraint on the efficiency of this sector if no action is taken to stop the deterioration.

Very rough calculation of the implications of charging the under-funding of infrastructure to road freight users indicates that about R 22 billion p.a. will need to be raised and that this could increase road freight costs by 15-20%. In the absence of alternative means of transport this will have serious implications for industrial logistics costs.

6.5.2.4 Road Freight Energy Consumption

The road freight industry in South Africa (and Southern Africa), is virtually 100% dependent on the availability of diesel fuel and uses about 80% of total diesel consumed. Current projections are that South Africa could in fact be short of diesel as early as 2010 and that due to refinery operating limitations and costs it will not be commercially viable to create refining capacity for more diesel in South Africa, as the fuel can be imported more economically than local manufacture.

The implications for the road freight sector are very serious, as a shortage of diesel in inland areas would cripple the country's transportation system, as currently constituted, and the absence of capacity in the electrified sections of the railway means that there is no alternative transportation option.

This threat to the freight transport system of the country is aggravated by the current problems with electricity supply and costs and will need to be thoroughly researched to develop contingency plans.

Possible options include;

- A deliberate increase in production of diesel from coal;
- Development of biofuel from industrial waste and agricultural residues'
- Electrified rail freight transport and
- Promoting research into alternate fuels for vehicles

6.5.2.5 Institutional Capacity to Enforce Road Freight Quality

One of the major strategic requirements for effective management of the road freight sector for the future, will the restructuring of the enforcement and control processes intended to ensure road freight transport operator quality.

Current institutional structures are dependent on the enforcement capabilities of 9 provinces, leaving extensive deficiencies in their ability to provide infrastructure, staffing, management, control systems, integrated information systems, and to coordinate the efforts of enforcement and quality control into a cohesive national framework.

The use of properly contracted PPP weighbridge and systems management providers could alleviate the current shortage of trained traffic officers and provide more economical ways of achieving effective control of overloading, speeding, vehicle inspections and other quality standards.

Without extensive institutional reorganisation and equipment of the authorities at various levels, charged with this task, it is unlikely that South Africa will be able to develop the effective control of quality in road freight transport that is frequently proposed and desperately needed to control the anticipated levels of increase in the freight vehicle fleet.

There is need for a separately managed information system for road freight operators as the NATIS system is not designed to permit recording of company details and to permit continual updates of information about movements of competent persons, company structures PrDP holders and transfers of vehicles between entities.

While there is clearly an appreciation of the need for planning these processes, as recently proposed in requests for tenders by the Department of Transport it is essential that the Department of Transport is restructured to provide the necessary regulatory competencies and capabilities. The restructuring should provide competent responsibility for policy formation, system development, management of the quality control system and coordination of provincial level enforcement programmes. These issues are discussed in Section 6.8.

6.5.2.6 Vehicle and Load Dimensions

There is an ongoing policy debate both in South Africa and in the SADC about the need to change vehicle dimensions and in particular to reduce axle loads to reduce road usage and costs. The de facto situation is that long haul vehicles in current usage with 7 axles are effectively already operating at 8000 LAM (7 axles x 8 tonnes = 56 tonnes). From analysis of 188,000 vehicles weighed in KZN it can be demonstrated that nearly all longer vehicle combinations are not benefitting from the increase in legal axle mass load to 9000 kgs and that reducing the LAM will have little effect on road usage by longer combination vehicles (LCVs).

In another development, there is currently, an experimental development programme in KZN, being monitored by CSIR and RTMS structures, to permit operation of Longer Combination Vehicles (LCVs) that meet Performance Based Standards (PBS) with train length of 27 metres and carrying capacity of 48-50 tonnes. This development expanded to national fleet proportions will have serious impact on road freight competitiveness and would certainly attract further traffic from railways.

Another unresolved policy issue is that current movements of High Cube containers (estimated at 500,000 p.a.) on roads all over South Africa is technically illegal without abnormal load permits as they have height of approximately 4.6 metres when loaded on “conventional” semi trailers. As the HC container has become the standard dimension for 12 metre ISO boxes and they are causing no problems, the transport of the containers without permits is currently being ignored by authorities, but their illegality has potential insurance implications for transporters and the regulatory issue must be resolved.

6.5.3 Ports

In the ports sector of the freight transport system of South Africa, there is also a need to re-evaluate the role of the national ports administrator Transnet National Ports Authority (TNPA) as has already been deliberated (and legislated), but not yet implemented.
The current situation with TNPA as landlord, port authority and controller of tariffs, terminal operator and planner of the National Ports System leads to exclusivity of the planning process, with failure to integrate with various external infrastructure providing authorities, the private sector logistics industries, and the international shipping community.

The concept of promoting integration of the port operations with an ineffective railway system have tended to skew the supply of port services towards the terminals operated within the Transnet stable..

A current restraint on development of fully competitive port operations is the limitation imposed by dependence on government sanctioned funding of port developments in an environment of decreasing fiscal capacity. The limitation of available funds is likely to delay critically needed further development unless provision is made for private sector investment in port functions and facilities.

Strategic options include the disaggregation of the port operating entities as described below.

6.5.3.1 Disaggregation of the National Ports Authority

There is considerable potential for improving the coordinative functions of the port authorities, if these are disaggregated. Individual port authorities should operate as statutory bodies with a mandate to ensure efficiency, competitiveness and a consumer orientation that includes both the maritime sector and the land based logistics industries.

The landlord function should include the provision of a statutory board for each port that is representative of the host municipality, the host province, the industrial users of the port, the logistics industry, any parastatals with interest in the port, terminal operators and the government.

The statutory board should be created with terms of reference and a mandate to operate an efficient port, for each port in the country, with the Department of Transport to provide an economic regulator and safety regulatory function, independent of the port authority. This would permit investment and the commercialisation of port terminal operations to promote competition and efficiency in port operations.

The current basis for retaining the status quo appears to be dependent on the assumption that the parastatal company must retain its ability to generate capital. This proposition implies exclusion of private sector capital investment which has negative implications for extension, modernisation and improvement of port operating procedures.

6.5.3.2 Port Terminal Operations

The strategic disaggregation of port terminal operations into commercialised entities with a mandate to compete and make profit, will revitalise many of the functions in the ports and will encourage private sector investment in modernisation programmes and the introduction of best practises.

6.5.3.3 Coastal Shipping

South Africa currently makes limited use of coastal shipping except for transport of fuels. Past attempts at developing coastal services have foundered on the costs of port berthing and handling charges and the delays caused by prioritisation of deep sea vessels. As part of the restructuring of the port administration, the development of coastal shipping should be a priority as a first step to creating a maritime capacity in South Africa.

6.5.4 Pipelines

The pipeline sector in South Africa is dominated by Transnet Pipelines, who have the monopoly on operation of pipelines, for petroleum products. This monopoly has allowed them to charge up to three times as much as similar commercial operations in other countries, and provides some of the revenue required to subside operational inefficiencies in other modes. The regulation of pipeline charges by the National Energy Regulator (NERSA) has limited some proposed increases in recent times, but this has had the immediate effect of stalling development of pipeline capacity, which is already severely restricted due to investment delays.

The state monopoly on transport of bulk liquid fuels is partly responsible for some of the distortions that are currently occurring (use of road and rail transport) and is likely to give rise to considerable shortages whilst budgetary restraints limit the capacity of the parastatal pipeline operator to increase capacity.

New pipeline development from Maputo to Kendal may assist in making up some of the deficiency in the supply of fuels in the interior in the short term but it is essential that the pipeline sector is deregulated within the planning period defined for this project, if significant distortion of modal usage for liquid fuel transport is to be avoided. The state monopoly on pipelines has resulted in a lack of investment by the private sector in pipeline and bulk liquid transport installations, to the detriment of the country. There are many international companies that will invest in pipeline and supporting infrastructure if this is permitted

6.5.5 Intermodal

The Intermodal systems in South Africa are confined to the transport of maritime ISO containers between ports and inland terminals. The rail transport is offered by the monopoly rail operator and the inland terminals and the ports are all managed by Transnet.

Failure to expand the inland facilities, has led to severe congestion in the City Deep area of Gauteng and there is an urgent need for revision of the strategy for handling containers for road and rail in the City Deep area which will probably require relocation of rail terminals, and redesign or development of suitable road terminal structures.

The fact that the terminal operation is owned by Transnet means that future planning tends to focus on rail only, and the alleviation of congestion in the road network around both ports and the inland terminals is external to the planning process of the terminal operations and is currently in a state of disarray.

The fact that all rail transport is provided by one monopoly operator means that there is no private sector investment in intermodal transport, no introduction of the modern intermodal transportation systems that have been effectively developed in various parts of the world and no plans to provide coordinated intermodal services, within the current planning framework.

To encourage the development of intermodal transport, it is necessary to revise the institutional structures and to permit private sector investment and involvement in road and rail intermodal systems and operations.

6.5.6 Air Cargo

There are limited strategic options for changing the air cargo environment in South Africa, as most international air cargo is moved to and from OR Tambo Airport in Johannesburg and the economics of low volume air cargo movement from other centres to ORTIA does not offer potential for development by any air carrier.
The present situation where the short haul domestic airfreight for international transport is hauled by road is likely to persist until sufficient volumes are developed in regional centres to justify domestic air cargo services with designated freighter aircraft. All current domestic air cargo services are operated by using belly hold capacity in passenger aircraft, where they take second priority to passenger baggage and are therefore limited and unreliable.

6.6 EVALUATION OF CURRENT FREIGHT PLANNING

6.6.1 Rail Freight

From all of the information, obtained in this project, it appears that the planning process for the rail sector (as performed in total by Transnet) does not take into account a range of practical considerations, and the current status and capability of the rail operating company.

The planning framework as described appears to assume that freight volumes will increase due to increased investment in locomotives, rolling stock and upgrading of certain lines. From the market perspective, most of the capital expenditure will be required to partially regain the capacity that has been lost over the past ten years, with no specific indications of where increasing capability will be generated.

As discussed in earlier sections of this report, the amount of capital required to create increased capacity, suggests that current capital planning may improve services in some areas, without offering much expansion capacity. There is however the concomitant cautionary possibility that the tariff increases necessary to finance the capital investments will make rail transport even less attractive.

Expansion of Services

From a national perspective, there is a need to develop very extensive rail services for approximately 40-50 million tonnes of long haul, high value general freight to and from all areas of the country, over the next 10 years. Rail movements in this market have reduced steadily for 20 years for the reasons described in this report and it is unlikely that one company can reverse this trend. It is also very doubtful whether the government will be able to provide the necessary funding in the medium term to recover the present need for upgrading and replacement of equipment.

Branch Lines

There is also urgent need for a total review of the government's policy in relation to secondary and branch line services and the development of railway in rural areas.

For as long as the decisions on the future of secondary and branch lines are left to Transnet Freight Rail to be made on purely commercial considerations, there is a grave danger that the branch lines system will be allowed to totally disintegrate, and deteriorate to the point of no return as has happened in several areas already.

For successful operation of branch lines, there is a need for the introduction of private sector competitiveness, severe reduction of overheads, realistic pay scales and the development of competent, competitive, management structures. The success of present plans to permit private sector operations of branch lines will be largely dependent on the economic regulation of the relations between branch line companies and TFR and will very likely require some government support or subsidy to cover the costs of infrastructure

Changes in technology, equipment and in particular the development of a regulated interface between branch lines operators and mainline operators would be critical to any future development of interline cooperation.

These issues are discussed further in Section 6.8.

6.6.2 Road Freight

The current planning for road capacity expansion appears to centre mainly on:

- Redevelopment of a section on the N3 from Warden to Keeversfontein to avoid the use of the Van Reenen's Pass;
- A future potential diversion from Ashburton to Cedara to avoid the congested section around Pietermaritzburg and the dangerous sector on Town Hill;

- Redevelopment of freeway sectors around the Johannesburg and Pretoria complex (R21 development) and potential widening of the N1 in the Midrand to Lynnwood sections. Further large scale freeway development in Gauteng;
- Creation of a bypass freeway to avoid congestion around George and Knysna and
- The much contested possible development of a national route along the coast between Port Edward and East London via Umtata, to provide for a direct, safer corridor.

The provision of the additional capacity noted above, will not make significant differences in the overall capability of the road freight sector, but will reduce some externalities (accidents and conflicts) and will reduce congestion in major urban areas such as Gauteng.

Current freight planning processes for road freight transport that is not being addressed:

1) The road access to the South Industrial Basin and ports areas of Durban;
2) The road freight access to the Port of Cape Town via N1 and N2, to relieve the severe congestion at this point;
3) The redevelopment of the City Deep-Kaserne area in Johannesburg, to provide for future road and rail logistics capability for inland container movements;
4) Provision of adequate through route capacity to avoid the severe congestion in the east Johannesburg area (Gillooly's to Kempton Park) by means of a bypass route leaving the N3 in the vicinity of Wadeville via the R21, through to the N1 beyond the Pretoria conurbation;
5) The issue of toll road avoidance by means of provincial road usage and the consequent damage to provincial roads and selective use of sections of the toll routes;
6) Weighbridge infrastructure and standardised and integrated overload enforcement facilities and system;
7) Provision of the road freight sector operational management systems to achieve effective enforcement and operator quality control;
8) Improvement of cross-border systems and facilities to reduce delays in cross-border freight transport movements to neighbouring countries and
9) Development of contingency plans, to resolve the issue of peak oil and possible future fuel shortage.

6.6.3 Ports

Problems with the current planning regime in ports were described in the previous section of this report. The planning by the Transnet National Port Authority, in isolation from many other authorities and stakeholders in the ports and maritime environment, means that the current stop-start decision making process, leaves various other stakeholders, incapable of making decisions, unwilling to invest and generally promotes inefficiency.

Failure to integrate the port planning process with the surrounding transportation systems, has led to severe congestion, inefficiency and excess costs around the ports of Durban and Cape Town and is causing sever distortion of modal usage to Richards Bay and Durban.

Failure to provide for development of a maritime industry and merchant marine in South Africa is also attributable to the fact that the national maritime planning has been largely left to Transnet National Ports Authority, with the National Department of Transport being virtually divorced from the maritime sector.

Institutional reform and reallocation of responsibilities is necessary in this sector in order to promote the stated objectives of the government.

6.6.4 Pipelines

Current pipeline planning in South Africa is largely dependent on the pipeline division of Transnet, in collaboration with the Department of Minerals and Energy. The creation of an Energy and Pipeline Systems (E&PS Project) by the Department of Public Enterprises in collaboration with minerals and energy serves to indicate that there is a continued perception that pipeline transport will continue to be prerogative of government enterprises and that no private sector investment or involvement is envisaged in the future.

This situation has led to the delayed development of pipeline capacity, modal distortion of the liquid fuel transport systems, increased costs and is currently causing severe problems for the petroleum industry in that the indecision around the provision of capital for the development of the Durban to Gauteng pipeline, is hampering the ability of the petroleum industry to meet the requirements.

The development of the pipeline from Mozambique to Kendal which is supposed to come on line in 2010 will partially alleviate this, but the planning of future pipeline developments is currently still officially to be done by parastatals organisations in spite of the likely lack of available budget from the fiscus.

This situation needs urgent evaluation and a pragmatic assessment of whether current monopoly structures are the most efficient way to provide pipeline services for South Africa.

6.6.5 Intermodal Freight

There is no currently coordinated planning for development of intermodal capability for land transport, apart from the provision of some railway rolling stock and the continued expansion of the road freight fleet capacity.

There are as far as is currently known, no significant integrated plans to develop capacity at the ports or the inland terminals to make any significant changes to Intermodal capability, apart from planning by Transnet (Transnet Freight Rail) and Transnet National Port Authority) to provide for greatly enlarged container terminals. This planning appears to be based on an assumption that container customers can be forced to use the services, and not on current market perceptions.

The development of the much needed container terminal capacity in Gauteng will require coordination between road, rail and shipping industries in order to develop a truly intermodal system that meets the requirements of customers of all modes.

The proposed development of massive inland terminal capacity for maritime ISO containers, appears to disregard the current market situation, the economic potential for attracting large volumes of containers, does not appear to be based on sound projections of likely container movement by rail, as compared to road freight, and is in need of extensive evaluation, prior to commitment to development proposals that appear to be at variance with the perceptions with the markets.

6.6.6 Air Cargo

Current air cargo planning includes:

ORTIA
Expansion of the facilities at ORTIA, to meet the perceived and stated needs of the air cargo forwarding fraternity based at the airport.

Space limitations will become a problem within the planning framework time period, and it will be necessary to incorporate future development of air cargo capacity at ORTIA with the proposed redesign and redevelopment of the passenger sectors of the airport, if it becomes viable to implement some of the more extensive plans that have been proposed.

Durban International Airport
The new Durban International Airport (King Shaka) at La Mercy incorporates a conceptual air cargo capacity that will no doubt be adequate for the entire planning period, as the base tonnage from the existing Durban Airport is less than 8,000 tonnes per annum which hardly offers potential for dedicated freighter cargo movements in the foreseeable future.

The proposed development of a Dube "Trade Port" has been cited as a catalyst for development of air cargo demand from the 6.7 National Freight Transport Strategic Imperatives

Cape Town International
It is anticipated that the tonnage of freight from Cape Town International Airport will continue to increase slowly and the current planning for expansion of the air cargo facilities, by gradual incremental growth will no doubt be capable of handling the expansion that can anticipated within the planning framework time period.

6.7 National Freight Transport Strategic Imperatives

The Natmap project has followed the process defined in the Terms of Reference, providing information on the transport systems of South Africa, as the basis for policy development, infrastructure planning, and the integration of transportation into the national planning framework.

The freight transport working group, has examined all aspects of the freight transport system, in all modes, and reported, in Phase 1 on the overall transportation system; in Phase 2 on the current volumes and operations, and Phase 3 on the present and future capacity of the freight transport modes.

In the course of this research and reporting, a number of strategic issues have been identified, and for the purpose of providing a framework for Phase 4 of the project, these are condensed and described in this section.

The major national strategic imperatives in each mode are described below.

6.7.1 National Freight Transport Policy

a) Create a National Transport Commission with executive level and academic expertise in freight transport to advise the Minister and broaden the decision making and policy formulation process for freight transport to include the logistics providers and industrial users.(Section 6.8);
b) Reassign the responsibility for freight transport policy in all modes to the Department of Transport and restructure the Department by functional responsibilities. (Section 6.8);
c) Redefine the role of government in the provision of freight transport, limit to ;
   - Provision of infrastructure;
   - Provision of effective “quality” [safety, economic and environmental] regulation and
   - Coordination of international developments
d) Critically analyse the role of Department of Transport as the regulatory authority:
   - redefine structures and responsibilities;
   - establish functional departments capable of being the regulatory authorities needed to manage freight transport ;
   - evaluate current staff, dissolve departments not required for functional management, retrain staff where suitable and
   - define the roles of various levels of government for each mode ; [engage provinces and agencies and provide support and funding for effective quality control] and
e) Commission a professional evaluation of current skills deficiencies in all modes and develop a national framework of privately managed training institutions with appropriate subsidised budget and strategy to attract students.

6.7.2 Rail

a) Locate the ownership of government railway infrastructure assets within Department of Transport ;
b) Redefine the institutional responsibility for policy formulation in rail transport to place under the Minister of Transport;

c) Define a disaggregated institutional framework within which competitive railway services can be developed (Section 6.8);
d) Introduce policies to permit widening of the investment base in rail freight operations (Section 6.8);
e) Develop national training capacity for development of operational, technical and managerial skills in rail freight sector;
f) Provide research capacity to inform national policy decisions on railway development;
g) Commission unbiased economic and operational evaluation of the potential for changing rail gauge and implications of resulting technical barrier to network linkages;
h) Commission economic research into the creation of a legislative framework for sustainable intermodal rail freight systems;
i) Commission technical and economic evaluation of the role of electrified railways in relation to possible future restrictions on hydro carbon liquid fuels and
j) Commission urgent investigation of strategies to maximise the potential for use of branch lines in rural areas.

6.7.3 Road

a) Commission research to establish the necessary conditions for creating a sustainable road freight infrastructure funding system;
b) Develop effective methods for road user cost recovery, including re-evaluation of toll roads strategies and practicable nation-wide alternatives;
c) Create structures and institutional changes to achieve effective operator regulation.(Section 6.8);
d) Commission research into the creation of operator competence and development of skills in the road freight sector;
e) Commission research into the logistics systems surrounding the major ports and the need for infrastructure planning;
f) Evaluate the potential for developing effective provincial management of road freight operations quality;
g) Commission research into the implications of reducing availability of fuel for road freight applications and
h) Complete the analysis of cross-border road freight operations and plan for large scale upgrade of facilities and systems at key border posts.

6.7.4 Ports

a) Re-evaluate role of Ports Authorities and define appropriate institutional structure to promote private sector investment;
b) Establish port authorities with broadened mandate to improve competitiveness;
c) Commission national port planning framework and
d) Commission research into optimising the logistics framework at each major port

6.7.5 Pipelines

a) Commission an independent integrated study of pipeline and storage facilities including all stakeholders and
b) Evaluate potential for attracting international investment

6.7.6 Intermodal

a) Research international systems development and evaluate the potential for attracting investment and involvement in provision of services

6.7.7 Air Cargo

a) Research the potential future industrial development that will give rise to demand for air cargo services

KwaZulu Natal coastal areas, but the mechanics of this process are currently largely unexplained, and do not appear to have any significant commercial support at this point in time.

Cape Town International
It is anticipated that the tonnage of freight from Cape Town International Airport will continue to increase slowly and the current planning for expansion of the air cargo facilities, by gradual incremental growth will no doubt be capable of handling the expansion that can anticipated within the planning framework time period.

6.8 Regulatory and Institutional Reform of Freight Transport Operations in South Africa

6.8.1 Current Issues in Freight Transportation

6.8.1.1 Introduction

The National Freight Logistics Strategy (Nfls), Commissioned By The Department Of Transport In 2004, Described The Situation In Freight Transport And Identified Major Problem Areas To Be Addressed.
The NFLS Identified The Major Functions Of The Public Sector With Regard To Freight Transport As:

- Effective Regulation To Ensure Economic Efficiency;
- Ownership And Provision Of Common User Infrastructure;
- Promotion Of Integration Of Transport Modes;
- Monitoring And Regulation Of Appropriate Safety Standards In All Modes amd
- Facilitation Of International Trade

For The Private Sector, the major functions identified, were;

- Provision Of Superstructure And Operational Equipment;

- Provision Of Operational Management Within An Appropriate Regulated Competitive Environment (Free From Unnecessary Sector Crowd-Out);
- Creation Of Efficient Logistics Integration To Foster Economic Growth And Development and
- Investment In Infrastructure

The NATMAP Project In 2008 Clearly Identifies That Several Of These Objectives Have Not Been Actively Promoted And In Fact The Situation Is Relatively Unchanged From The Time Of The NFLS Report. In Particular The Recommended Creation Of An Environment Of Effective Regulated Competition Has Not Been Pursued.

In Order To Lay A Foundation For The Effective Development Of The NATMAP Vision For Freight Transport In The Future, It Is Essential To Address The Current Constraints And Restrictions On Efficiency And Competitiveness Of All The Modes.

6.8.1.2 Need for Regulated Competition

Effective regulation is applied in all modes, worldwide, in order to ensure that competition between transport operators does not lead to excessive creation of externalities such as unsafe operation, excessive pollution, damage to infrastructure, and unethical operating practises.

The objective of effective regulation is to create an environment where operating companies (in all modes) are required to observe the defined regulation whilst achieving optimum efficiency and profitability for their business. For the authorities, the objectives are to establish a regulatory framework and structures which enable the monitoring and control of the standards defined, with the minimum administrative effort and interference by the regulator.

In South Africa there is currently a dualistic situation where some modes are effectively regulated (air carriers), others are ineffectively regulated (road transport) and others are self regulated monopolies (rail, pipelines and ports).

The principles and motivation for achieving effective regulation are discussed in the literature referenced in the bibliography.

There is a need for creation of conditions of competition within the modes that have present monopoly status, in the interests of improving performance, national asset utilisation and attraction of investment and competitive operations.

There is urgent need for revision of the road transport operator registration and licencing system in order to improve effectiveness of control of externalities such as accidents, pollution, overloading, and failure to maintain the standards of drivers, vehicles and operating practises.

Recommendations for changes to the structure of the regulatory system are described in detail in Chapter 6 of this report.

6.8.1.3 Self Regulated Monopolies

Transport policy in South Africa has created parastatal monopoly companies, wholly owned by government, with monopoly rights to manage all aspects of transportation in rail, ports, pipelines [and previously air transport].

This monopoly situation has had several negative effects on the South African economy over the years, due to:

- Inadequate capital investment in rail infrastructure, rolling stock, ports equipment and infrastructure, and delayed investment in pipeline capacity;
- The exclusion of private sector competition, which has resulted in inefficiency, withdrawal of services, increased costs and failure to meet industrial market demand for freight transport;
- The inadequate supply of rail service has led to the excessive growth of long haul road transport, for many commodities which were formerly rail cargo. This has caused high levels of road usage and premature deterioration, aggravated by unavailability of funds for maintenance;
- The unavailability of rail service has also prevented the development of mining projects that cannot afford road transport rates;
- The parastatal company's mandate to achieve profitability has resulted in selective provision of services, restricted to the sectors that are regarded as profitable;
- The monopoly situation has resulted in lack of development, training, capacity building and the absence of a pool of trained and qualified personnel for the modes operated by the parastatal transport companies, thereby aggravating inefficiencies;
- The rates and tariffs charged for transport are higher than typical tariffs in a competitive environment and the monopoly rates are a major factor in South Africa's excessive logistics costs;
- The monopoly's selective provision of services has forced cargo owners to use road transport, in spite of the 30-40% higher costs of road compared to rail and
- The general decline of equipment and infrastructure condition is giving rise to safety concerns

From the analysis done in Phase 2 of NATMAP, it is clear that there is very urgent need for restructuring of the South African transportation system to achieve efficient freight transport for the future economic development of the country.

The problem has been identified in successive national policy studies over the past 30 years, but there has been continual inertia and rationalisation of the role of the government in transport service provision. It is critically important that NATMAP addresses the institutional issues before making recommendations on infrastructure requirements as these will be seriously affected by the institutional changes that are recommended in this study.

6.8.1.4 Redefining the Role and Structure of the Department of Transport

In order to achieve effective restructuring and management in an environment that will promote regulated competition in all modes, it is absolutely essential to redefine the role and structure of the Department of Transport.

It is essential that the department is empowered to take control of and manage policy formation with regard to all modes of transport. In addition, the department must be restructured so as to provide for organisational capabilities to manage the regulatory functions that are required in each mode.

The reorganisation will necessarily revise the roles and responsibilities of a large proportion of the current staffing and may lead to extensive need for revision of job descriptions and recruitment of specialist capabilities in the areas of modal regulation and effective performance based management of the administrative processes that will be essential for success of the department’s activities.

The necessary steps to achieve effective restructuring in line with the proposed redirection to achieve dynamic revitalisation and control of transport in all modes, is described in the following section.

6.8.1.5 National Framework for Regulated Competition

6.8.1.5.1 The Process

In order to establish an orderly and cohesive national framework within which the policies of regulated competition can take place in all modes it will be necessary to implement the following steps;

a) **Seek a Cabinet decision that the Ministry of Transport will transform transport policy**
The political will to change the existing structures is an essential element of any policy implementation;
b) **Establish high level National Transport Commission to advise Minister on Policy**
To guide the policy of regulated competition there will be the need for a panel of senior businessmen from user industries, academics and regulators to provide balanced advice to the Minister regarding policy issues;
c) **Restructure DoT**
The DoT will need to undergo extensive restructuring to cover the revised responsibilities, but it must be recognised that many of the departments and agencies in this plan are already in existence;
d) **Reduce state monopoly in transport provision.**
The restructuring will necessarily involve the reorganisation of current management of state owned infrastructure to create or ratify the status of independent statutory corporations for rail, ports, road, airports and pipelines;
e) **Develop strategies to encourage investment in transportation.**
Policy must be structured to promote investment by private sector in the operation of services in all modes. Passenger airline growth is currently a good example of the effectiveness of competition,
f) **Introduce specific transformation programmes in each mode.**
Plans must be made for each mode to ensure orderly transition and continual development of the services to match demand and
g) **Establish modal restructuring.**

6.8.1.5.2 Railways

a) Establish a track management company as a statutory body, to own the defined state assets and manage mandatory Open Access for rail operations;
b) Establish a train operator register and procedures for train operating companies to be registered and receive operating licenses;
c) Register TFR as a train operating company and specify assets and operational scope;
d) Establish track-access charging regime and control by the Economic Regulator and
e) Establish role, scope and authority of Rail Safety Regulator within new system.

Road Freight

a) Redefine role of Road Traffic Management Corporation in relation to freight and passenger transport ;
b) Redefine role of SANRAL, Provincial and Municipal road management organisations;
c) Introduce Road Transport Operator registration and licensing system;
d) Define role of Provinces and other regulatory agencies and
e) Establish Road Safety Regulator – [may be incorporated in RTMC.]

Ports

a) Establish separate Port Authority for each port as independent statutory bodies;
b) Disaggregate management of ports;
c) Commercialise terminals and operations;
d) Encourage investment in port facilities and operations and
e) Redefine role of SAMSA in revised Safety Regulatory structure.

Pipelines

a) Establish an independent pipeline management corporation;
b) Register pipeline operating companies;
c) Appoint Pipeline Safety Regulator and define authority and
d) Encourage further investment in pipelines.

6.8.1.5.3 Air Freight

a) Redefine the role of Civil Aviation Authority in relation to the revised DoT regulatory structure;
b) Redefine role of ACSA in relation to new DoT structure. Redefine structure for management of airports, and encourage further investment in airport and air freight facilities and
c) Re-examine registration of operators in relation to the need for more open regulatory framework

6.8.1.6 The National Institutional Structure

The regulatory agencies (many of which already exist) within, or nominated by the Department of Transport, will be:

a) **National Transport Commission;**

b) **Safety regulators** – all modes

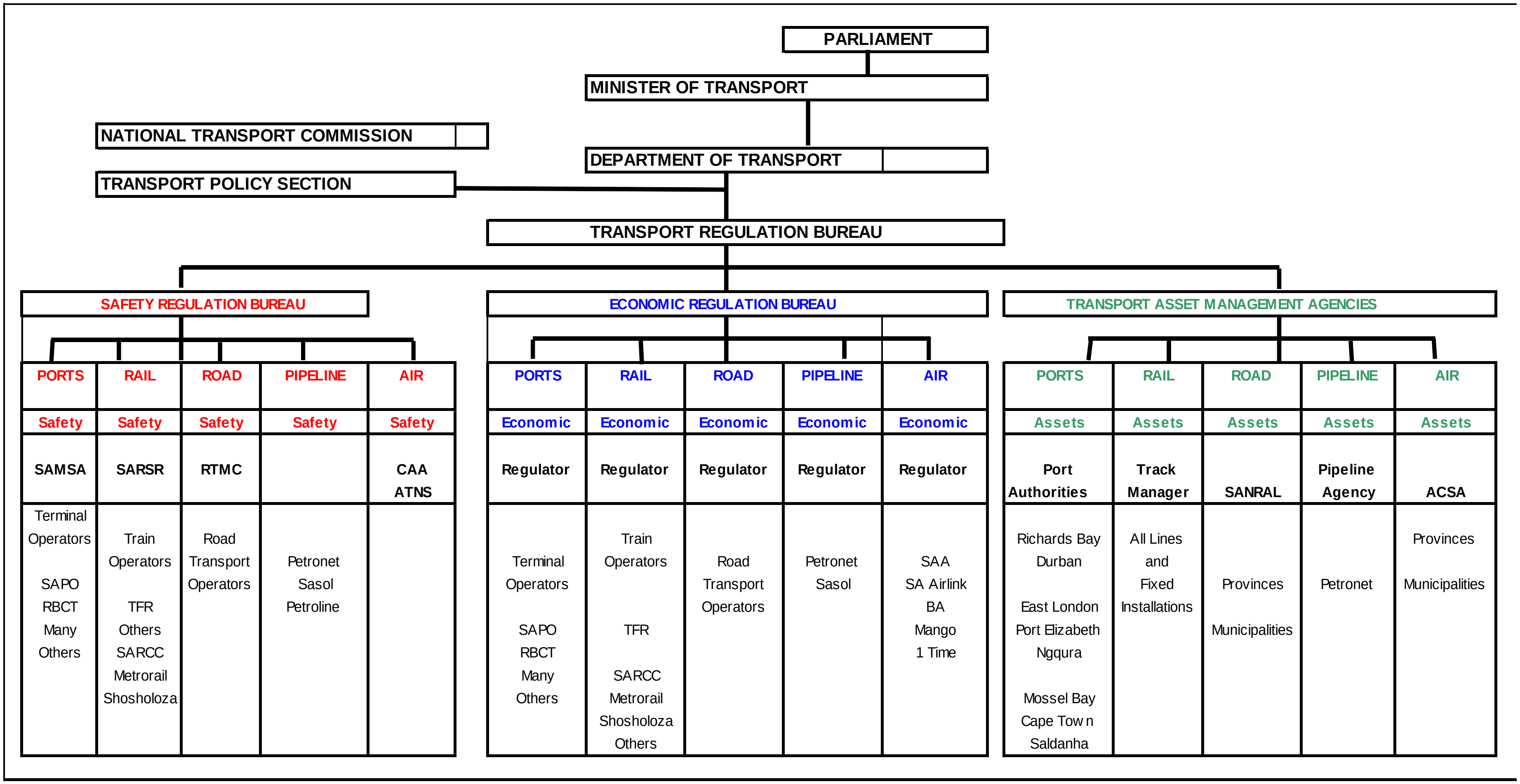
Air	-	CAA; ATNS
Maritime	-	SAMSA
Rail	-	Rail Safety Regulator
Road	-	RTMC
Pipeline	-	PLER or NERSA;

c) **Economic regulators** – all modes
Port Economic Regulator
Rail Economic Regulator
Road Economic Regulator
Pipeline Economic Regulator
Air Transport Economic Regulator;

d) **Infrastructure Management Corporations** – all modes
SANRAL/ Provinces/ Others
Port Authorities
ACSA
Rail Track Company
Pipeline Authority

The proposed structure of the regulatory agencies within the Department of Transport is shown in **Figure 6.8.A** below.

Figure 6.8.A: Revised Structure for Transport in South Africa to Achieve Regulated Competition in All Modes



As shown in the above diagram, the department would be restructured into 3 main operational areas covering:

- Safety Regulation,
- Economic Regulation and
- Asset Management Agencies : charged with the management of the government owned infrastructure assets;
  - o In the ports (Port Authorities)
  - o For railways (Track Management Company)
  - o For roads, (SANRAL and other Agencies)
  - o Fr pipelines (a proposed pipeline agency) and
  - o For air freight (ACSA).

The 3 primary regulatory agencies or bureaux within the department would fall under a Division of Transport Regulation. As shown on the second level within the diagram, the organisations to be regulated in each mode include all the operational entities. It is intended that the current parastatal entities would be part of the operational structure for as long as they continue to perform transport operations.

Provinces

The reorganisation of the Department of Transport should be accompanied by restructuring of the provincial departments of transport to provide for a Directorate: Freight Transport. These directorates in each province should take charge of:

- Weighbridges;
- Abnormal Loads;
- Vehicle Inspection stations (Freight Vehicles);
- Transport of Dangerous Goods;
- Applications for Freight Transport Operator Permits;
- Provincial Road Freight Operator Records;
- Driver Training of Good Vehicles;
- Liaison with Traffic authorities;
- Coordination with cross-border authorities;
- Branch line development;
- Planning of modal Freight Logistics infrastructure;
- Management of Provincial Freight Forums and
- Development of provincial freight information systems

The development of capacity and professionalism in the management of the overall freight systems of the province will contribute to improved understanding of the needs of local industries and effective provincial involvement in planning and control activities.

More detailed description of the proposed reorganisation in each mode is described in the following sections.

6.8.2 Reorganisation of the Rail Sector

The situation with the rail services of the country has long been evident and known to the government [as with Eskom], as shown by the excerpt from the Transnet Freight Demand Model -Final Report in November 2006 by BER Stellenbosch. [Page 23]

> "Corridor traffic in South Africa shifted far beyond 50% from rail to road in a relatively short period, but assuming a 50% shift this would mean a loss of R1 billion income on the theoretical corridor and only a reduction of R0.25 billion of costs in the short term and R0.5 billion in the medium term. This means that R0.75 billion would have to be cross-subsidised from rail "captured" freight in the short terms and R0.5 billion in the medium term. In the absence of cross-subsidisation the remaining traffic would have to carry a tariff of 35c per tonne kilometre in the short term and 30c in the medium term (an immediate tariff increase of between 50 and 75%) ".
>
> The report continues by noting that;
>
> "……… in South Africa the following hybrid, unsystematic strategy was followed:
>
> 1. Cross-subsidisation did occur to some extent, making South Africa's "captured" rail traffic slightly less competitive – this was partly offset by state of the art world class engineering especially on the export lines;
> 2. Relative tariff growth on some higher value time sensitive freight did occur at faster than PPI growth rates, but this led to a worsening of the problem as more traffic left the railway and
> 3. The complete difference could never be earned, causing a declining investment and maintenance strategy, inducing further freight losses and a never ending downward spiral."

The other main issue, not mentioned in the report, is that neither the government nor Transnet have the capacity to supply all the transport services needed by the South African economy nor the continued embargo on private sector fixed investment in transport has continued to stunt economic growth.

Due to the fact that the policy position of the government has been focused on State ownership in all of the above mentioned strategic planning, the obvious alternative of improving the provision of rail transport services by opening access to the underutilised rail network and under-developed port infrastructure by encouraging investment by private operators was not considered.

6.8.3 Recommendations for Policy Change in the Rail Industry

From the research done in this project it is evident that in order to meet the demand for long haul freight transport by rail, in preference to road haulage, there is need for urgent changes to the institutional organisation of the rail transport system in South Africa.

In particular it is essential to change transport policy to permit the entry of more operators and much more investment in operations. This will achieve a state of regulated competition for railways similar to the environment prevailing in the road and airline industries, which show all the vitality of competitive transport systems.

This change need not have major impact on TFR as it will still operate as the largest railroad company in the country and will relieve the company of the burden of unproductive rail lines.

6.8.3.1 Separation of Track and Infrastructure from Train Operations

The first step to achieve mandatory open access will be the separation of the management of the state owned railway infrastructure from the management of train operations. The company managing the rail infrastructure must be separate and independent from all train operating companies and must manage the assets of the State according to policies laid down by the government and supervised by a Rail Economic Regulator [RER] and a Rail Safety Regulator [RSR].

The principles and practices regarding application of a mandatory open access regime are discussed in Appendix 1 to this Annexure C.

6.8.3.2 Rail Track Company [RTC]

An infrastructure company, that may be referred to as the Rail Track Company [RTC] should be created to take over and manage all fixed assets of the railway in accordance with a set of agreements on track access charges between the operator and the track owner(the State). The rates will be agreed with the Rail Economic Regulator [RER] and a set of Safety regulations will be defined by the Rail Safety Regulator [RSR]. The RTC Company may remain government owned, or have structure defined by statute. The RTC will undertake to construct maintain and operate the entire fixed infrastructure of the railway in terms of its agreement with the regulator and its contracts with train operating companies.

Initially, the RTC may own and manage the unused rolling stock currently in existence, but over time it will decrease this role as train leasing companies and train operators make their own arrangements.

The RER and RTC will monitor the actual results being achieved on each route, and where both statistics show low usage or excessive usage appropriate reduction or expansion plans must be formulated and presented to the Minister.

Track access fees will be calculated and adjusted by the RER and the fees will be agreed between the RER and RTC, and train operators will be advised accordingly.

If there are to be any form of subsidy for government programmes to support the poor or food production, these will be managed by the Rail Economic regulator.

6.8.3.3 Railway Economic Regulator [RER]

The RER will be a division of the Department of Transport with the mandate to ensure that competition exists in the market between train operators.

Fees for track access are to be determined between the Rail Economic Regulator [RER] and RTC. The regulator will actively prevent operators from cornering market segments and will attempt to ensure impartiality and equity between operators.

The RER will control relations between the RTC and the train operating companies. In terms of equitable allocation of slots and train paths and track access charges. Regulatory issues between the RER and the RTC will include;

- The capacity of each section of track;
- Train path capacity - i.e. the number of daily slots available in each direction and
- Route tonnage capacity- i.e. the tonnage that the route is capable of carrying
  .

Based on published standards for;

- Axle loads
- Traction modes and loco types
- Gradients
- Maximum train lengths
- Headway between trains
- Train speeds
- Commodities

In order to apply for operating rights train operators must first hold a Train Operators License [TOL] to operate, based on demonstrating a business plan, financial capability, management capacity, and safety compliance plan.

The regulator will entertain requests for slots and train paths from aspirant train operating companies and from licensed train operators on any reasonable traffic expectation.

The license may also be withdrawn if;

- the operator fails to use the slots allocated–
- if the operator – in the opinion of the regulator is attempting to corner a market sector or engaging in anti competitive practices.
- if the operator fails to pay track access fees.
- if the Operator fails to meet Safety regulations

Cargo owners will always be free to choose their train operators and may appeal to the RER if they are being prejudiced by the anti-competitive actions of a specific operator.

6.8.3.4 Rail Safety Regulator [RSR]

The RSR will also be a division of the national Department of Transport, charged with monitoring and control of all aspects of rail transport. This agency has already been established.

Train Operators will be licensed by the RER but the terms and conditions of licensing will include all the standards set by the RSR.

A track quality index measuring standard must be agreed between RER, RSR and RTC. The indices will be different for main and branch lines. All tracks will be measured annually in accordance with these indices. RER will issue directives to RTC in respect of sub-standard track, as reported by the RSR.

All other fixed assets such as overhead wires and signalling systems and marshalling yards must be maintained by RTC in a fit for purpose state.

6.8.3.5 Train Operating Companies

TFR will become the first and probably remain the largest train operating company with a number of services registered with the RTC and RSR.

With open track access, more than one train operating company will come into existence, as companies assess the viability of setting up train operations. Train operators may be set up by commodity owners, logistics and 3PL companies, forwarders, and industries, but they may not have any interests in RTC.

Rolling stock can be rented from the RTC initially but operators are free to source their traction and rolling stock requirements as they see fit.

Train Operators will generally ensure their rolling stock utilisation by entering into contracts with cargo owners, but this will not preclude acceptance of casual and consolidator coordinated freight. In the event that commercial or other disputes emerge that require resolution the regulator is empowered to make decisions- the RER will follow government policy as a primary principle.

The RER will not engage in disputes between train operator and the cargo owner.

6.8.3.6 Recommended Changes to SA Ports Structures

From the description of the present situation and the negative effects of the current arrangements it is recommended that restructuring of the institutional role of the ports authorities and port operators should become part of the overall rationalisation process to promote effective competition, with oversight by the Ports Economic Regulator.

6.8.3.7 Disaggregation of Port Structure

6.8.3.7.1 Port Authority

The Transnet National Ports Authority [TNPA] should be restructured to permit the creation of individual port authorities for each port. The structure of the Board of the Port Authorities should permit inclusion of officials from the host city in which the port is located, the provincial government, national Department of Transport, senior maritime business executives and academics with proficiency on port and maritime issues.

The infrastructure will remain in the ownership of the state, administered by the Port Authority as an independent autonomous statutory body.

The port authority should be separated from companies operating other modal services in rail, pipeline or road transport. State owned terminal operators will receive the same equitable treatment as all other competitors; and in the longer term these operations may be devolved to investors. It is noteworthy that the legislation to effect this change to the port management structure has already been promulgated but not implemented.

6.8.3.7.2 Ports Economic Regulator [PER]

The Ports Economic Regulator [PER] has already been appointed and the terms of reference for this function have been written and discussed. It is however likely that the TOR will need to be altered somewhat to deal with the recommended restructuring and to ensure that the Regulator has suitable powers and authority. The PER will exercise a national oversight on all ports in South Africa.

The PER will be charged with ensuring that in so far as is practicable, competitive conditions are created within the ports, and possibly between ports.

The PER will set the prices paid by terminal operators for the use of infrastructure. The open market will set the prices between terminal operators and user. The PER will entertain and consider any proposals made by any party for additional terminals in collaboration with the Port Authority concerned.

The regulator will review proposals from parties interested in providing infrastructure at a port. These parties need not necessarily be existing port authorities but may also include city managers or private companies. The regulator will award contracts to the most suitable proposals for the construction and maintenance and improvement of fixed assets at a particular port. The regulator will, with cargo owners and terminal operators and infrastructure providers determine from time to time the additional capacity required.

The regulator will keep statistics of all operations and berths and remain abreast of world wide shipping trends so that cargo owners are placed in a globally competitive situation.

6.8.3.7.3 Port Safety Regulator

The Port Safety Regulator will determine the standards of safe operating for all terminals and maritime activities within the port. The port safety regulator (PSR) may well be incorporated into South African Marine Safety Authority (SAMSA), in order to integrate the safety regulations on land and water.

6.8.3.7.4 Terminal Operators

Terminal operators will be required to obtain licenses from the ports economic regulator which will incorporate compliance with the regulations of the Safety Regulator as a basic requirement to obtain a license. Thereafter, safe operating will be a requirement for retaining the license.

Terminal operators will be registered and exposed to competition wherever it is practical. The practice of reserving certain cargoes to certain terminals will be reviewed and the Ports Economic Regulator (PER) will promote a competitive environment within the ports jurisdiction.

6.8.3.7.5 Port Responsibilities

The responsibilities of the various parties will be relatively unchanged by the restructuring, but will need to be restated in their Terms of Reference.

Port Authority:

- Port entrance draft;
- Draft to be maintained on any berth;
- Maintenance of the apron and quay wall and mooring equipment of berths;
- Number of tugs and pilots;
- Hours of navigation working;
- Uptime of navigation equipment;
- Length of berths to be provided;
- Back space area to be allocated per berth;
- Access transport systems to be provided and
- Terminal operator fees to be paid.—as set by the PER

Terminal Operators

- Operator to hold a terminal operator license confirming safety and commercial standards;
- Terminal operator to seek a specific license for a berth or group of berths;
- Specific license describes the length of wharf granted as well as draft and back berth area – the license also describes the equipment the terminal operator will install and the expected berth occupancy and tonnage throughout and the term of the license and
- Should ownership of a terminal alter or if any of the terms of the license are not complied with for a period, the PER may withdraw the license and invite other operators to make alternate proposals.

6.8.4 Pipelines

6.8.4.1 Future Pipelines

There is scope for further pipeline development and with private sector investment and competition there is likely to be reduction in costs of transport by pipeline and supply of adequate capacity in the future. If all future pipeline investment is restricted to government parastatals it is likely that supply will lag demand and future tariffs will continue to reflect a monopoly premium.

6.8.4.2 Recommended Changes To Pipeline Structures

6.8.4.2.1 Pipeline Economic Regulator

The function of Pipeline Economic Regulator [PLER] may possibly combined with one of the other modal Economic Regulators within the Department of Transport.

The functions of such a Regulator will be;

- Issue licenses to pipeline owner/operators as requested by any party in accordance with safety and commercial capability;
- Pipelines will be owned and operated as a set for each pipeline;
- Licenses will be granted by specific route;
- Measure capacity against usage on each route;
- When demand reaches a point where the construction of new capacity is needed [PLER] must consider proposals from pipeline operator owners;
- [PLER] together with pipeline owner operators will decide the pricing structure that applies to a pipeline annually;
- Anyone may apply for a pipeline license and
- [PLER] must actively encourage pipeline operators to seek extra markets where volume flows have now reached economic levels.

If NERSA is to continue as the regulator of pipelines it should be encouraged to create competition. NERSA should be requested to ensure pipe capacity exceeds demand all the time to prevent overflow onto other transport modes.

The National Department of Transport should provide NERSA with the operating costs of pipelines elsewhere in the world. NERSA should be encouraged to look at other possible pipeline routes.

6.8.4.2.2 Pipeline Operators

The current Transnet pipeline division should be restructured as an independent government owned company. Future tenders should be designed to improve competition in the liquid bulk storage and transport industry.

6.8.5 Air Cargo

The provision of domestic air transport services in South Africa is largely confined to transport of passengers with small quantities of freight being carried in belly holds of passenger aircraft.

Domestic air cargo is a very small portion of the total airline activity, and is in no need of regulation in an industry which is expanding very rapidly due to the introduction of competitive passenger fares and new carriers.

International air cargo movements are largely confined to OR Tambo International in Johannesburg, with a small amount from Cape Town. There is no need of regulation in this highly competitive environment.

There is however a need for introduction of some form of mandatory reporting of cargo volumes by airlines that are “air cargo carriers”, as the lack of cargo data has impact on the planning of facilities and infrastructure.

6.8.6 Road Freight Transport

6.8.6.1 Development of Road Freight Regulation – Past and Present

In the 1980’s there was a growing awareness in South Africa that the regulatory environment in land transport was having negative impacts on the economy. There were growing pressures for deregulation of the road freight industry to remove “quantity” controls and to improve “quality”, controls on road transport operators.

The National Transport Policy Study [NTPS] recommended deregulation of the road transport industry and the repeal of the road transportation permit system. This removal of “quantity“ legislation was intended to be supported by introduction of the “quality” controls in the Road Transport Quality System [RTQS], which was embodied in the revised National Road Traffic Act.
At the time, it was intended to introduce the concept of a certificate of professional competence (CPC) which would provide for competence amongst Transport Operators to manage road transport operations. .

With the re-writing of the National Road Traffic Act, the intention was initially to register all transport operators and to establish a system whereby operator competence and identification were maintained by a registrar of transport operators. For this purpose a National Diploma Series in Road Transport Management was sponsored by the DoT, at Rand Afrikaans University. More than 30 000 students have graduated over the years.

At the same time a Professional Drivers Permit [PrDP] was introduced to improve the quality of drivers and to establish a registry, to be linked to the Operator register.

The National Traffic Information System [NATIS] was initiated to provide a register of vehicles and was intended to link vehicles to Operators. The system has taken years to develop and is still somewhat problematic in many respects.

These processes unfortunately did not happen in an integrated manner due to various distortions; the operator identification was included in the vehicle registration system, and is not linked to the PrDP, the CPC was dropped and NATIS was diluted by a range of other objectives, with results that have proved highly ineffective in regulating the road freight industry.

6.8.6.2 Principles for Effective Operator Registration

In evaluating the situation it is relevant to consider the criteria that are applied for operator registration in almost all forms of transport, in most countries. These criteria can be described as follows:

1. Absolute identification of individuals responsible for specific operations.
2. Identification of all vehicles, ships, planes, etc. operated by registered operator.
3. Records of characteristics of the fleet of the operator.
4. Identification of the precise location from which the fleet is operated.
5. The personal identity of the manager, who bears the CPC and is responsible for operation of the vehicles identified in his operation.
6. The issue of an operator identity number which appears in all moving equipment, and is used to connect offences by moving equipment and drivers to the operator license.
7. Details of maintenance arrangements and the location at which maintenance will be performed.
8. The identification of all qualified staff, drivers (captains, pilots, loco drivers, etc).
9. An analytical system which keeps a record of the performance in terms of management quality and control of each operator and automatically identifies operators that are failing to meet performance standards.
10. Mandatory reporting of accidents and incidents by registered operators.
11. Periodic review of records and physical inspections of equipment.
12. Periodic review of records and inspection [or testing] of drivers.

If any of the above criteria are not met, the registration and licensing system is invariably defective in controlling the quality standards of transport operators. It is worth noting that exactly the same principles are applied to ocean shipping, aircraft operations, etc.

6.8.6.3 Current Operations and Scope of System

After approximately 10 years of operation, it is evident that the South African road transport operator recording system is proving ineffective in controlling the quality of road transport operations. The Road Transport Quality System (RTQS) was expected to provide a framework for operator control and improvement of the standards of transport operations.

It must of course be recognised that there are many operators who try to comply with the Road Traffic Act and other legislation and make every attempt to operate legally and effectively but due to deficiencies in the existing system, it is possible for operators to take chances and circumvent the enforcement process.

The evidence for this situation can be seen in rising heavy vehicle accident frequency, increasing difficulty of attracting competent drivers, lack of trained technical staff for vehicle maintenance, continual contravention of loading regulations, and almost uncontrolled transport of dangerous goods.

If the system is to be changed in order to achieve effective regulation of the road freight industry the following parameters will form the basis for the revised system.

6.8.6.3.1 Operators

According to NATIS, there are approximately 300,000 heavy goods vehicles in South Africa and 140,000 heavy trailers and semi-trailers.

It can be estimated from the above figures that there may be approximately 30 000 operators of commercial goods vehicles in South Africa. From cursory examination of the industry records, it would appear that as many as 30% of the operators may be professional hauliers for hire and reward and 70% will therefore be operators of vehicles for own account. Current legislation does not make a distinction between the two categories but for registration purposes it may well be advisable to identify the two classes.

The situation is somewhat aggravated by the presence of numbers of long haul operators from neighbouring countries running on the main corridors between the ports and the northern borders. These operators and their drivers will need to be incorporated in whatever system is established to correct the above unsatisfactory situation.

There is need for a separately managed information system for road freight operators as the NATIS system is not designed to permit recording of company details and to permit continual updates of information about movements of competent persons, company structures PrDP holders and transfers of vehicles between entities.

6.8.6.3.2 Holders of Certificates of Professional Competence (CPC)

There will be one CPC holder registered for each operational depot registered by the operators so that it is likely that there will more CPC holders than Operators. It can be estimated that the CPC register will hold approximately 30,000 names, including many holders of CPCs who are not working in the road freight industry, for active operators and are therefore “dormant”.

A grandfather clause will be needed to cater for the many existing operators who can not satisfy CPC requirements.

6.8.6.3.3 Vehicles

The number of freight vehicles in South Africa is not accurately known but the NATIS categories of "Trucks" amounted to 312118 in June 2008 and the numbers of heavy load trailers [all sizes, including semitrailers] amounted to 139,749.

6.8.6.3.4 Drivers

The numbers of goods vehicle drivers will presumably approximately match the number of powered vehicles. In fact the RTMC records in 2005 showed 542,136 valid PrDPs of all categories.

The proportions of PrDPs were approximately;

G	(Goods only)	1.5%
P	(Passenger only)	0.9%
P+G		79%
D+G (Dangerous Goods)		0.1%
D+P+G		17.6%

From the above data it can be estimated that Goods PrDPs will amount to about 400,000 drivers.

As drivers of commercial vehicles are supposed to be in possession of a, Professional Driving Permit [PrDP], a register of PrDP holders will be a system requirement, as it introduces a further measure of control by ensuring competence at all levels in each transport organisation, and a dedicated professional driver [PrDP] register would enable better tracking of offenders.

6.8.6.4 Recommended Changes to Road Freight Operator Licensing

6.8.6.5 Road Freight Operator Registrar (RFR)

The office of a Registrar will be created within the DoT. The registrar will develop a system for the issue of operator licences and will maintain a register of licensed operators and the details of their operations, in the National Freight Transport Database.

There will a planned transition from the existing recording of "Operators" on vehicle registration papers to the mandatory application for "Operator Licences", for which conditions of compliance will be defined.

6.8.6.6 Road Freight Economic Regulator (RFER)

The Road Freight Economic Regulator will be a separate function within the RFR, in relation to other role-players such as Roads Agencies, Toll concessionaires etc.

6.8.6.7 Road Freight Safety Regulator

The regulation of safety in the Road Freight Industry will be a function of the Road Traffic Management Corporation (RTMC).

The Road Freight Operator System [ROS] should be redesigned to include the following processes;

When an individual or firm wishes to operate a road freight undertaking;

1. Application is made for an Operator License, information required ;

Details of firm – name, business details, owners,
Details of depot-address and facilities
Details of proposed, hired or owned fleet
Details of CPC holder
Details of Drivers employed or hired
Details of maintenance arrangements
Nature scope, area, and broad activities of proposed, or current business
Nearest RTI

2. Once the firm is operating, monthly returns will provide statistical information about the following aspects of operations ;

2.1 Monthly email on pro forma showing changes to above
2.2 Monthly return –activities, kms, tonnes, commodities

Each depot or operating centre will be issued with a unique number [related to the firm] and all vehicles have a disc displaying this number. All references by enforcement officials are to the unique depot number, which in turn is directly linked to the CPC holder and the firm.

The basic outline of a simple system of operator registration is shown below.

Figure 6.8.A: Basic Outline Of Road Freight Operator Licensing System

6.8.6.8 Essential System Requirements

a) The system must be national.
b) The system must be capable of receiving monthly IT updates and returns from operators
c) Must be accessible by all enforcements agencies
d) Must be linked to effective electronic transmission systems.
e) The Database input and capture system must be as automatic as possible to ensure continual currency of the information.
f) The information database must be completely confidential and hold no commercially usable information about operators.
g) Statistical information must be accessible.
h) Data input must be possible by several different methods, e.g. email, fax, data input, etc.

6.8.6.9 Implementation

It is essential that implementation of the system is only attempted, once all electronic data systems have been designed and tested.

At a specified date, it will be gazetted that transport operators with more than a certain number of vehicles, are required to obtain an operator registration number and a procedure will be prescribed.

The current presumption in the vehicle licensing system can be allowed to continue, using the new operator number which will be entered in the re-licensing and COR records of all commercial freight vehicles. The new system will cross-check with NATIS.

Once the larger fleets have been registered, a further round of smaller fleets can be introduced to the registration and licensing system and then finally, one man operators and owner drivers can be incorporated once the system is fully operational and means have been found to permit contact with the small operators.

7. INFRASTRUCTURE DEVELOPMENT PLANS

7.1 INTEGRATED INFRASTRUCTURE FRAMEWORK

7.1.1 Introduction

7.1.1.1 Integration Required by the Terms of Reference

The central theme of the Terms of Reference of NATMAP is integrated planning and the development of an Integrated Master Plan. References to the lack of integration across various planning dimensions abound in the ToR. A few extracts are given here from the ToR regarding the lack of integration and the need for integration. “Objectives:

- Integrated growth and development strategy for each development corridor and/or region of national importance and
- Integrated multi-modal infrastructure facilities development Plan;”

“The freight system in South Africa is fraught with inefficiencies at system and firms levels. There are infrastructure shortfalls and mismatches; the institutional structure of the freight sector is inappropriate, and there is a lack of integrated planning. (National Freight Logistics Strategy pp ii)

“--it is now paramount that there is a comprehensive, multimodal and integrated transport plan that is demand responsive to various land uses and sectoral investments.”

“The Transport Lekgotla held on 08-09 April 2005 resolved that we should develop an “Integrated National Transport Plan by March 2006”

“A typical example is the lack of coordination in many urban areas between agencies responsible for providing and operating infrastructure facilities and public passenger transport systems.”

“To this end, DoT is now focusing on alternative approaches for improving the coordination and integration amongst the various agencies and operators responsible for operating various elements of transport systems and how to better organize and operate multi-modal systems.”

“Poor land use/transport integrated planning is aggravated by sporadic unplanned land use within major corridors; and urban areas.”

“Uncoordinated implementation of multi-sectoral land use committed developmental projects is prevalent in South Africa. At the moment local perception is that there is an increasing tendency for each sector to do its own land use development without due regard to the bigger picture of national development.”

“At the moment transportation in this country is characterized by fragmentation of the responsibility for multi-modal planning, operation, and regulation amongst different government departments, agencies and private operators in all three spheres of Government and institutional hierarchies.”

“Almost all of the above planning initiatives took and continue to take place in a fragmented manner. There is therefore a need to have a national plan for transport that will guide transport planning, management and operations for all the spheres of government as well as all the different modes. Section 5(5)(k) of the NLTTA prescribes that the Minister must promote effective integrated transport planning.

There is therefore a need for central transport planning that will integrate all of the planning initiatives and close the gaps with regard to transport planning. It is envisaged that a National Transport Plan will go some way to provide a solution to this problem. The envisaged National Integrated Plan will attempt to not only comply with the legislation but also to streamline transport planning both vertically (among the planning authorities) and horizontally (across all modes)."

Despite stated policies of government to develop integrated land-use transport plans, very little has been achieved in practice. The main problem is that integrated plans cannot be developed if the planning authorities are not integrated or coordinated. Even so, it requires commitment by authorities to coordinate planning. The institutional and legal issues hampering integrated planning, and institutional restructuring required, are adequately addressed in the national FILM reports for Phase 2 and 3.

7.1.1.2 Lack of Integration in Current Infrastructure Planning

The planning of infrastructure has traditionally been managed by authorities responsible for different modes of transport. While the ownership of infrastructure typically resides with the authority, the ownership of vehicles and their operation are spread between the public and private sector. **Table 7.1.A** shows the typically spread of ownership and operational responsibilities for different infrastructure and modes.

Table 7.1.A: Ownership and operation of Passenger Modes in SA

Mode	Interchange	Way	Vehicle
Air	Airports: ACSA **Public**	Airspace **Public regulated**	Airlines: **Public & Private**
Sea	Sea Ports: NPA **Public**	Sea routes **Public regulated**	Shipping lines: **Private**
Rail	Stations: PRASA **Public**	Rail track: TFR / PRASA **Public regulated**	Rolling Stock: **Public**
Road	Parking Garage: **Private**	Roads: DoT / SANRAL **Public regulated**	Cars, Taxis & Buses: **Private**

Each authority is tasked with the planning and development of its own infrastructure to meet forecasted growth in demand. The authority typically does not have control over the operational characteristics of the modes using that infrastructure. For instance, where operations and vehicles are privately owned (e.g. airlines and cars), the capitalist economy requires that these entities develop the growth of their own segments of the transport market. The ability to respond to market forces are typically weak in modes that are wholly owned and operated by public entities, such as rail.

The result is that road construction is driven by a response to growth in private car numbers, while a decrease in rail demand result in the abandonment of existing infrastructure. Even when a policy directive results in the construction or upgrade of a rail line in a corridor, this neither ensures the efficient operation of services on that line, nor does it curtail the further development of parallel road infrastructure, as planning for the three components of the system occurs independently. Likewise, a shift to higher occupancy modes like the Bus Rapid Transit (BRT) system will not be efficient when surplus road space is being provided in the same corridor.

The above challenges for integrated planning are further aggravated by the fragmentation of roles and responsibilities of different planning authorities across the different spheres of government.

7.1.1.3 Structure of Chapter

This Framework for developing an Integrated National Transport Master Plan (NTMP) firstly defines the different dimensions and principles of integrated planning, and secondly, describes how various components of the NTMP have been integrated.

7.2 INTEGRATED INFRASTRUCTURE PLANNING FRAMEWORK

7.2.1 Dimensions of Integration

The extracts form the ToR above already alluded to the various dimensions of integration of planning. They are briefly described here.

i) The **Institutional Dimension** is the most important factor in integrated planning, as well as enabling legislation. Horizontally, at national sphere the planning between the various national government departments who are responsible for various economic sectors must be integrated. These are departments dealing with mining, agriculture, human settlements, land affairs, energy, transport and economic development. Vertically, the planning between national, provincial and local government needs to be integrated. Integration between so many divergent authorities with different functional and spatial responsibilities is a huge challenge, and therefore authorities at one sphere coordinating the planning of those on another sphere is important, i.e. DoT coordinating provincial transport departments, and provinces coordinating the transport planning of municipalities. However, this does not address integration between different sectoral functions, such as land use, transport, etc. The new National Planning Commission will hopefully facilitate such integration.

Up to now the DoT has developed transport policies and strategies, which were helpful to facilitate coordination, but for the first time the DoT developed a detailed master plan at national level, which will achieve more effective integration. The national plan was done simultaneously with provincial master plans, again achieving direct integration.

ii) **Land use, Economic Development and Transport** must be integrated. Transport demand must be based on land use and economic development plans, and in turn, transport infrastructure development can facilitate land use and economic development. At a national scale this is much more challenging than at a municipal scale, which is often addressed in planning guidelines.

The development of different modes, and technological advancements within these, has fundamentally shaped the land use development patterns on both local and regional levels over time. Long term transport planning can therefore not be optimised without integrating it with land use planning. For instance, public transport is more efficient in higher density corridors due to the increased ridership. Lower density environments can never warrant higher occupancy modes, while the provision of high occupancy modes does not automatically result in densification. Policy driven and coordinated planning is therefore necessary to ensure both land use and transport intervention occurs in a manner that is mutually supportive of each other.

In an urban environment, moving from a lower density to higher density land use pattern therefore requires the gradual implementation of higher occupancy modes. Similarly on a regional level, moving from lower occupancy modes to higher occupancy modes requires the strategic implementation of infrastructure to support the ultimate desired mode. Infrastructure planning, where different modes support each other, should be driven by travel demand and land use changes, and cannot be planned on a mode specific basis.

iii) **Transport Services**, consisting of the vehicles moving people and goods, which are managed by institutions and their human resources, must be integrated with transport infrastructure on which they operate. The infrastructure should be designed to suit efficient and effective operations. Inefficient operations will require higher capacity infrastructure, and the solution is then to improve efficiencies and not providing costly extra infrastructure.

The role of the transport system is to serve the movement needs of persons and goods. A number of different modes, or technologies, have developed over the centuries that provide different levels of efficiency for a variety of trip purposes, volumes and distances of travel.

Transport services are provided by a large number of different passenger and freight modes, different vehicle types with different capacities and operating characteristics. The optimal selection and utilisation of the various modes and vehicle classes, as well as integrating modes to compliment each other, are important for the efficient supply of services.

It is as important to recognise the operational efficiency of a mode that makes use of a particular piece of infrastructure. Cars require much more road infrastructure than buses to move the same number of people, while are more efficient in moving high volumes of people and goods over long distances.

iv) **Finance and Implementation** of different infrastructure components which are supportive of each other need to be coordinated in order to have a well-functioning system, for example, a rural school or hospital and its transport access.

v) **Sustainable Transport** moved high up on the agenda of the South African Government in line with the international awareness of the so-called “peak oil scenario”, which have been demonstrated by recent hikes in the price of oil and fossil fuels, as well as the trend of global warming. This debate has also been addressed in NATMAP in terms of the Energy and Environmental implications for NATMAP. Consideration of energy efficiency and environmental sustainable transport have been considered in all aspects of the NTMP in order to support these goals.

vi) Finally, **coordinated data** of high quality is crucial for integrated planning, and if the planning data of different authorities are not supportive of each other in terms of timing, scope, and level of detail, the planning will be ill-informed.

7.2.2 Principles of Integrated Planning

Infrastructure planning should be led by establishing the effective modal mix within a corridor or system, assuming each mode is operated efficiently. Thereafter infrastructure planning should be integrated to ensure the strategic and timely implementation of infrastructure to support the desired modal mix.

The effective modal mix will depend on the policy directives for planning, which include factors such as land use spacing and density; energy availability and efficiency; available technologies; funding structures and affordability. Planning that is done on an operational level will therefore inform the infrastructure requirement for the corridor or system.

Travel demand increases gradually over time, while infrastructure expansion results in incremental, or step-wise, increases in capacity. Expanding infrastructure in lieu of improving operational efficiency though, results in unnecessary capital expenditure and a proliferation of poor operational practices. Planning on an operational level can therefore compare the cost of a bus service on existing infrastructure against a new lane for cars. Similarly, expanding a road when a parallel rail line is underutilised results in capital expenditure in lieu of operational efficiency. This disparity cannot be addressed by the roads authority that has no control over efficiency of rail services.

The incremental increase in capacity when adding a rail line in a corridor, instead of an additional lane to a road, is significantly larger and more costly.

Figure 7.2.A shows a consistent growth in demand (assuming a fixed modal split) over time with two incremental increases in capacity. The first increase (1) would typically constitute adding a lane to a road when capacity exceeds demand. Utilisation even after the expansion is still high and the full value of the investment is realised in a relatively short time.

The second increase in capacity constitutes adding a rail line with significant additional capacity. A balance needs to be found between the level of congestion experienced when demand exceeds prevailing capacity (2), and the under-utilisation of capacity (3). Underutilisation in capacity results in a low initial rate of return on the investment, which would result in a significant subsidy.

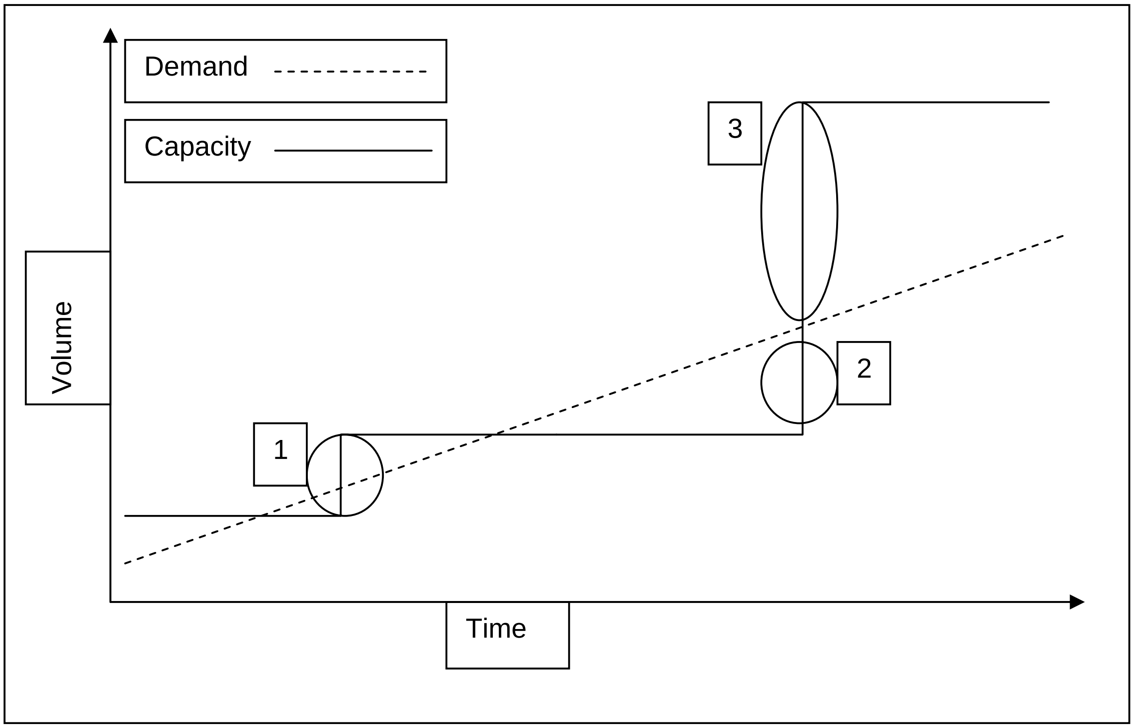


Figure 7.2.A: Increase in capacity for growth in demand

If the rail link is the more efficient and appropriate long-term mode, the strategic decision would be to resist short-term, lower cost incremental capacity increases that will compromise reaching the long term goal. This decision cannot be taken by either the roads or rail authority, as it falls outside the ambit of their planning function and legal obligations and funding structures. This is where effective planning coordination needs to take place through the structures provided for in the NLTA of 2009.

An authority planning for operational capacity would, however, be able to ensure higher occupancy road based modes are provided in lieu of additional capacity for low occupancy modes until such time that the larger investment is warranted. Moving towards a desired modal mix can therefore only be achieved by integrating the planning for infrastructure based on the operational requirements of the system.

7.2.3 The NATMAP Integrated Infrastructure Plan

In NATMAP the different dimensions of integrated planning and principles defined above are being addressed in this Forward Planning Phase. Typical examples of the integration of the different components of the total NTMP are described below:

i) **In terms of land use**, the National Land Spatial Development Framework and Spatial Development frameworks of provinces have been used to derive the demand for transport. A national demographic and economic model based on various homogenous scenarios has been developed and projections have been done, also informed by the Spatial Frameworks, from which the demand for transport have been determined. Following the development of the transport plans, land use strategies have been developed in support of the infrastructure development, and to exploit the transport development to achieve land use goals. Chapter 4 on Land Use addresses these aspects;

ii) Chapter 3 discusses the **role of transport in the economy**. The NTMP was drafted to respond to the economic needs and planning of the country via the economic scenarios and projections conducted for NATMAP. In turn, the proposed strategies and plans proposed for transport services and infrastructure investment will have a major impact on the economic development of the country. In Phase 4, once the investment costs have been quantified, the likely impact of this on the economy will be estimated, using appropriate multipliers from the SA national input – output model;

iv) **The freight and passenger transport operations strategies** in Chapters 5 and 6 address operational strategies to optimise the transport services by means of the different modes and the ways in which these services are provided. For example, in the Passenger Chapter, the different public transport modes are integrated in terms of a national Strategic Public Transport Network and the utilisation of the most appropriate mode, or optimal mode, for the demand profile on each route. In turn, the SPTN is supported by the road and rail network plans.

In terms of freight operations, the overloading of the road infrastructure and under-utilisation of rail infrastructure has been addressed by promoting a more optimal balance in the utilisation of road and rail by means of heavy vehicle overloading control strategies, and strategies to make rail more attractive for the movement of goods for which rail is more cost-efficient;

v) Integration of the plans of the various **infrastructure components** described in Chapter 7 have been achieved by trading-off the roles of different modes and types of infrastructure and not by just increasing capacity of one type of infrastructure in isolation to the rest. Different infrastructure components which are supportive of each other have been integrated. Examples are:

- Road and rail access to ports and airports
- Promoting the role of freight rail above road in order to alleviate road congestion and overloading on strategic national transport corridors
- Promoting public transport to alleviate traffic congestion on roads and hence delaying road capacity upgrading
- Defining strategic road network to support the main public transport corridors in the Strategic Public Transport Network.
- Strategic assessment of the role of each sea port around the South African Coast together with the resulting inland transport requirements

vi) **The implementation and funding program** will be determined in Phase 4. The plans and projects for each five-year interval will be done in such a way that supporting projects which will jointly have the largest benefit, are packaged together;

vii) Finally, the **demographic, economic and transport demand models** have been developed and applied in an integrated way and the formulation of all the plans have been informed by the same set of models from a national perspective, consistent across all provinces.

A challenge in terms of planning models is posed by the different freight models of the DoT (NATMAP) and Transnet. Various attempts were made to align the two models and extensive time was spent by the planning teams to understand each others models. Unfortunately Transnet could not see its way open to share their detailed model input data, possibly due to commercial security reasons, which is respected. Outputs at corridor level have been shared in order to achieve some level of coordination.

This issue needs to be urgently and seriously addressed at the highest level for the purposes of future planning alignment between the DoT and Transnet, as the country cannot afford that such duplication of expensive resources are duplicated in future, as well as the lack of integration between the two government organisations. Proposals are made in this regard in the national FILM report and

viii) **In conclusion**, it must be stated that the various plans proposed in this first draft provincial reports provides only a first step towards full integration. The Consolidated Working Group should facilitate further integration in their documentation of the national Phase 3 report. Following on the discussions at the Phase 3 Round Table (RT3), and incorporation of the inputs received from the stakeholders at the RT3, further integration will be achieved and documented in the second version of the provincial reports, which will be distributed to the provinces and other national stakeholders.

7.3 ROAD NETWORK

7.3.1 Methodology / Approach

7.3.1.1 Estimation Methodologies

The determination of service capacity and bottlenecks on a provincial and national level for the base year (2005) as well as future year scenarios (i.e. 2030 and 2050) presented significant challenges in terms of:

- Data input requirements and suitable available data on a provincial basis and
- Selection of a suitable methodology to process and model the data to produce capacity and level of service results.

Currently, two distinct approaches are being followed in determining road network capacity, namely:

- Transport Demand Model (EMME2);

- The Transport Demand Model is a comprehensive transportation demand estimation approach taking into account numerous variables that impacts on future transportation behaviour on the county's major transport ways. This model will make strategic estimates on the demand for travel and transportation across a number of modalities. Socio-economic projections, future infrastructure plans and existing demand estimates are incorporated to estimate future demand;

- First Order Network Assessment - FONA (HCM 2000 Methodology);

  There is however a need to determine the overall status of road-based transportation on the country's roads based on existing traffic demand and existing infrastructure to accommodate this demand. Information to develop a "snapshot" of the existing operating conditions on all of the country's major roadways was collated and formed the foundation of the development of a strategy to analyse and represent key performance indicators on a country-wide basis.

  The strategic nature of the analysis had to be taken into account as well as realistic time-frames in which meaningful results could be produced. The methodology contained in the Highway Capacity Manual (HCM) of 2000 (published by the Transportation Research Board in Washing D.C.) was selected as the most appropriate methodology to adopt for this purpose. The specific methodologies prescribed for the analysis two-lane and multi-lane freeways are of relevance (Chapters 20 and 21 of the HCM).

7.3.1.2 Measures of Effectiveness

The key performance indicator that is used to evaluate the status of vehicular operations on a roadway is expressed in terms of Level of Service (LOS). LOS is indicated by using the letters of the alphabet ("A" through to "F"), "A" representing the best operating conditions and "F" the worst. When new road infrastructure is designed, most public sector entities tend to require a design LOS of at least "C" in the design year – in other words, if a facility is designed to last for a period of seven years, in year seven the facility should preferably still operate at a LOS of "C". The reality within most countries, however, is at a level that is usually exceedingly lower than this ideal situation, especially in and around urban environments. For the purposes of this project a **LOS D** was deemed to be an acceptable level of service to be maintained on the country's roads of national importance.

7.3.1.3 Data

The data that was used as input into the modelling process in order to obtain a set of network assessment results were obtained from existing databases that were made available by the South African National Roads agency and the respective provinces and metros (Pavement Management Systems). The data included:

- A range of traffic counts that were collated over time by means of electronic counting stations (some permanent and some temporary) – this assisted in the determination of LOS for each road and providing the percentage heavy vehicles as well as the directional split;

- Road cross section data (number of lanes, width of lanes, width of road shoulders and the presence of a median) – this assisted in the estimation of free flow speeds;
- Geographical location of roads (based on a GIS or Geographical Information System) – this assisted with the stratification of results per province;
- The classification of the roads (National, Provincial i.e. R2 and R3 routes or Metropolitan) – this assisted in making informed assumptions about the number of recreational vehicles and daily commuters within the respective traffic streams;
- The topography traversed by the road (rolling, flat or mountainous) derived from the GIS contour map – this assisted in estimating the effects on flow and capacity caused by heavy vehicles and recreational vehicles and provided input into the estimation of percentage no-passing zones per roadway and
- The percentage heavy vehicles and the percentage recreation vehicles (traffic counts always provide the percentage heavy vehicles directly, however, the percentage recreational vehicles had to be assumed based on the location and function of the road) – this assisted in the determination of actual traffic flow characteristics and capacity.

7.3.1.4 FONA Network

The FONA road network was developed from various spatial (GIS) data sets and incorporated the following primary road network categories, namely:

- National Roads (such as N2, N3 and N11);
- R2 Provincial Roads (such as R33, R34, R56, R66, R68 and R74);
- R3 Provincial Roads (such as R102,R602, R612, R618 and R620) and
- Major Metropolitan Roads (such as M1, M5, M13 and M35

The total kilometres of each road class included in the FONA road network is shown in **Table 7.3.A** below.

Table 7.3.A: Sum of Road Length (km) per Road Type

Province	Metropolitan	National	R2 (i.e. R21)	R3 (i.e. R612)	Total (km)
KZN	29	1,105	1,872	1,579	4,583

The FONA network coding process required special attention in order to accommodate more detail capacity analysis. The following important network alterations were required:

- Links were split per direction in the attribute table in order to accommodate a bi-directional analysis to account for the % split assumptions on traffic count data
- Median separated links (dual carriageway) links had to be coded spatially correct in order to account for passing opportunities not hampered by on-coming traffic (opposing flow)
- Links shorter than 400m had to be consolidated as this length of link is not accommodated in the HCM 2000 single and multi-lane freeway section analysis methodology
- The number of lanes per direction had to be verified as correct as this was a primary determinant in the capacity of each directional link.

7.3.1.5 Link between the Transport Demand Model and FONA

The Transport Demand Model (EMME2) and FONA current have two distinct road networks. The Transport Demand Model uses a more simplified model network focusing on roads of national importance (typically National Roads and Provincial Roads of strategic importance such as R2 roads i.e. R34, R66.) linking land-uses of strategic significance of the country. The EMME2 network is also more simplistic and simplifies road geometries into straight lines.

FONA, on the other hand, has a more complex road network including many more provincial roads than the EMME2 Transport Demand Model, and similarly follows the actual GIS road alignment as opposed to a simplified geometry.

Given the network disparities between the two models, the link between the Transport Demand Model and FONA is created at a Transport Demand Model Zone level as shown in **Figure 7.3.A**. Each Zone in the Transport Demand Model has a specific growth rate for trip generation purposes which is based on socio-economic and demographic projections. These growth rates are assigned on a link-by-link basis from the EMME2 Transport Demand Model Zone to the associated FONA links contained within each specific zone.

This link enables the FONA Capacity Analysis model to project current base year traffic volumes (2005) into the future for various horizon years (i.e. 2030 and 2050) and for various modelled scenarios (i.e. high, medium and low growth scenarios).

Due to the high level, strategic nature of the NATMAP, the model zones utilised in both the EMME2 and the FONA are relatively large. This does result in some localised inconsistencies in respect of the outputs, but at the higher levels provides an acceptable level of accuracy.

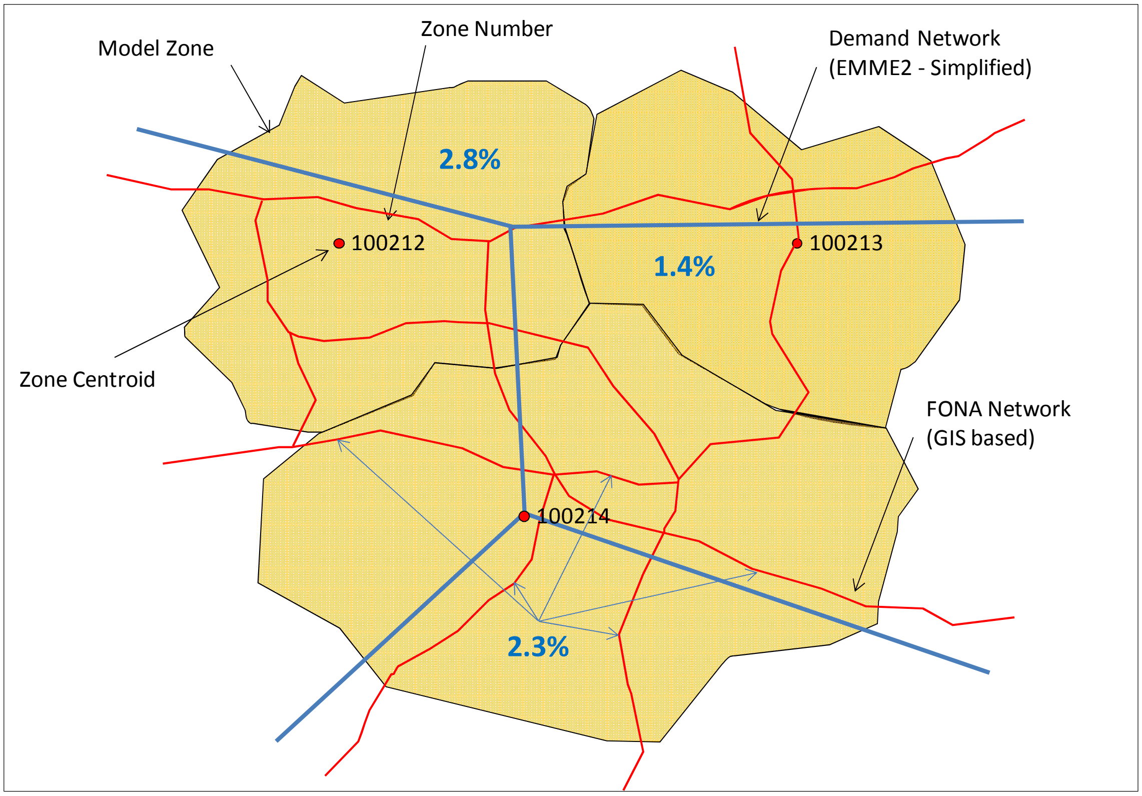


Figure 7.3.A: Link between Transport Demand Model and FONA

7.3.2 Summary of Road Network

As mentioned earlier in Section 7.4.1.4, the KwaZulu Natal road network included in the FONA model amounts to 4 583 km of roads. The following road classes were incorporated in the KwaZulu Natal FONA analysis network:

- 1,105 km of National Roads, including sections of National Routes N2, N3 and N11;
- 1,872 km of Provincial (R2) Roads, including sections of the R33, R34, R56, R66, R68 and R74;
- 1,579 km of Provincial (R3) Roads, including sections of the R102,R602, R612, R618 and R620 and
- 29 km of Metropolitan Roads. were considered important enough to be considered as freeway segments

7.3.3 Projections for Future Years

The traffic growth projections for the First Order Network Assessment capacity analysis was obtained from the Transport Demand Model (EMME2) on a zone per zone basis (Refer to **Figure 7.3.A**). **Table 7.3.B** below shows the average traffic growth per province per road class per scenario (as obtained from the Transport Demand Model).

Table 7.3.B: Average Growth Rate per Road Type (from Transport Demand Model Zone Growth Rates)

Province	Type	A2020M	A2030M	A2040M	A2050M	A2030L	A2030H	A2050L	A2050H
KZN	**KZ Ave**	**3.7%**	**2.5%**	**2.1%**	**1.9%**	**-0.9%**	**0.3%**	**-0.3%**	**0.3%**
	M	-7.2%	-2.9%	-1.5%	-0.9%	0.2%	0.8%	0.3%	0.7%
	N	0.6%	1.0%	1.2%	1.2%	-0.9%	0.3%	-0.3%	0.4%
	R2	7.4%	4.4%	3.3%	2.7%	-0.9%	0.4%	-0.3%	0.4%
	R3	3.0%	2.2%	1.9%	1.7%	-1.0%	0.2%	-0.4%	0.3%
RSA	**Average**	**2.0%**	**1.7%**	**1.6%**	**1.4%**	**-0.1%**	**1.2%**	**0.1%**	**0.8%**

Source: NATMAP EMME2 Transport Demand Model

The anticipated Average Daily Traffic (per direction) growth based on the growth rates from the Demand Model are shown in **Figure 7.3.B.**

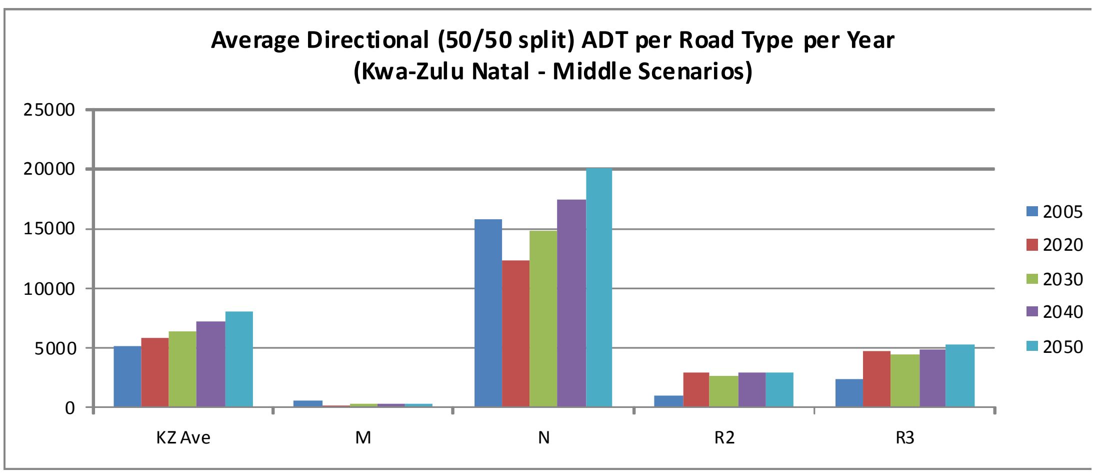


Figure 7.3.B: Average Directional (50/50 Split) ADT per Road Type per Year

Based on the average growth rates applied from **Table 7.3.B** to the KwaZulu-Natal Province base year traffic volumes (Refer to **Figure 7.3.B**), it is evident that the KwaZulu-Natal Province traffic volumes will increase by 149 percent 2005 to 2050. Between 2005 and 2020 it is projected that the traffic volumes will increase by 37 percent and between 2005 and 2030 by 67 percent.

Table 7.3.C shows the 20 roads with the highest 30th Highest Hourly Volumes (50/50 Directional Split) based on the base year (2005) traffic volumes.

Table 7.3.C: Highest Trafficked Roads within the KwaZulu

Province FONA Network

No.	Route Number	Min	Average	Max
1	N2	203	1736	8131
2	N3	29	2482	8081
3	R620	1534	1534	1534
4	R102	24	600	1212
5	R61	101	559	858
6	R602	285	518	751
7	R103	5	265	736
8	N11	147	408	651
9	R617	71	284	536
10	R34	25	269	485
11	R68	43	225	485
12	R74	92	253	384
13	M13	349	349	349
14	R66	114	147	344
15	R22	9	78	318
16	R621	183	236	297
17	R33	114	174	252
18	R69	43	146	250
19	R616	164	188	237
20	R622	45	98	218

Note: Table shows 30th Highest Hourly Volumes (50/50 Directional Split)

Investigating the traffic growth patterns spatially on **Map 7.3 A** to **Map 7.3.C**, it appears that the highest areas of growth from the Base Year (2005) until 2030 as well from 2030 to 2050, are as follows:

7.3.3.1 National Roads

- Along the N2 from Amanzimtoti to Verulam:
- Along the N2 from Ballito to Mtubatuba;
- Along the N3 from Durban to the Free State border;;
- The N11 between Ladysmith and Elandslaagte and also from Newcastle to the R34 intersection;

7.3.3.2 R2 Provincial Roads

- Along the R 66 between Nkwalini and Melmoth

7.3.3.3 R3 Provincial Roads

- The R617 from Kingscote to Underberg
- The R620 from Port Shepstone to Southbroom

Kwazulu Natal Province: MODELLED TRAFFIC VOLUMES ON ROAD NETWORK (2005 - Base Year)

ROAD NETWORK

BASE YEAR 2005

30th Highest Hourly Directional Traffic Volumes

- 5 - 1 000
- 1 001 - 2 500
- 2 501 - 6 000
- 6 001 - 15 000
- 15 001 - 20 000

*** Note: Volumes represented in vehicles per hour per direction**

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

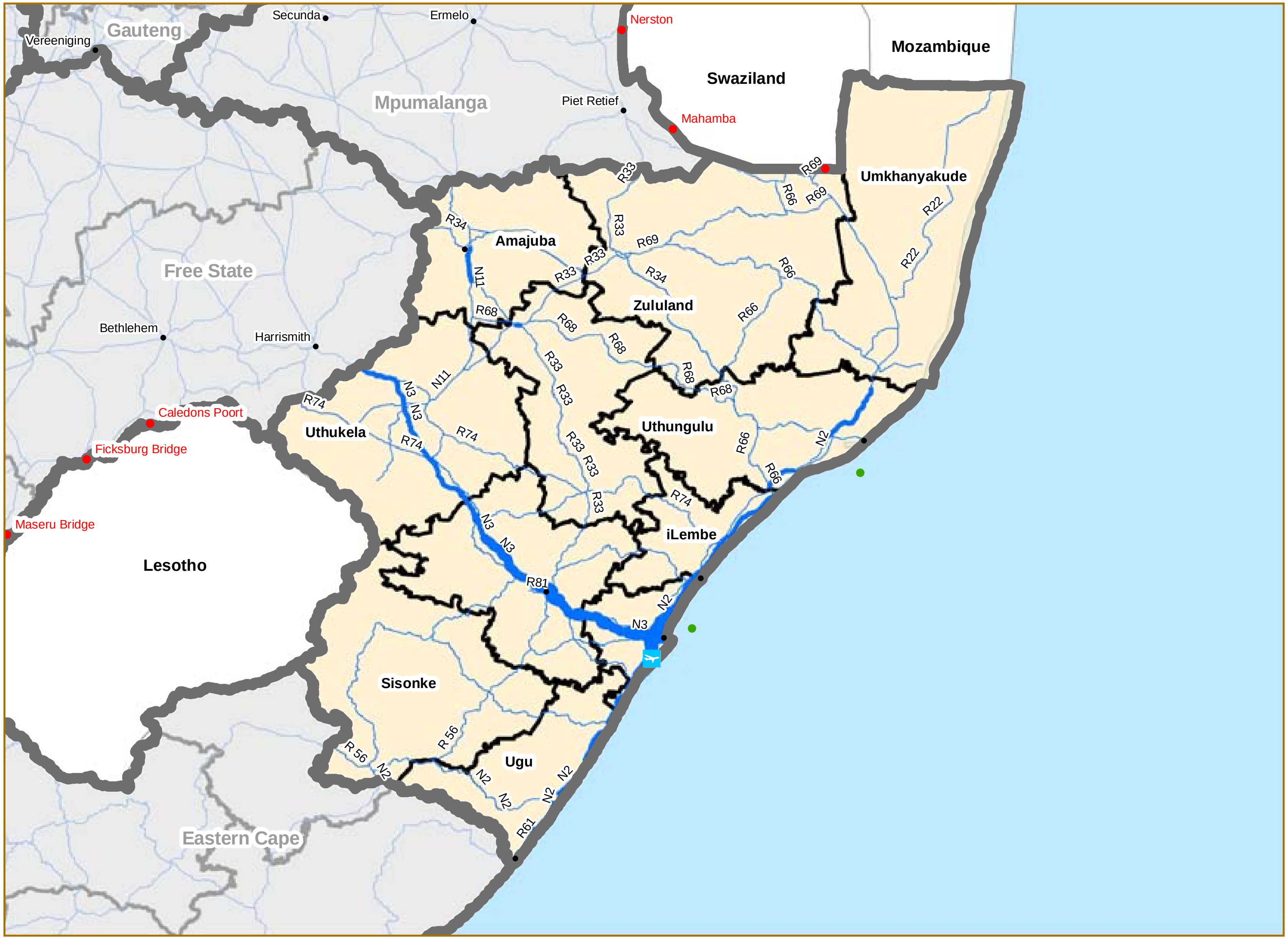
Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

MAP 7.3A Modelled Traffic Volumes on Road Network 2005 Base Year

Kwazulu Natal Province: MODELLED TRAFFIC VOLUMES ON ROAD NETWORK (2030 - Middle Scenario)



ROAD NETWORK

MIDDLE SCENARIO 2030

30th Highest Hourly Directional Traffic Volumes

- 9 - 1 000
- 1 001 - 2 500
- 2 501 - 6 000
- 6 001 - 15 000
- 15 001 - 20 000

*** Note: Volumes represented in vehicles per hour per direction**

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

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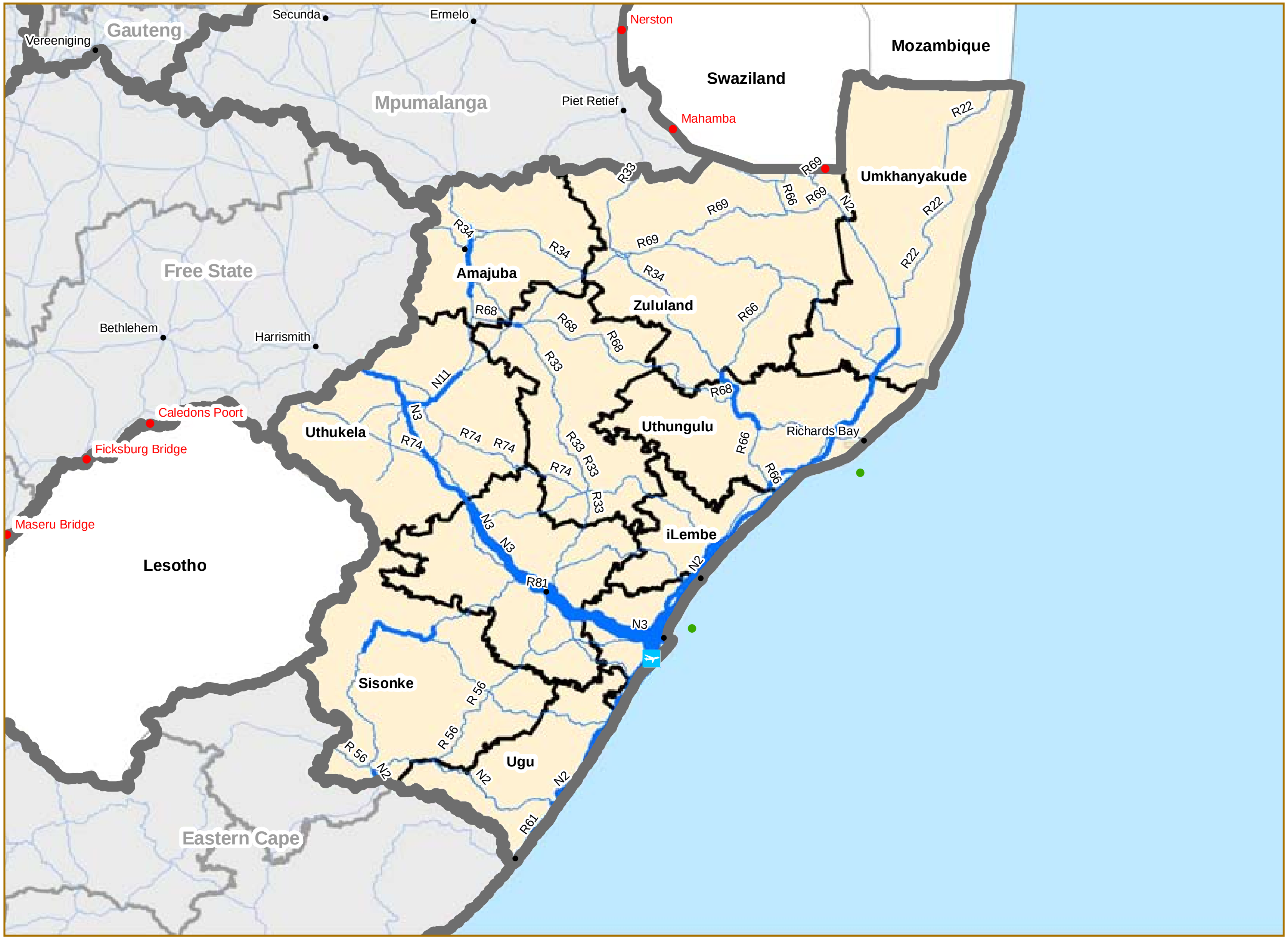
MAP 7.3B Modelled Traffic Volumes on Road Network 2030 Middle Scenario

Kwazulu Natal Province: MODELLED TRAFFIC VOLUMES ON ROAD NETWORK (2050 - Middle Scenario)



ROAD NETWORK

MIDDLE SCENARIO 2050

30th Highest Hourly Directional Traffic Volumes

- 13 - 1 000
- 1 001 - 2 500
- 2 501 - 6 000
- 6 001 - 15 000
- 15 001 - 20 000

*** Note: Volumes represented in vehicles per hour per direction**

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

MAP 7.3C Modelled Traffic Volumes on Road Network 2050 Middle Scenario

7.3.4 "Do Nothing Scenario" – Future Capacity Constraints

7.3.4.1 Capacity Utilisation for Future Years

A Level of Service calculation was undertaken for all links for the KwaZulu-Natal Province FONA road network for the following scenarios:

- 2005 Base Year (Refer to **Figure 7.3.C** and **Table 7.3.D**)
- 2030 Middle Growth Scenario (Refer to **Figure 7.3.D** and **Table 7.3.D**)
- 2050 Middle Growth Scenario (Refer to **Figure 7.3.E** and Table 7.3.D)

The calculations were undertaken according to the HCM 2000 single and multi-lane freeway segment analysis methodology, assuming a 30% crawl speed for all heavy vehicles on steep downgrades on the road network.

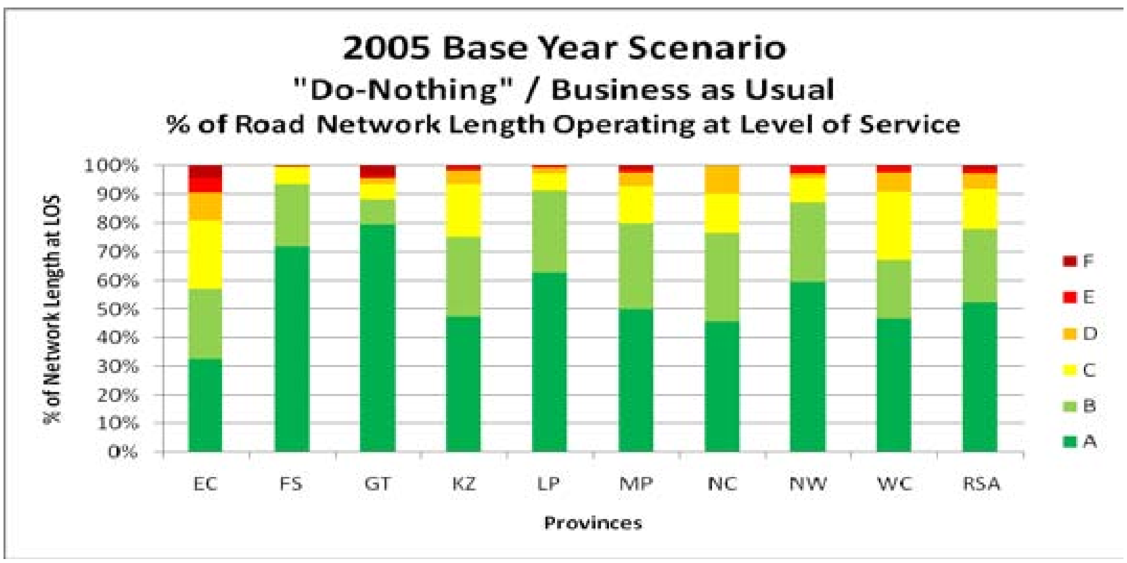


Figure 7.3.C: 2005 Base Year - % of Road Network Operating at LOS

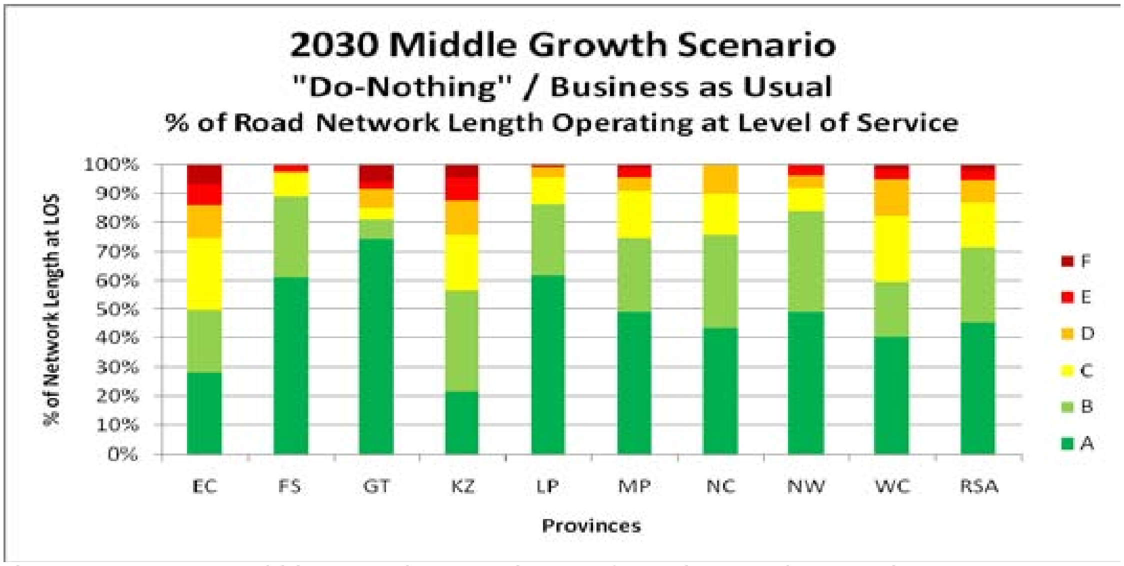


Figure 7.3.D: 2030 Middle Growth Scenario - % of Road Network Operating at LOS

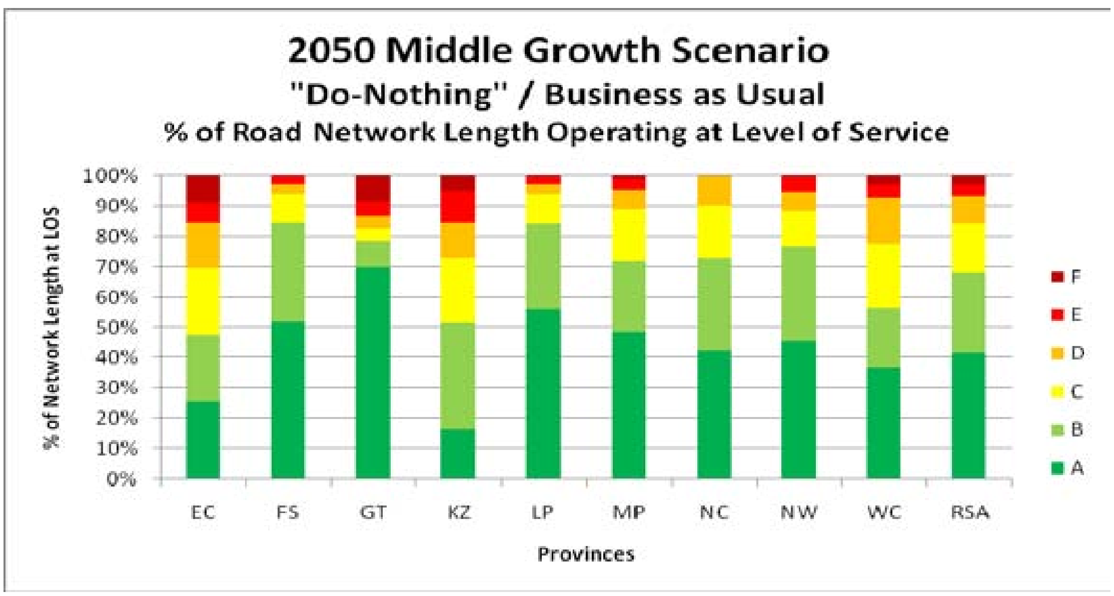


Figure 7.3.E: 2050 Middle Growth Scenario - % of Road Network Operating at LOS

Table 7.3.D: % Road Network per LOS Class per Year (Middle Scenario)

Scenarios	Level of Service						Total
	A	B	C	D	E	F	
KZN 2005	36.4	23.8	28.4	9.1	1.7	0.6	100
KZN 2030	18.5	26.5	27.6	14.5	9.8	3	100
KZN 2050	13	21.3	21.2	18.7	20.4	5.4	100

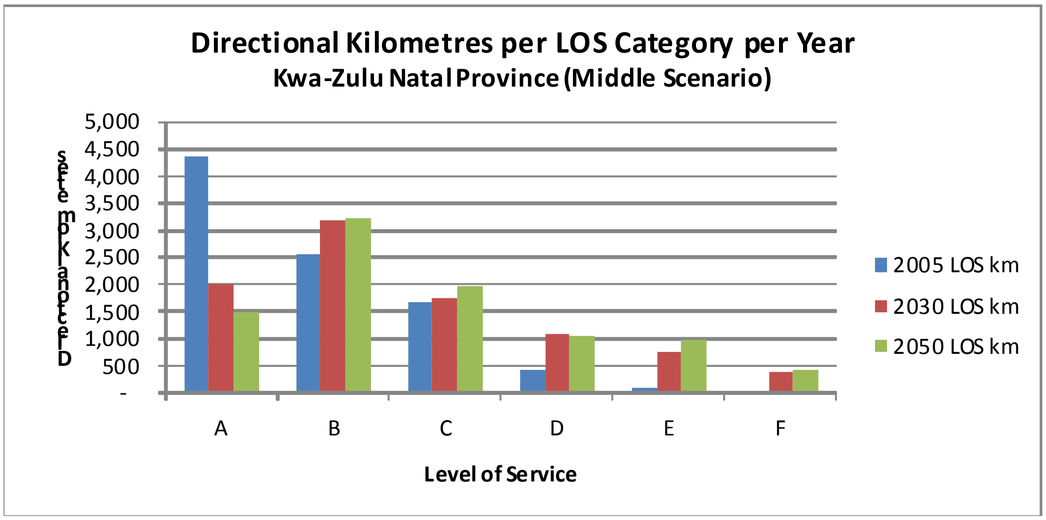


Figure 7.3.F: Directional Kilometres per LOS Category per Year for the KwaZulu-Natal Province (Middle Scenario)

The results of this capacity analysis in also presented spatially on the following maps:

- 2005 Base Year (Refer to ***Map 7.3. D***)
- 2030 Middle Growth Scenario (Refer to ***Map 7.3.E***)
- 2050 Middle Growth Scenario (Refer to ***Map 7.3.F***)

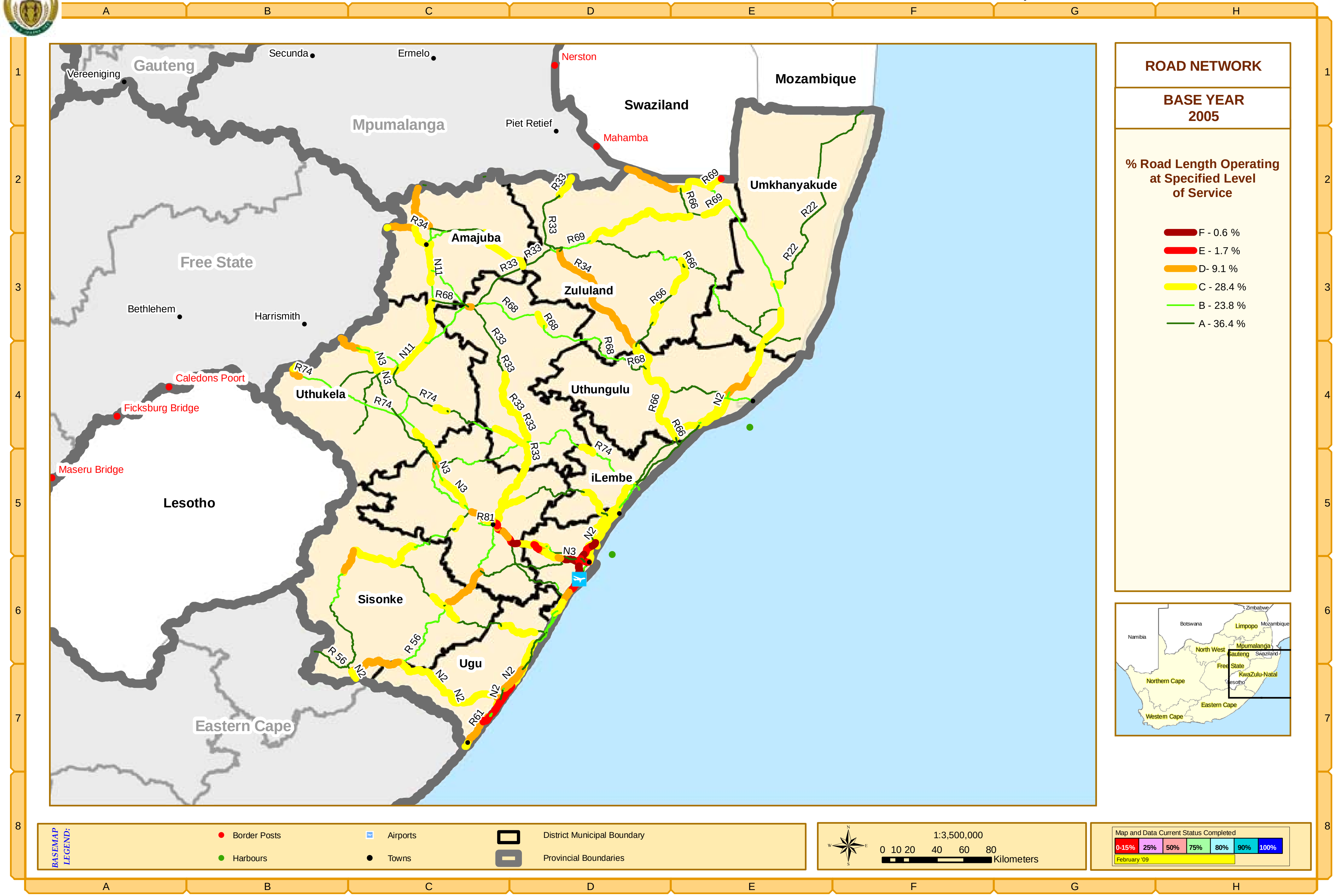
Based on the LOS analysis the following observations can be made:

- The percentage of roads operating at LOS A reduces from 36.4% in the base year (2005) to 18.5% in 2030 and to 13% in 2050.
- The percentage of roads operating at LOS B increases from 23.8% in the base year (2005) to 26.5% in 2030 and decrease again to 21.3% in 2050.
- The percentage of roads operating at LOS C decreases from 28.4% in the base year (2005) to 27.6% in 2030 and to 21.2% in 2050.
- The percentage of roads operating at LOS D increases from 9.1% in the base year (2005) to 14.5% in 2030 and to 18.7% in 2050

- The percentage of roads operating at LOS E increases from 1.7% in the base year (2005) to 9.8% in 2030 and then to 20.4% in 2050
- The percentage of roads operating at LOS F increases from 0.6% in the base year (2005) to 3% in 2030 and to 5.4% in 2050

The percentage of roads operating at LOS A to LOS C decreases over time whereas all the other increase which indicates that the roads across the board will deteriorate over time.

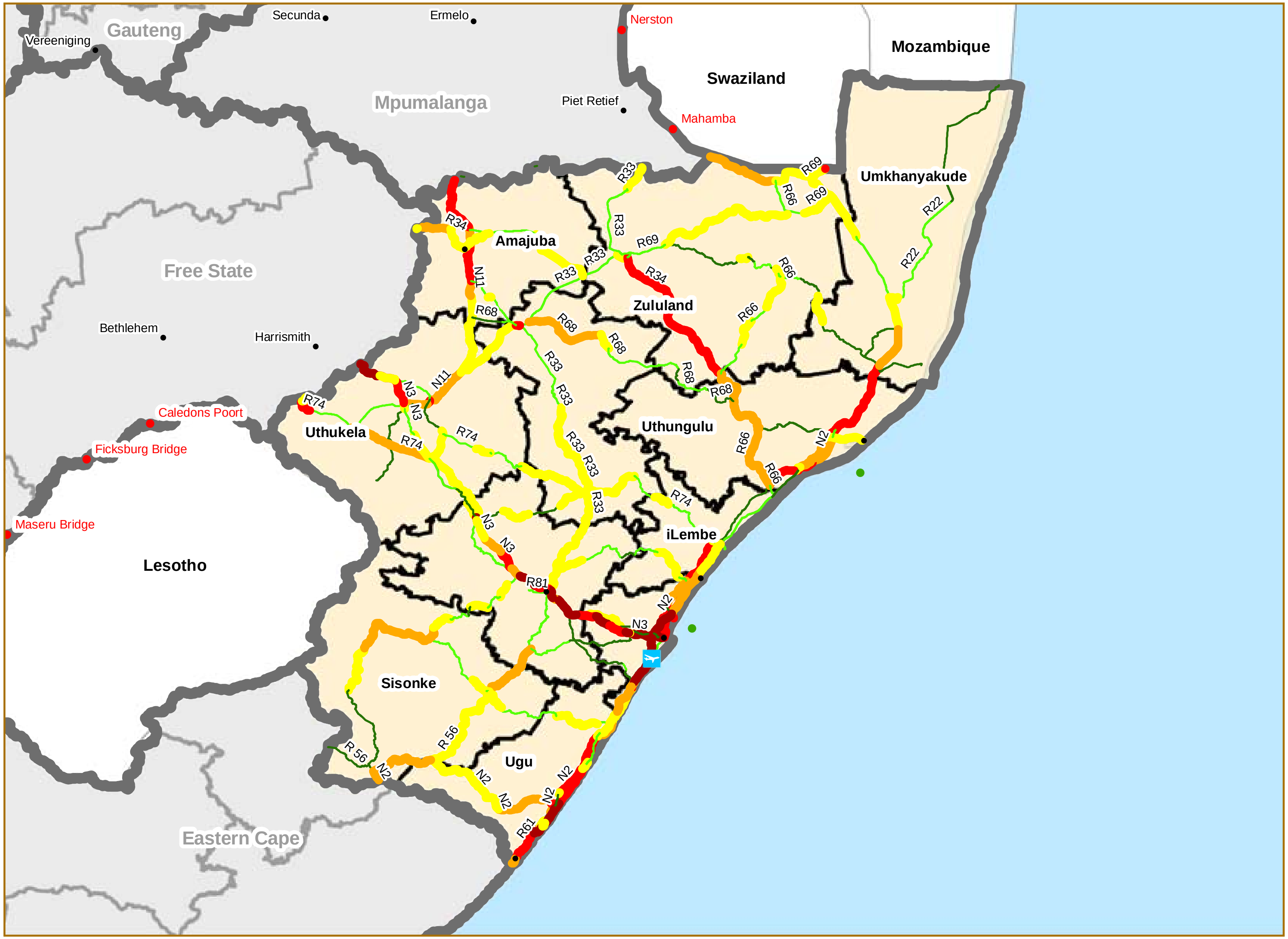
Kwazulu Natal Province: LEVEL OF SERVICE ON ROAD NETWORK (2005 BASE YEAR)



NATIONAL TRANSPORT MASTERPLAN 2050

MAP 7.3D Level of Service on Road Network 2005 Base Year

Kwazulu Natal Province: LEVEL OF SERVICE ON ROAD NETWORK (2030 MIDDLE SCENARIO)



ROAD NETWORK

MIDDLE SCENARIO 2030

% Road Length Operating at Specified Level of Service

- F - 3.0 %
- E - 9.8 %
- D - 14.5 %
- C - 27.6 %
- B - 26.5 %
- A - 18.5 %

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

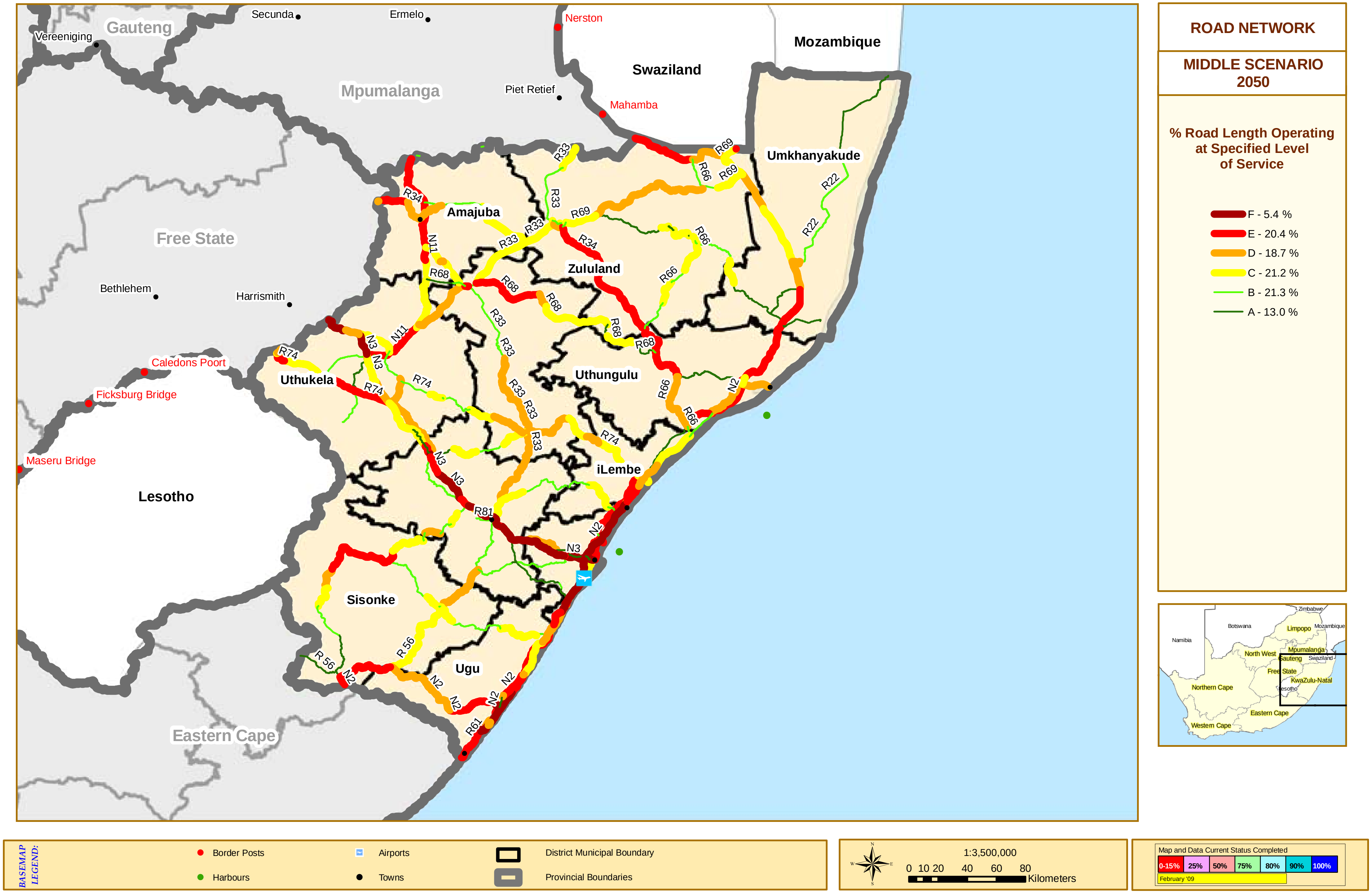
Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

MAP 7.3E Level of Service on Road Network 2030 Middle Scenario

Kwazulu Natal Province: LEVEL OF SERVICE ON ROAD NETWORK (2050 MIDDLE SCENARIO)



MAP 7.3F Level of Service on Road Network 2050 Middle Scenario

7.3.4.2 *Upgrading Required for Future Years*

In order to determine the upgrade requirements for future years, a Level of Service calculation was undertaken for all links for the KwaZulu-Natal FONA road network to determine the following:

- The LOS in the target year (selected target year was 2025);
- The estimated vehicular flow at which a threshold/target LOS of "D" will be reached for each roadway segment analysed;
- The year during which the threshold/target LOS D will be reached assuming no upgrades and an assumed traffic growth rate of 2%;
- The number of additional lanes required per direction in order to achieve/maintain the threshold/target LOS D for each road segment analysed;
- The LOS that will be achieved within the target year assuming that the additional required lanes are provided.

The results from these analyses are shown in **Table 7.3.E** and **Table 7.3.F**.

Table 7.3.E: % Road Length Exceeding LOS D (2% traffic growth) by Province by Year

	Provinces									
Years	EC	FS	GT	KZ	LP	MP	NC	NW	WC	RSA
2005	2.0%	0.1%	34.0%	3.1%	4.5%	4.4%	0.0%	4.3%	7.3%	4.5%
2006	0.0%	0.0%	1.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.4%	0.1%
2007	0.1%	0.0%	0.8%	0.1%	0.1%	0.0%	0.0%	0.1%	0.2%	0.1%
2008	0.0%	0.0%	0.7%	0.1%	0.0%	0.5%	0.0%	0.0%	0.1%	0.1%
2009	0.0%	0.0%	0.6%	0.1%	0.0%	0.0%	0.0%	0.2%	2.4%	0.3%
2010	0.0%	0.0%	0.6%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%
2011	0.0%	0.0%	2.4%	2.3%	0.1%	0.0%	0.0%	0.7%	0.4%	0.4%
2012	0.0%	0.0%	1.8%	0.2%	0.1%	0.0%	0.0%	0.3%	0.0%	0.2%
2013	0.0%	0.1%	0.0%	0.4%	0.5%	0.4%	0.0%	0.4%	0.1%	0.2%
2014	0.0%	0.0%	0.1%	0.3%	0.0%	0.0%	0.0%	0.2%	0.4%	0.1%
2015	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.1%	0.3%	0.1%
2016	0.0%	0.0%	0.2%	0.3%	0.0%	1.6%	0.0%	0.1%	0.9%	0.3%
2017	0.1%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
2018	0.1%	0.0%	0.7%	0.0%	0.0%	0.2%	0.0%	0.3%	0.0%	0.1%
2019	0.0%	0.0%	0.5%	0.2%	1.2%	0.5%	0.0%	0.4%	0.2%	0.3%
2020	0.0%	0.0%	0.5%	0.2%	0.3%	0.4%	0.0%	0.0%	0.0%	0.1%
2021	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.2%	2.2%	0.3%
2022	0.0%	0.9%	0.3%	0.7%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%
2023	0.4%	0.1%	0.7%	0.3%	0.1%	0.1%	0.0%	0.2%	0.1%	0.2%
2024	0.0%	0.2%	0.8%	2.2%	3.4%	0.2%	0.0%	0.1%	0.1%	0.6%
2025	0.0%	0.0%	0.8%	0.3%	1.4%	0.7%	0.0%	0.1%	0.2%	0.3%
2026	0.0%	0.0%	0.3%	0.7%	0.0%	0.5%	0.0%	0.2%	0.2%	0.2%
2027	0.1%	0.7%	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
2028	0.0%	0.0%	1.4%	0.9%	0.4%	0.2%	0.0%	0.0%	0.0%	0.2%
2029	0.2%	0.0%	1.5%	0.3%	0.5%	0.0%	0.0%	0.5%	0.6%	0.3%
2030	0.0%	0.0%	0.7%	0.3%	0.0%	0.2%	0.0%	0.1%	0.5%	0.1%
2031	0.0%	0.0%	0.8%	1.0%	0.0%	0.2%	0.0%	0.0%	0.5%	0.2%
2032	0.2%	0.1%	0.8%	0.8%	0.2%	0.2%	0.0%	1.3%	2.7%	0.6%
2033	0.3%	0.8%	0.6%	0.7%	0.4%	0.6%	0.0%	0.6%	2.8%	0.7%
2034	0.4%	0.0%	0.3%	1.0%	0.6%	0.3%	0.0%	0.1%	0.2%	0.3%
2035	0.1%	0.0%	0.9%	1.1%	0.0%	1.3%	0.0%	0.0%	0.1%	0.3%
2036	0.2%	0.0%	0.3%	0.1%	0.3%	0.1%	0.0%	0.2%	0.0%	0.1%
2037	0.0%	0.0%	0.4%	0.2%	0.3%	0.0%	0.0%	0.4%	0.2%	0.1%
2038	0.5%	0.1%	0.7%	0.3%	0.2%	1.4%	0.0%	0.0%	0.0%	0.3%
2039	0.7%	0.4%	0.5%	0.8%	0.8%	0.6%	1.5%	0.4%	1.0%	0.8%
2040	0.2%	0.0%	1.3%	0.2%	0.1%	0.5%	0.0%	0.3%	0.6%	0.3%
2041	0.2%	0.0%	0.8%	1.4%	0.0%	0.2%	0.0%	0.5%	0.7%	0.3%
2042	0.0%	1.2%	0.4%	0.7%	0.1%	0.1%	0.0%	0.1%	0.1%	0.3%
2043	0.0%	0.8%	0.3%	1.1%	0.0%	0.5%	0.0%	0.4%	1.0%	0.4%
2044	0.7%	0.5%	0.8%	0.3%	3.0%	2.5%	0.0%	0.1%	0.2%	0.8%
2045	0.0%	0.1%	0.5%	0.0%	0.1%	0.8%	0.0%	0.1%	0.7%	0.2%
2046	0.1%	0.0%	0.2%	0.2%	0.2%	0.0%	0.0%	0.0%	0.5%	0.1%
2047	0.0%	0.0%	0.3%	0.3%	1.5%	0.1%	0.0%	0.3%	0.8%	0.3%
2048	0.0%	0.2%	1.0%	3.2%	0.7%	0.0%	0.0%	0.4%	0.0%	0.5%
2049	0.0%	0.1%	1.8%	0.0%	0.2%	0.4%	0.0%	0.7%	0.1%	0.2%
2050	0.7%	0.0%	0.5%	0.7%	0.4%	0.4%	0.0%	0.1%	0.6%	0.3%
>2050	92.4%	93.3%	33.7%	71.6%	77.9%	79.5%	98.5%	84.9%	70.5%	83.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 7.3.F: % Road Length Exceeding LOS D (2% Traffic Growth) Requiring Lane Additions by Province by Year

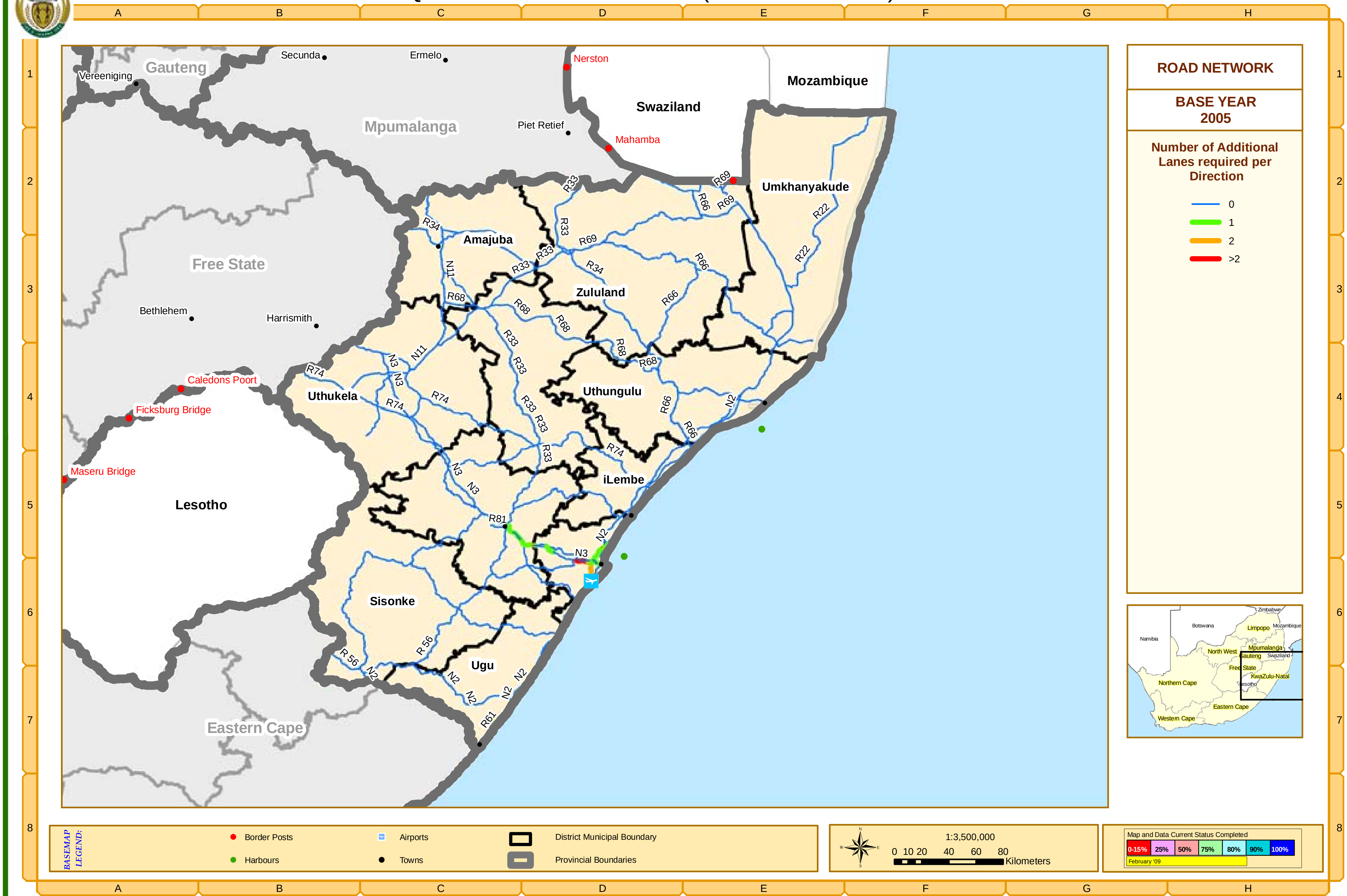
	Eastern Cape				Free State				Gauteng					Kwa-Zulu Natal				
Years	0	1	2	Tot	0	1	2	Tot	0	1	2	3	Tot	0	1	2	3	Tot
2005	0.0%	2.0%	0.0%	2.0%	0.0%	0.1%	0.0%	0.1%	0.0%	6.1%	9.6%	18.4%	34.0%	0.0%	1.5%	0.0%	1.6%	3.1%
2006	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.4%	0.0%	1.0%	0.0%	0.0%	0.0%	0.1%	0.1%
2007	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.1%	0.2%	0.8%	0.0%	0.0%	0.0%	0.1%	0.1%
2008	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.1%	0.1%	0.7%	0.0%	0.1%	0.0%	0.0%	0.1%
2009	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.1%	0.0%	0.6%	0.0%	0.1%	0.0%	0.0%	0.1%
2010	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
2011	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.1%	0.2%	2.4%	0.0%	2.2%	0.0%	0.1%	2.3%
2012	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.1%	0.4%	1.8%	0.0%	0.0%	0.0%	0.2%	0.2%
2013	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.4%
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.2%	0.1%	0.0%	0.3%
2015	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%
2016	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.3%
2017	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.4%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%
2018	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.2%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
2019	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.2%	0.0%	0.2%
2020	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.4%	0.0%	0.5%	0.0%	0.0%	0.2%	0.0%	0.2%
2021	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.4%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
2022	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.9%	0.0%	0.1%	0.2%	0.0%	0.3%	0.0%	0.5%	0.1%	0.0%	0.7%
2023	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.1%	0.1%	0.0%	0.5%	0.2%	0.0%	0.7%	0.0%	0.2%	0.2%	0.0%	0.3%
2024	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.6%	0.2%	0.0%	0.8%	0.0%	2.1%	0.1%	0.0%	2.2%
2025	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.4%	0.0%	0.8%	0.0%	0.3%	0.0%	0.0%	0.3%
2026	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.7%	0.0%	0.0%	0.7%
2027	0.0%	0.1%	0.0%	0.1%	0.0%	0.7%	0.0%	0.7%	0.0%	0.2%	0.1%	0.0%	0.4%	0.0%	0.6%	0.1%	0.0%	0.7%
2028	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.7%	0.0%	1.4%	0.0%	0.9%	0.0%	0.0%	0.9%
2029	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	1.5%	0.0%	0.3%	0.0%	0.0%	0.3%
2030	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.7%	0.0%	0.3%	0.0%	0.0%	0.3%
2031	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.8%	0.0%	1.0%	0.0%	0.0%	1.0%
2032	0.0%	0.2%	0.0%	0.2%	0.0%	0.1%	0.0%	0.1%	0.0%	0.8%	0.0%	0.0%	0.8%	0.0%	0.8%	0.0%	0.0%	0.8%
2033	0.0%	0.3%	0.0%	0.3%	0.0%	0.8%	0.0%	0.8%	0.0%	0.6%	0.1%	0.0%	0.6%	0.0%	0.7%	0.0%	0.0%	0.7%
2034	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	1.0%	0.0%	0.0%	1.0%
2035	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.9%	0.0%	1.1%	0.0%	0.0%	1.1%
2036	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.1%	0.0%	0.0%	0.1%
2037	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.4%	0.0%	0.2%	0.0%	0.0%	0.2%
2038	0.0%	0.5%	0.0%	0.5%	0.0%	0.1%	0.0%	0.1%	0.0%	0.7%	0.0%	0.0%	0.7%	0.0%	0.3%	0.0%	0.0%	0.3%
2039	0.0%	0.7%	0.0%	0.7%	0.0%	0.4%	0.0%	0.4%	0.0%	0.5%	0.0%	0.0%	0.5%	0.0%	0.8%	0.0%	0.0%	0.8%
2040	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	1.3%	0.0%	0.2%	0.0%	0.0%	0.2%
2041	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.8%	0.9%	0.6%	0.0%	0.0%	1.4%
2042	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	1.2%	0.0%	0.4%	0.0%	0.0%	0.4%	0.0%	0.7%	0.0%	0.0%	0.7%
2043	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.8%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	1.1%	0.0%	0.0%	1.1%
2044	0.5%	0.2%	0.0%	0.7%	0.0%	0.5%	0.0%	0.5%	0.0%	0.8%	0.0%	0.0%	0.8%	0.0%	0.3%	0.0%	0.0%	0.3%
2045	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.5%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
2046	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.2%
2047	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.3%
2048	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	1.0%	0.0%	0.0%	1.0%	1.0%	2.1%	0.0%	0.0%	3.2%
2049	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	1.8%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%
2050	0.7%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.5%	0.7%	0.0%	0.0%	0.0%	0.7%
>2050	91.7%	0.6%	0.0%	92.4%	93.3%	0.0%	0.0%	93.3%	33.7%	0.0%	0.0%	0.0%	33.7%	71.6%	0.0%	0.0%	0.0%	71.6%
Grand Total	93.2%	6.7%	0.1%	100.0%	93.4%	6.5%	0.1%	100.0%	36.2%	29.6%	14.8%	19.3%	100.0%	74.2%	22.3%	1.4%	2.1%	100.0%

	Limpopo				Mpumalanga				Northern Cape			North West				Western Cape					
Years	0	1	2	Tot	0	1	2	Tot	0	1	Tot	0	1	2	Tot	0	1	2	3	Tot	RSA
2005	0.0%	4.4%	0.1%	4.5%	0.0%	4.3%	0.1%	4.4%	0.0%	0.0%	0.0%	0.0%	3.2%	1.1%	4.3%	0.0%	3.5%	2.4%	1.4%	7.3%	4.5%
2006	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.1%	0.4%	0.1%
2007	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.2%	0.1%
2008	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%
2009	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	2.3%	0.0%	0.1%	2.4%	0.3%
2010	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
2011	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.7%	0.0%	0.3%	0.0%	0.2%	0.4%	0.4%
2012	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
2013	0.0%	0.5%	0.0%	0.5%	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	0.1%	0.0%	0.0%	0.1%	0.2%
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.3%	0.1%	0.0%	0.4%	0.1%
2015	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.1%	0.0%	0.3%	0.1%
2016	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.9%	0.0%	0.0%	0.9%	0.3%
2017	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%
2018	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
2019	0.0%	1.2%	0.0%	1.2%	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	0.2%	0.0%	0.0%	0.2%	0.3%
2020	0.0%	0.3%	0.0%	0.3%	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
2021	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	2.1%	0.0%	0.0%	2.2%	0.3%
2022	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.1%	0.0%	0.1%	0.2%
2023	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.1%	0.2%
2024	0.0%	3.4%	0.0%	3.4%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.6%
2025	0.0%	1.4%	0.0%	1.4%	0.0%	0.7%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.2%	0.3%
2026	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.1%	0.1%	0.0%	0.2%	0.2%
2027	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
2028	0.0%	0.4%	0.0%	0.4%	0.0%	0.1%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
2029	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	0.6%	0.0%	0.0%	0.6%	0.3%
2030	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.5%	0.0%	0.0%	0.5%	0.1%
2031	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%	0.2%
2032	0.0%	0.2%	0.0%	0.2%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	1.3%	0.0%	2.7%	0.0%	0.0%	2.7%	0.6%
2033	0.0%	0.4%	0.0%	0.4%	0.0%	0.6%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.6%	0.0%	2.8%	0.0%	0.0%	2.8%	0.7%
2034	0.0%	0.6%	0.0%	0.6%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.2%	0.3%
2035	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.3%
2036	0.0%	0.3%	0.0%	0.3%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
2037	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	0.2%	0.0%	0.0%	0.2%	0.1%
2038	0.0%	0.2%	0.0%	0.2%	0.0%	1.4%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
2039	0.0%	0.8%	0.0%	0.8%	0.0%	0.6%	0.0%	0.6%	0.0%	1.5%	1.5%	0.0%	0.4%	0.0%	0.4%	0.0%	1.0%	0.0%	0.0%	1.0%	0.8%
2040	0.0%	0.1%	0.0%	0.1%	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.6%	0.0%	0.0%	0.6%	0.3%
2041	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	0.7%	0.0%	0.0%	0.7%	0.3%
2042	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.3%
2043	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	1.0%	0.0%	0.0%	1.0%	0.4%
2044	0.0%	3.0%	0.0%	3.0%	0.0%	2.5%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.2%	0.8%
2045	0.0%	0.1%	0.0%	0.1%	0.0%	0.8%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.7%	0.0%	0.0%	0.7%	0.2%
2046	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.5%	0.1%
2047	1.0%	0.6%	0.0%	1.5%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.8%	0.0%	0.0%	0.8%	0.3%
2048	0.0%	0.7%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
2049	0.0%	0.2%	0.0%	0.2%	0.4%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.7%	0.1%	0.0%	0.0%	0.0%	0.1%	0.2%
2050	0.4%	0.0%	0.0%	0.4%	0.4%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.6%	0.0%	0.0%	0.0%	0.6%	0.3%
>2050	77.9%	0.0%	0.0%	77.9%	79.5%	0.0%	0.0%	79.5%	95.7%	2.9%	98.5%	84.9%	0.0%	0.0%	84.9%	70.2%	0.3%	0.0%	0.0%	70.5%	83.0%
Grand Total	79.3%	20.6%	0.1%	100.0%	80.2%	19.6%	0.2%	100.0%	95.7%	4.3%	100.0%	86.1%	12.8%	1.1%	100.0%	71.1%	24.1%	3.0%	1.9%	100.0%	100.0%

Based on the Target LOS analysis and the additional lane requirement calculations the following observations can be made:

- The majority (71.6%) of the KwaZulu Natal roads only reach or exceed the Target LOS “D” beyond the horizon year of 2050. The Target LOS “D” is reached according to the following date groupings:
    - 1.5% of the KZN road network reached or exceeded LOS “D” in 2005 and would require 1 lane (per direction) to be added to them
    - 1.6% of the KZN road network reached or exceeded LOS “D” in 2005 and would require 3 lane (per direction) to be added to them
    - The remaining 25.3% of the remainingKwaZulu Natal road network reaches or exceeds LOS “D” between 2006 and 2050
- Lane additions are warranted once LOS “D” is exceeded. The zero (0) lane requirement field in Table 7.3.F: % Road Length Exceeding LOS D (2% Traffic Growth) Requiring Lane Additions by Province by Year indicates that capacity utilisation is approaching LOS D.

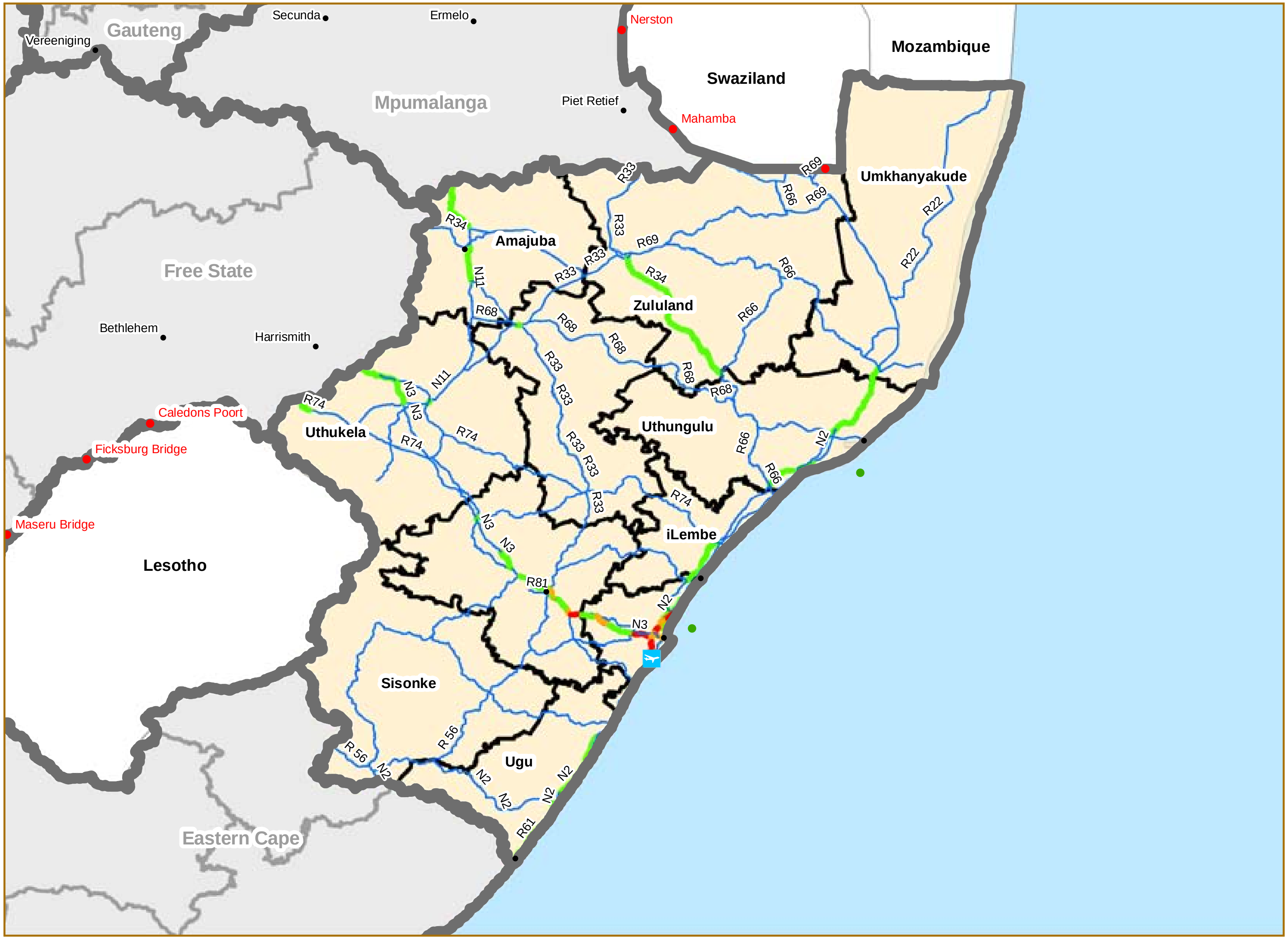
Kwazulu Natal Province: REQUIRED LANE ADDITIONS (2005 - Base Year)



NATIONAL TRANSPORT MASTERPLAN 2050

MAP 7.3G Required Lane Additions 2005 Base Year

Kwazulu Natal Province: REQUIRED LANE ADDITIONS (2030 - Middle Scenario)



ROAD NETWORK

MIDDLE SCENARIO 2030

Number of Additional Lanes required per Direction

- 0
- 1
- 2
- >2

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

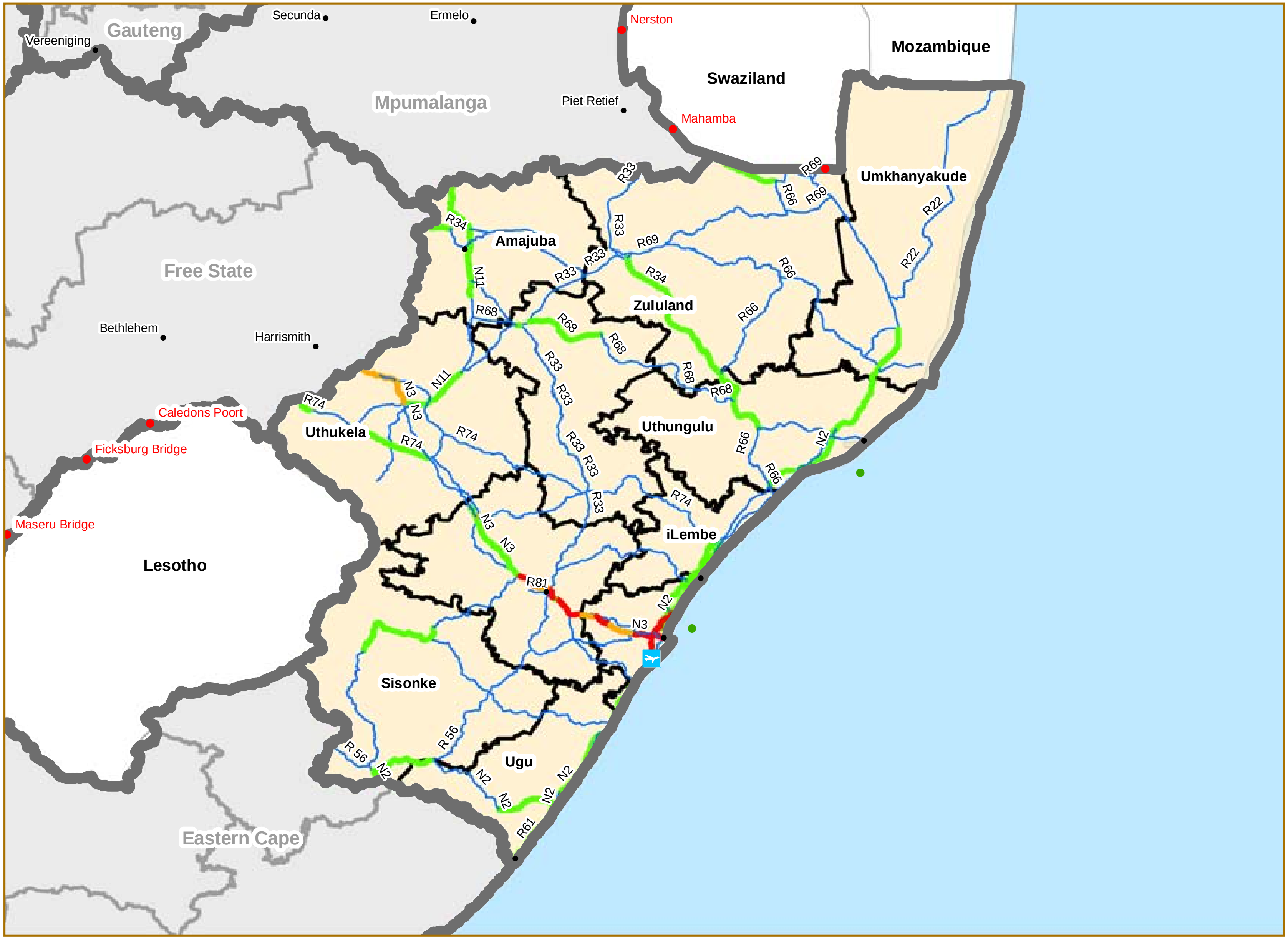
Map and Data Current Status Completed

0-15% | 25% | 50% | 75% | 80% | 90% | 100%

February '09

MAP 7.3H Required Lane Additions 2030 Middle Scenario

Kwazulu Natal Province: REQUIRED LANE ADDITIONS (2050 - Middle Scenario)



ROAD NETWORK

MIDDLE SCENARIO 2050

Number of Additional Lanes required per Direction

- 0
- 1
- 2
- >2

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

MAP 7.3I Required Lane Additions 2050 Middle Scenario

7.3.5 "Alternative Strategies" – Evaluation of Strategies

In order to test the impact of alternative strategies on the road network capacity both now (2005) and in the horizon year (2050), the FONA model was again applied. For the purpose of simplicity three National corridors were selected and tested in terms of the relationship between the strategy being implemented and the possible outcomes in terms of network or corridor operational efficiency (i.e. Level of Service). The following corridors were selected in their entirety:

- National Route N1;
- National Route N3 and
- National Route N4

The following alternative strategies were tested with regards to their impact on network operational efficiency (estimated by means of LOS) and the sensitivity with regards to the reduction in additional lane requirements in future years:

- Reduce Freight Volumes on Road Network;
- Reduce Private Vehicle Volumes on Road Network and
- Combination of Private Vehicle and Freight Reduction on Road Network

7.3.5.1 Reduce Freight Volumes on Road Network

Given that the FONA model follows a very strategic approach to modelling network utilization and hence network operational efficiency, the reduction of freight from the road network was simulated by simply reducing the percentage heavy vehicles on each corridor by 10%. This reduction was under the assumption that the freight volumes would have shifted to alternative non-road based freight modes such as rail or pipelines. Although strictly speaking a 10% freight volume does not necessarily equate to a 10% reduction in heavy vehicles (as this is largely dependent on the commodity being transported), this simplistic approach was applied to show the possible trend or relationship between heavy vehicle reduction and effect on network operational efficiency (i.e. Level of Service) and the sensitivity with regards to the reduction in additional lane requirements in future years.

Based on the LOS analysis and the additional lane requirement calculations shown in

In all cases of lane upgrade requirements, primarily vertical percentage changes were observed. The N3 showed the highest vertical percentage change, followed by the N4 and thereafter the N1.

Table 7.3.G the following observations can be made:

- A 10% reduction in heavy vehicle volumes on the N1, N3 and N4 results in the greatest improvement in network operational efficiency on the National Route N3. The percentage of road network operating within LOS A increases by 8.1% in 2005 and by 8.7% in 2050. These percentages are primarily contributed by LOS B and LOS C categories;
- The N1 and N4 corridors also show marginal improvements in network operational efficiency, but these corridors are not nearly as sensitive to reductions in heavy vehicles, than the N3. This sensitivity to heavy vehicle reduction on the National Route N3 can be attributed to the high percentage heavy vehicles operating along this route transporting freight commodities;
- Lane upgrade requirements should be interpreted as follows:
    - Horizontal shifts in percentage change (i.e. where previously two lanes per direction had to be added and now only one lane per direction has to be added) results in a reduced capital investment / expenditure owing to improved and prolonged network operational efficiency.
    - Vertical shifts in percentage change (i.e. where previously a one lane per direction upgrade on 2% of the road network resulted in a LOS B network operational efficiency and now a one lane per direction upgrade on 2% of the road network results in a LOS A network operational efficiency) indicates that equal amounts of investment yield better network operating efficiency, in other words, more value for money is achieved;
- In all cases of lane upgrade requirements, primarily vertical percentage changes were observed. The N3 showed the highest vertical percentage change, followed by the N4 and thereafter the N1.

Table 7.3.G: Road Network Performance Impact of Achieving a Road-based Freight Volume Reduction on Strategic Corridors

Do-Nothing / Business as Usual

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**100.0%**	**100.0%**	**81.6%**	**15.9%**	**0.0%**	**2.5%**	**100.0%**
A	29.5%	10.0%	10.0%	1.6%	0.0%	0.0%	11.5%
B	34.7%	24.9%	24.9%	8.6%	0.0%	0.0%	33.5%
C	27.0%	24.1%	24.1%	1.1%	0.0%	0.0%	25.2%
D	3.5%	22.6%	22.6%	1.0%	0.0%	0.0%	23.6%
E	2.7%	11.2%	0.0%	0.5%	0.0%	0.2%	0.6%
F	2.6%	7.2%	0.0%	3.3%	0.0%	2.3%	5.6%
N3	**100.0%**	**100.0%**	**71.0%**	**24.7%**	**0.0%**	**4.2%**	**100.0%**
A	59.2%	15.7%	15.7%	0.0%	0.0%	0.0%	15.7%
B	25.1%	24.3%	24.3%	0.0%	0.0%	0.0%	24.3%
C	7.4%	16.0%	16.0%	2.5%	0.0%	0.0%	18.5%
D	4.7%	15.1%	15.1%	14.5%	0.0%	0.0%	29.6%
E	3.2%	12.9%	0.0%	2.0%	0.0%	0.3%	2.3%
F	0.4%	16.0%	0.0%	5.7%	0.0%	3.9%	9.6%
N4	**100.0%**	**100.0%**	**68.4%**	**30.5%**	**1.1%**	**0.0%**	**100.0%**
A	40.4%	21.9%	21.9%	1.4%	0.0%	0.0%	23.2%
B	23.7%	12.9%	12.9%	15.4%	0.0%	0.0%	28.3%
C	15.2%	19.9%	19.9%	8.7%	0.0%	0.0%	28.6%
D	17.5%	13.8%	13.8%	4.3%	0.4%	0.0%	18.5%
E	3.1%	19.9%	0.0%	0.1%	0.7%	0.0%	0.8%
F	0.1%	11.7%	0.0%	0.7%	0.0%	0.0%	0.7%
TOTAL	**100.0%**	**100.0%**	**76.5%**	**21.1%**	**0.3%**	**2.2%**	**100.0%**

10% Reduction in Heavy Vehicles

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**100.0%**	**100.0%**	**81.8%**	**15.7%**	**0.0%**	**2.5%**	**100.0%**
A	32.5%	10.0%	10.0%	3.9%	0.0%	0.0%	13.8%
B	33.8%	25.1%	25.1%	6.2%	0.0%	0.0%	31.3%
C	24.9%	25.8%	25.8%	1.4%	0.0%	0.0%	27.2%
D	3.5%	20.9%	20.9%	0.6%	0.0%	0.0%	21.6%
E	2.7%	11.2%	0.0%	0.4%	0.0%	0.2%	0.6%
F	2.6%	7.0%	0.0%	3.2%	0.0%	2.3%	5.5%
N3	**100.0%**	**100.0%**	**73.1%**	**22.6%**	**0.0%**	**4.2%**	**100.0%**
A	67.3%	24.4%	24.4%	0.0%	0.0%	0.0%	24.4%
B	18.1%	18.2%	18.2%	0.0%	0.0%	0.0%	18.2%
C	6.2%	14.7%	14.7%	8.4%	0.0%	0.0%	23.2%
D	5.6%	15.9%	15.9%	7.5%	0.0%	0.0%	23.4%
E	2.6%	12.2%	0.0%	1.0%	0.0%	0.3%	1.3%
F	0.2%	14.6%	0.0%	5.7%	0.0%	3.9%	9.6%
N4	**100.0%**	**100.0%**	**69.0%**	**30.4%**	**0.7%**	**0.0%**	**100.0%**
A	40.4%	21.9%	21.9%	6.8%	0.0%	0.0%	28.6%
B	23.7%	13.5%	13.5%	11.4%	0.0%	0.0%	24.9%
C	15.2%	19.3%	19.3%	8.4%	0.0%	0.0%	27.7%
D	17.5%	14.3%	14.3%	3.0%	0.7%	0.0%	18.0%
E	3.1%	19.9%	0.0%	0.1%	0.0%	0.0%	0.1%
F	0.1%	11.2%	0.0%	0.7%	0.0%	0.0%	0.7%
TOTAL	**100.0%**	**100.0%**	**77.1%**	**20.6%**	**0.2%**	**2.2%**	**100.0%**

Change Analysis

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**0.0%**	**0.0%**	**0.2%**	**-0.2%**	**0.0%**	**0.0%**	**0.0%**
A	3.1%	0.0%	0.0%	2.3%	0.0%	0.0%	2.3%
B	-0.8%	0.2%	0.2%	-2.4%	0.0%	0.0%	-2.2%
C	-2.2%	1.7%	1.7%	0.3%	0.0%	0.0%	2.0%
D	0.0%	-1.7%	-1.7%	-0.3%	0.0%	0.0%	-2.0%
E	0.0%	-0.1%	0.0%	-0.1%	0.0%	0.0%	-0.1%
F	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
N3	**0.0%**	**0.0%**	**2.1%**	**-2.1%**	**0.0%**	**0.0%**	**0.0%**
A	8.1%	8.7%	8.7%	0.0%	0.0%	0.0%	8.7%
B	-6.9%	-6.1%	-6.1%	0.0%	0.0%	0.0%	-6.1%
C	-1.2%	-1.3%	-1.3%	6.0%	0.0%	0.0%	4.7%
D	0.9%	0.8%	0.8%	-7.0%	0.0%	0.0%	-6.2%
E	-0.6%	-0.7%	0.0%	-1.0%	0.0%	0.0%	-1.0%
F	-0.2%	-1.4%	0.0%	0.0%	0.0%	0.0%	0.0%
N4	**0.0%**	**0.0%**	**0.6%**	**-0.1%**	**-0.4%**	**0.0%**	**0.0%**
A	0.0%	0.0%	0.0%	5.4%	0.0%	0.0%	5.4%
B	0.0%	0.7%	0.7%	-4.0%	0.0%	0.0%	-3.4%
C	0.0%	-0.7%	-0.7%	-0.3%	0.0%	0.0%	-0.9%
D	0.0%	0.6%	0.6%	-1.2%	0.2%	0.0%	-0.4%
E	0.0%	-0.1%	0.0%	0.0%	-0.7%	0.0%	-0.7%
F	0.0%	-0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL	**0.0%**	**0.0%**	**0.6%**	**-0.5%**	**-0.1%**	**0.0%**	**0.0%**

Table 7.3.H: Road Network Performance Impact of Achieving a Private Vehicle Volume Reduction on Strategic Corridors

Do-Nothing / Business as Usual

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**100.0%**	**100.0%**	**81.6%**	**15.9%**	**0.0%**	**2.5%**	**100.0%**
A	29.5%	10.0%	10.0%	1.6%	0.0%	0.0%	11.5%
B	34.7%	24.9%	24.9%	8.6%	0.0%	0.0%	33.5%
C	27.0%	24.1%	24.1%	1.1%	0.0%	0.0%	25.2%
D	3.5%	22.6%	22.6%	1.0%	0.0%	0.0%	23.6%
E	2.7%	11.2%	0.0%	0.5%	0.0%	0.2%	0.6%
F	2.6%	7.2%	0.0%	3.3%	0.0%	2.3%	5.6%
N3	**100.0%**	**100.0%**	**71.0%**	**24.7%**	**0.0%**	**4.2%**	**100.0%**
A	59.2%	15.7%	15.7%	0.0%	0.0%	0.0%	15.7%
B	25.1%	24.3%	24.3%	0.0%	0.0%	0.0%	24.3%
C	7.4%	16.0%	16.0%	2.5%	0.0%	0.0%	18.5%
D	4.7%	15.1%	15.1%	14.5%	0.0%	0.0%	29.6%
E	3.2%	12.9%	0.0%	2.0%	0.0%	0.3%	2.3%
F	0.4%	16.0%	0.0%	5.7%	0.0%	3.9%	9.6%
N4	**100.0%**	**100.0%**	**68.4%**	**30.5%**	**1.1%**	**0.0%**	**100.0%**
A	40.4%	21.9%	21.9%	1.4%	0.0%	0.0%	23.2%
B	23.7%	12.9%	12.9%	15.4%	0.0%	0.0%	28.3%
C	15.2%	19.9%	19.9%	8.7%	0.0%	0.0%	28.6%
D	17.5%	13.8%	13.8%	4.3%	0.4%	0.0%	18.5%
E	3.1%	19.9%	0.0%	0.1%	0.7%	0.0%	0.8%
F	0.1%	11.7%	0.0%	0.7%	0.0%	0.0%	0.7%
TOTAL	**100.0%**	**100.0%**	**76.5%**	**21.1%**	**0.3%**	**2.2%**	**100.0%**

10% Private Vehicle Reduction

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**100.0%**	**100.0%**	**82.1%**	**15.6%**	**0.0%**	**2.3%**	**100.0%**
A	35.5%	10.8%	10.8%	2.4%	0.0%	0.0%	13.2%
B	32.0%	24.5%	24.5%	7.6%	0.0%	0.0%	32.1%
C	23.7%	27.7%	27.7%	1.7%	0.0%	0.0%	29.5%
D	3.8%	19.0%	19.0%	0.2%	0.0%	0.0%	19.3%
E	2.5%	12.5%	0.0%	0.4%	0.0%	0.7%	1.1%
F	2.5%	5.5%	0.0%	3.2%	0.0%	1.6%	4.9%
N3	**100.0%**	**100.0%**	**73.5%**	**22.2%**	**0.0%**	**4.2%**	**100.0%**
A	65.6%	27.8%	27.8%	0.0%	0.0%	0.0%	27.8%
B	22.7%	18.2%	18.2%	0.0%	0.0%	0.0%	18.2%
C	4.4%	11.6%	11.6%	9.8%	0.0%	0.0%	21.4%
D	4.6%	15.9%	15.9%	5.2%	0.0%	0.0%	21.1%
E	2.6%	14.7%	0.0%	2.3%	0.0%	0.5%	2.8%
F	0.2%	11.7%	0.0%	5.0%	0.0%	3.8%	8.7%
N4	**100.0%**	**100.0%**	**70.3%**	**28.6%**	**1.1%**	**0.0%**	**100.0%**
A	40.5%	24.2%	24.2%	7.7%	0.0%	0.0%	31.9%
B	24.9%	11.2%	11.2%	9.9%	0.0%	0.0%	21.2%
C	15.6%	21.9%	21.9%	7.6%	0.4%	0.0%	30.0%
D	16.0%	12.9%	12.9%	2.6%	0.7%	0.0%	16.2%
E	3.0%	20.9%	0.0%	0.4%	0.0%	0.0%	0.4%
F	0.1%	8.8%	0.0%	0.4%	0.0%	0.0%	0.4%
TOTAL	**100.0%**	**100.0%**	**77.6%**	**20.0%**	**0.3%**	**2.0%**	**100.0%**

Change Analysis

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**0.0%**	**0.0%**	**0.5%**	**-0.3%**	**0.0%**	**-0.2%**	**0.0%**
A	6.0%	0.8%	0.8%	0.8%	0.0%	0.0%	1.7%
B	-2.6%	-0.4%	-0.4%	-0.9%	0.0%	0.0%	-1.4%
C	-3.3%	3.6%	3.6%	0.7%	0.0%	0.0%	4.3%
D	0.3%	-3.6%	-3.6%	-0.7%	0.0%	0.0%	-4.3%
E	-0.3%	1.2%	0.0%	-0.1%	0.0%	0.5%	0.4%
F	-0.1%	-1.7%	0.0%	0.0%	0.0%	-0.7%	-0.7%
N3	**0.0%**	**0.0%**	**2.5%**	**-2.5%**	**0.0%**	**0.0%**	**0.0%**
A	6.4%	12.2%	12.2%	0.0%	0.0%	0.0%	12.2%
B	-2.4%	-6.1%	-6.1%	0.0%	0.0%	0.0%	-6.1%
C	-3.0%	-4.4%	-4.4%	7.3%	0.0%	0.0%	2.9%
D	-0.2%	0.8%	0.8%	-9.3%	0.0%	0.0%	-8.5%
E	-0.6%	1.8%	0.0%	0.3%	0.0%	0.2%	0.4%
F	-0.2%	-4.3%	0.0%	-0.7%	0.0%	-0.2%	-0.9%
N4	**0.0%**	**0.0%**	**1.9%**	**-1.9%**	**0.0%**	**0.0%**	**0.0%**
A	0.1%	2.4%	2.4%	6.3%	0.0%	0.0%	8.7%
B	1.2%	-1.6%	-1.6%	-5.5%	0.0%	0.0%	-7.1%
C	0.4%	2.0%	2.0%	-1.1%	0.4%	0.0%	1.4%
D	-1.6%	-0.8%	-0.8%	-1.7%	0.2%	0.0%	-2.3%
E	-0.1%	1.0%	0.0%	0.3%	-0.7%	0.0%	-0.4%
F	0.0%	-2.9%	0.0%	-0.3%	0.0%	0.0%	-0.3%
TOTAL	**0.0%**	**0.0%**	**1.2%**	**-1.1%**	**0.0%**	**-0.1%**	**0.0%**

Table 7.3.I: Road Network Performance Impact of a Private Vehicle and Freight Volume Reduction on Strategic Corridors

Do-Nothing / Business as Usual

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**100.0%**	**100.0%**	**81.6%**	**15.9%**	**0.0%**	**2.5%**	**100.0%**
A	29.5%	10.0%	10.0%	1.6%	0.0%	0.0%	11.5%
B	34.7%	24.9%	24.9%	8.6%	0.0%	0.0%	33.5%
C	27.0%	24.1%	24.1%	1.1%	0.0%	0.0%	25.2%
D	3.5%	22.6%	22.6%	1.0%	0.0%	0.0%	23.6%
E	2.7%	11.2%	0.0%	0.5%	0.0%	0.2%	0.6%
F	2.6%	7.2%	0.0%	3.3%	0.0%	2.3%	5.6%
N3	**100.0%**	**100.0%**	**71.0%**	**24.7%**	**0.0%**	**4.2%**	**100.0%**
A	59.2%	15.7%	15.7%	0.0%	0.0%	0.0%	15.7%
B	25.1%	24.3%	24.3%	0.0%	0.0%	0.0%	24.3%
C	7.4%	16.0%	16.0%	2.5%	0.0%	0.0%	18.5%
D	4.7%	15.1%	15.1%	14.5%	0.0%	0.0%	29.6%
E	3.2%	12.9%	0.0%	2.0%	0.0%	0.3%	2.3%
F	0.4%	16.0%	0.0%	5.7%	0.0%	3.9%	9.6%
N4	**100.0%**	**100.0%**	**68.4%**	**30.5%**	**1.1%**	**0.0%**	**100.0%**
A	40.4%	21.9%	21.9%	1.4%	0.0%	0.0%	23.2%
B	23.7%	12.9%	12.9%	15.4%	0.0%	0.0%	28.3%
C	15.2%	19.9%	19.9%	8.7%	0.0%	0.0%	28.6%
D	17.5%	13.8%	13.8%	4.3%	0.4%	0.0%	18.5%
E	3.1%	19.9%	0.0%	0.1%	0.7%	0.0%	0.8%
F	0.1%	11.7%	0.0%	0.7%	0.0%	0.0%	0.7%
TOTAL	**100.0%**	**100.0%**	**76.5%**	**21.1%**	**0.3%**	**2.2%**	**100.0%**

10% PVT and 10% HV Reduction

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**100.0%**	**100.0%**	**83.1%**	**14.6%**	**0.0%**	**2.3%**	**100.0%**
A	36.6%	14.0%	14.0%	4.6%	0.0%	0.0%	18.6%
B	26.3%	21.6%	21.6%	5.6%	0.0%	0.0%	27.2%
C	28.5%	28.5%	28.5%	0.5%	0.0%	0.0%	29.0%
D	3.6%	19.0%	19.0%	0.2%	0.0%	0.0%	19.3%
E	2.5%	11.5%	0.0%	0.5%	0.0%	0.7%	1.2%
F	2.5%	5.3%	0.0%	3.1%	0.0%	1.6%	4.8%
N3	**100.0%**	**100.0%**	**81.6%**	**14.2%**	**0.0%**	**4.2%**	**100.0%**
A	68.8%	32.1%	32.1%	0.0%	0.0%	0.0%	32.1%
B	19.7%	14.4%	14.4%	0.0%	0.0%	0.0%	14.4%
C	4.3%	13.2%	13.2%	3.5%	0.0%	0.0%	16.7%
D	5.1%	21.9%	21.9%	4.5%	0.0%	0.0%	26.4%
E	1.9%	6.9%	0.0%	1.5%	0.0%	0.5%	2.0%
F	0.2%	11.5%	0.0%	4.7%	0.0%	3.8%	8.4%
N4	**100.0%**	**100.0%**	**70.9%**	**28.5%**	**0.7%**	**0.0%**	**100.0%**
A	40.5%	31.3%	31.3%	7.7%	0.0%	0.0%	39.0%
B	24.9%	4.8%	4.8%	13.1%	0.0%	0.0%	17.9%
C	15.6%	22.4%	22.4%	5.9%	0.0%	0.0%	28.3%
D	16.0%	12.3%	12.3%	1.0%	0.7%	0.0%	14.0%
E	3.0%	20.4%	0.0%	0.4%	0.0%	0.0%	0.4%
F	0.1%	8.8%	0.0%	0.4%	0.0%	0.0%	0.4%
TOTAL	**100.0%**	**100.0%**	**79.8%**	**18.0%**	**0.2%**	**2.0%**	**100.0%**

Change Analysis

Corridor	2005 LOS (%)	2050 LOS (%)	2050 LOS (%) Lane Upgrades 0	1	2	> 2 lanes	TOTAL
N1	**0.0%**	**0.0%**	**1.6%**	**-1.4%**	**0.0%**	**-0.2%**	**0.0%**
A	7.2%	4.1%	4.1%	3.0%	0.0%	0.0%	7.1%
B	-8.4%	-3.3%	-3.3%	-3.0%	0.0%	0.0%	-6.3%
C	1.4%	4.4%	4.4%	-0.6%	0.0%	0.0%	3.8%
D	0.1%	-3.6%	-3.6%	-0.7%	0.0%	0.0%	-4.3%
E	-0.3%	0.3%	0.0%	0.0%	0.0%	0.5%	0.5%
F	-0.1%	-1.8%	0.0%	-0.1%	0.0%	-0.7%	-0.8%
N3	**0.0%**	**0.0%**	**10.5%**	**-10.5%**	**0.0%**	**0.0%**	**0.0%**
A	9.6%	16.5%	16.5%	0.0%	0.0%	0.0%	16.5%
B	-5.3%	-10.0%	-10.0%	0.0%	0.0%	0.0%	-10.0%
C	-3.1%	-2.8%	-2.8%	1.0%	0.0%	0.0%	-1.8%
D	0.4%	6.8%	6.8%	-10.0%	0.0%	0.0%	-3.1%
E	-1.3%	-6.0%	0.0%	-0.5%	0.0%	0.2%	-0.3%
F	-0.2%	-4.5%	0.0%	-1.1%	0.0%	-0.2%	-1.2%
N4	**0.0%**	**0.0%**	**2.5%**	**-2.0%**	**-0.4%**	**0.0%**	**0.0%**
A	0.1%	9.4%	9.4%	6.3%	0.0%	0.0%	15.8%
B	1.2%	-8.0%	-8.0%	-2.3%	0.0%	0.0%	-10.4%
C	0.4%	2.5%	2.5%	-2.8%	0.0%	0.0%	-0.3%
D	-1.6%	-1.4%	-1.4%	-3.2%	0.2%	0.0%	-4.4%
E	-0.1%	0.4%	0.0%	0.3%	-0.7%	0.0%	-0.4%
F	0.0%	-2.9%	0.0%	-0.3%	0.0%	0.0%	-0.3%
TOTAL	**0.0%**	**0.0%**	**3.3%**	**-3.1%**	**-0.1%**	**-0.1%**	**0.0%**

- On the National Route N3, a 10% reduction in heavy vehicles requiring an upgrading of 6% of the road network length by 1 lane per direction now yields a network operational efficiency of LOS C where previously an equivalent investment resulted in a network operational efficiency at LOS D for the same sections.
- The National Route N3 did show nominal horizontal percentage change in that previously 2.1% of the road network required 1 lane per direction but owing to the percentage reduction in heavy vehicles these lane additions were no longer warranted in the 2050 horizon year.
- It can therefore be concluded that a reduction in heavy vehicles on strategic freight corridors shows a high sensitivity or elasticity towards network operational performance improvement as well as return on investment.

7.3.5.2 Reduce Private Vehicle Volumes on Road Network

Similar to the approach followed for the reduction in freight volumes discussed above, the reduction in private vehicles was simulated by reducing private vehicles on the road network by 10% under the assumption that the occupants of these vehicles would either use public transport or their demand for travel has been eliminated by means of Travel Demand Management measures. Again this assumption is simplistic as a reduction in private vehicles on the road network would possibly result in additional road based public transport vehicles on the road network. For simplicity sake, only the reduction in private vehicles was accounted for in the evaluation of this alternative strategy.

Based on the LOS analysis and the additional lane requirement calculations shown in **Table 7.3.H** the following observations can be made:

- Similar to the heavy vehicle reduction scenario described above, a 10% reduction in private vehicle volumes on the N1, N3 and N4 results in the greatest improvement in network operational efficiency on the National Route N3. The percentage of road network operating within LOS A increases by 6.4% in 2005 and by 12.2% in 2050. Again these percentages are primarily contributed by LOS B and LOS C categories;
- The N1 also shows a 6% increase in road network percentage operating at LOS A for 2005 but does not show a similarly high improvement for 2050 as was the case with the N3. The N4 corridor only shows marginal improvements in network operational efficiency;
- In all cases of lane upgrade requirements, significant lateral or horizontal percentage changes were observed. The N3 showed the highest horizontal percentage change, followed by the N4 and thereafter the N1;
- The National Route N3 showed a nominal horizontal percentage change in that previously 2.5% of the road network required 1 lane per direction but owing to the percentage reduction in heavy vehicles these lane additions were no longer warranted in the 2050 horizon year. The N4 showed a similar trend in the 1.9% of

road network length no longer required lane additions of 1 lane per direction in the 2050 horizon year;

- On the National Route N3, a 10% reduction in private vehicles requiring an upgrading of 9.3% of the road network length by 1 lane per direction now yields a network operational efficiency of LOS C (7.3% of the network) where previously an equivalent investment resulted in a network operational efficiency at LOS D for the same sections. The difference between 9.3% of the road network requiring investment and the 7.3% operating at a higher level of service than before can be accounted for by the 2% horizontal shift no longer requiring or warranting the lane additions and
- It can therefore be concluded that a reduction in private vehicles on strategic high volume corridors shows a high sensitivity or elasticity towards network operational performance improvement as well as return on investment.

7.3.5.3 Combination of Private Vehicle and Freight Reduction on Road Network

The combination of the two strategies discussed above follows the same methodology as described in each alternative strategy. The effect of the combination of the tow strategies was therefore also tested to determine the effect on network operational efficiency (i.e. Level of Service) and the sensitivity with regards to the reduction in additional lane requirements in future years:

- The combination of the private vehicle and heavy vehicle reductions on strategic corridors shows a similar trend to the individual strategy applications. It is however, notable that although the same trend in network operational efficiencies apply, the degree of horizontal or lateral percentage network change requiring lane upgrades in significantly improved – i.e. a significant percentage of lane additions are no longer warranted and
- It can therefore be concluded that a reduction in private vehicles in conjunction with a reduction of heavy vehicles on strategic high volume corridors yields a high sensitivity or elasticity towards network operational performance improvement as well as return on investment.

7.3.6 Management of Road Infrastructure

7.3.6.1 Overloading Control

A. Background

There are thirteen operational weighbridges in KwaZulu-Natal. Six of them are on the N2 at Marburg, Park Rynie, Winkelspruit,.Umhloti, Groutville and Empangeni On the N3 there are weighbridges at Westmead, Mkondeni and Midway. Two weighbridges are located on the N11 at Ladysmith and Newcastle. On the R33 there is a weighbridge at Greytown and on the R69 at Vryheid.

There has been a continued significant decrease in the extent of overloading on the N3 corridor from approximately 16% to approximately 11%. When compared with 25% estimated for the rest of the country it is an excellent achievement.

Some constraints associated with overload control are:

- Lack of trained staff;
- Escape roads in the urban areas;
- Lack of weighbridges to achieve geographic coverage;
- Inadequate legal support for the overloading enforcement system,
- Possibility of corruption and
- The profitability of overloading.

B. Rationale of overload control

The rationale of overload control (OLC) is to ensure that legal loads, set at a level that minimizes total transport costs to the national economy, are observed. Violation of these limits by overloading and associated premature distress of road infrastructure can be very costly to the national economy. Consequently, there is a very strong technical and economic rationale for controlling axle loads on the road network.

Technical rationale includes aspects such as:

- Design of the weighbridge and the infrastructure provided;
- Management; and
- Operations.

These aspects should be attended to once the weighbridge location(s), the number of weighbridges and the size and type of overload control facility have been determined.

The economic rationale requires that the financial benefits of OLC should be greater than the cost of conducting the OLC. The economics of overload control is graphically illustrated in

Figure 7.3.G.

The financial benefits of OLC are equal to the saving in road damage costs due to overloading. The costs of overload control are equal to the capital costs to build the network of OLC facilities plus the operational and maintenance costs plus the road damage costs due to the overloading which still occur on the network (100 percent control of overloading is not practically possible).

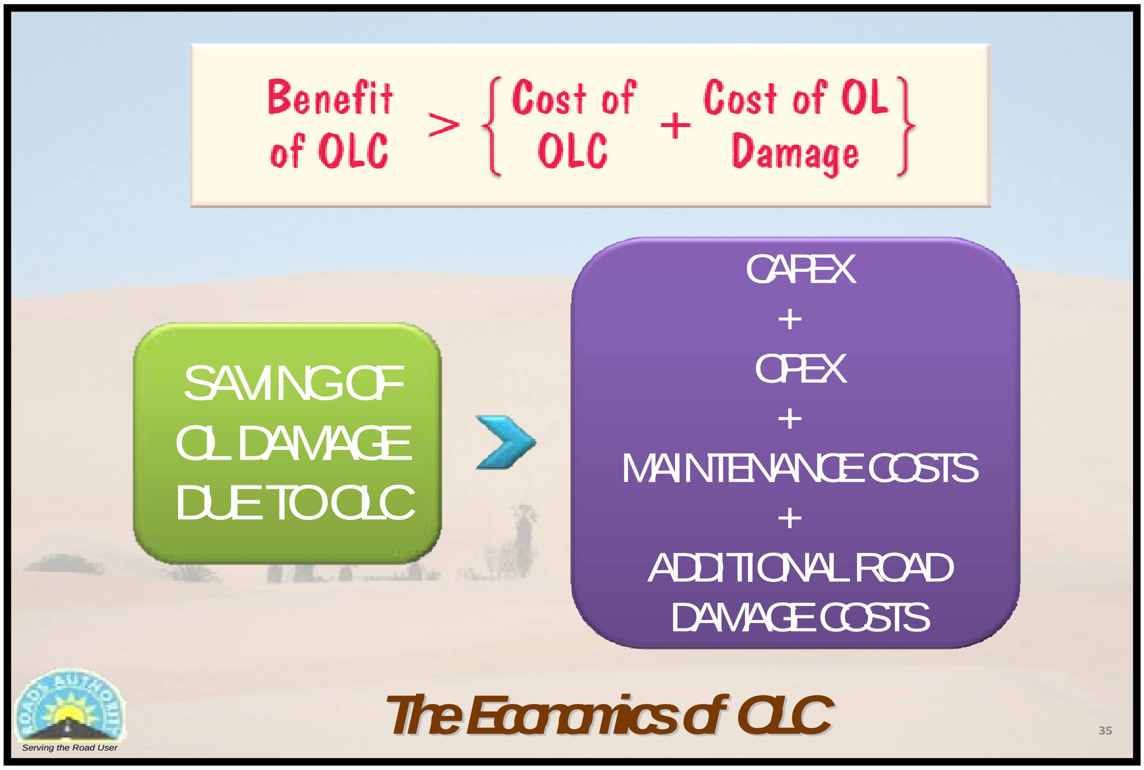


Figure 7.3.G: Graphical Illustration of The Economics

The economic viability of overload control should be determined on an overload control network basis and not for individual weighbridges. The location of individual weighbridges within the network is therefore of critical importance. An overload control index was therefore derived to ensure that individual weighbridge locations will be such that the operation will be economically viable on a network basis.

C. Overload Control Index (OLCI)

Economic viability of overload control should be determined over the full design life of the operation (assumed to be 20 years). In the first place the OLC initiative as a whole should viable, i.e. the capital costs plus the operational and maintenance costs plus the remaining road damage which will still occur must be less than what the road damage would have been if there was no OLC. In the second place the overload control activity as such should be viable, i.e. the saving in overload road damage as a result of the OLC should be more than the cost to carry it out (capital costs plus operational and maintenance costs).

In order to compare the costs and benefit aspects meaningful it is necessary to convert the different elements to a common factor which could be used to derive at a OLCI. The Net Present Value (NPV) technique was used for this purpose. The OLCI is therefore defined as:

OLCI =[NPV(Do - Nothing Damage) / NPV(Capex + Opex + Maintenance + Remaining OL Damage)] + [NPV(OL Damage Saving) / NPV (Capex + Opex + Maintenance)]

The OLCI must be greater than 2 for the OLC network to be financially viable over its entire lifespan.

The OLCI concept was also used to develop graphs which could be used to determine weighbridge locations. These graphs are shown in **Figure 7.3.H**

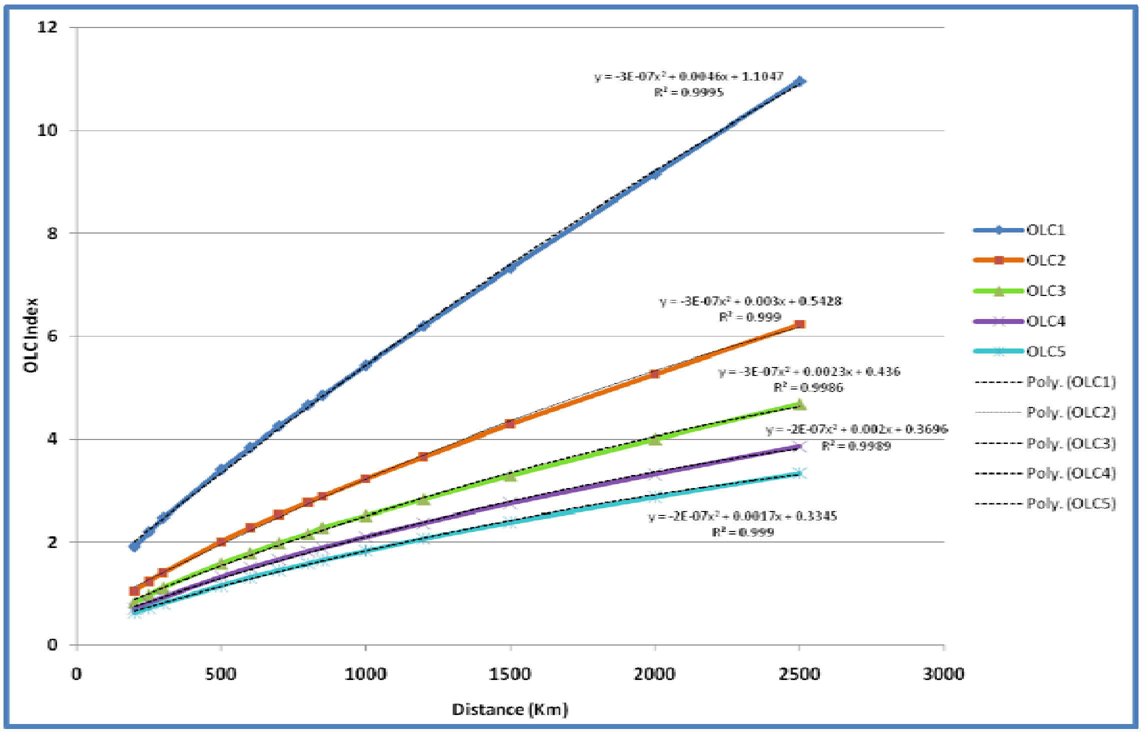


Figure 7.3.H: Recommended Number of Weighbridges per Road Length

The top graph was derived for only one weighbridge over the length of the road located more or less in the middle depending on where the intersecting road(s) with the highest HV traffic are located. At a road length of 200 km or more this location layout becomes economically viable.

The second graph provides for weighbridges at the origin and destination ends of the road. At a road length of 500 km or more this location layout becomes economically viable.

For road lengths of 700 km or more the third graph can be used which requires weighbridges at the origin and destination as well as at midpoint.

Roads of a 1000 km or more would require four weighbridges more or less at equal spacing depending on where the intersecting roads are located.

The last graph shows that for roads longer as 1200 km five weighbridges are required more or less at equal spacing depending on where the intersecting roads are located.

D. Proposed economically viable OLC network for KwaZulu-Natal

Applying the above proposed weighbridge spacing to the KwaZulu-Natal road network the following weighbridge locations are recommended:

- N2: Park Rynie, Groutville, and Mkhuze;
- N3: Westmead and Midway;
- N11: Newcastle and
- R33: Vryheid

7.3.6.2 Road Safety

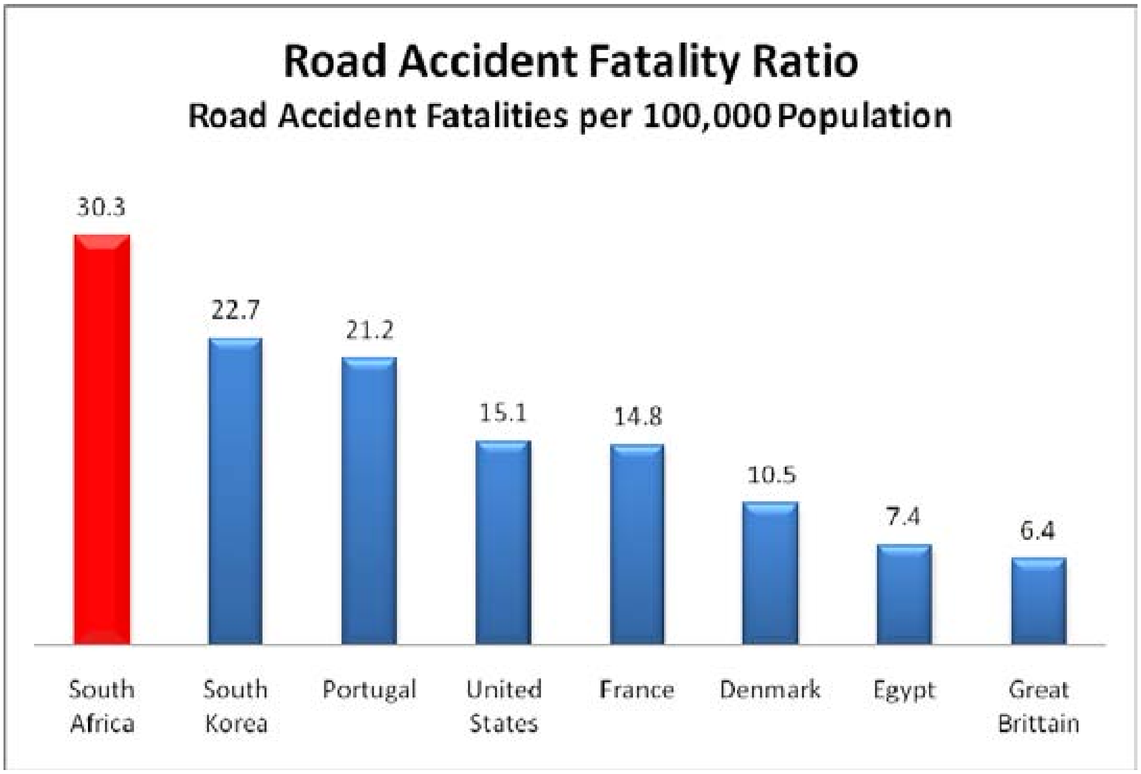
A. Status of Road Safety in South Africa

In order to fully understand the extent of the Road Safety problem within South Africa, it is important to have an appreciation for the road environment, driver population, driver behaviour, accident record etc. which are all contributing factors to South Africa's road safety problems.

South Africa has one of the worst road safety records in the world, recording road accident related deaths of approximately 120,000 people per annum and injuries in excess of a million people per annum. This annual road carnage costs the South African economy in the order of R43 billion (2005).

Traffic growth in South Africa has been increasing at an alarming rate and the annual traffic growth on South African roads was estimated at 5.22% between 2007 and 2008. The registered vehicle population for 2008 amounted to approximately 5,2 million cars (excluding heavy vehicles and buses) with approximately 430,000 (8%) vehicles that were unregistered or un-roadworthy. The average occupancy of vehicles was estimated at 6.2 persons.

Fatalities from road traffic accidents in 2008 amounted to 11,577. Road accident fatalities is on the increase as the road accident fatalities over the last 14 years has increased from 25.1 fatalities per 100,000 population in 1994 to 30.3 fatalities per 100,000 population in 2008.

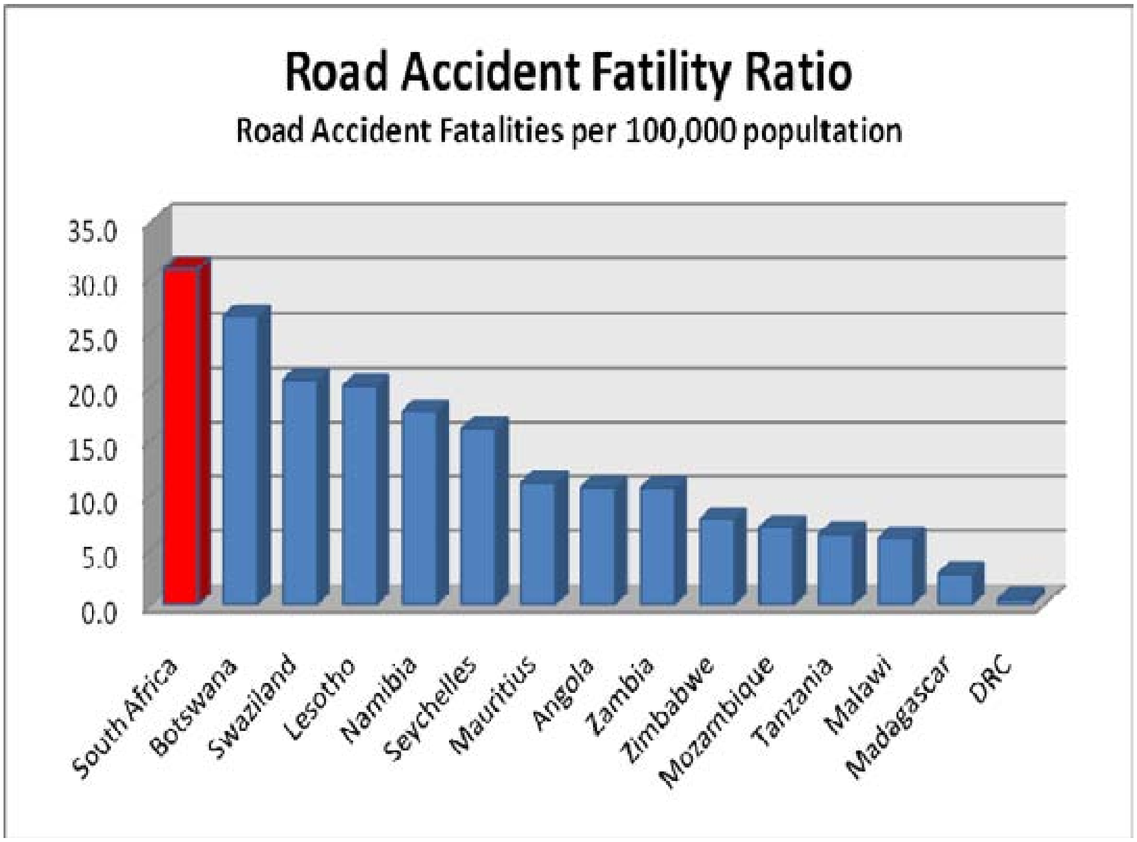


Source: RTMC, 2008. Road Traffic Report.

Figure 7.3.I: International Comparison of Road Accident Fatality Ratios

In comparison with the rest of the world South Africa has a very poor road safety record if one uses road accident fatalities as a yard stick. From **Figure 7.3.I** it is evident that South Africa has, in most cases, a road accident fatality ratio that is more than double than that of any developed nation in the world. Alarmingly, comparing South Africa to Egypt, a fellow developing nation, South Africa is more than four times worst than Egypt with regards to road accident fatalities per 100,000 population.

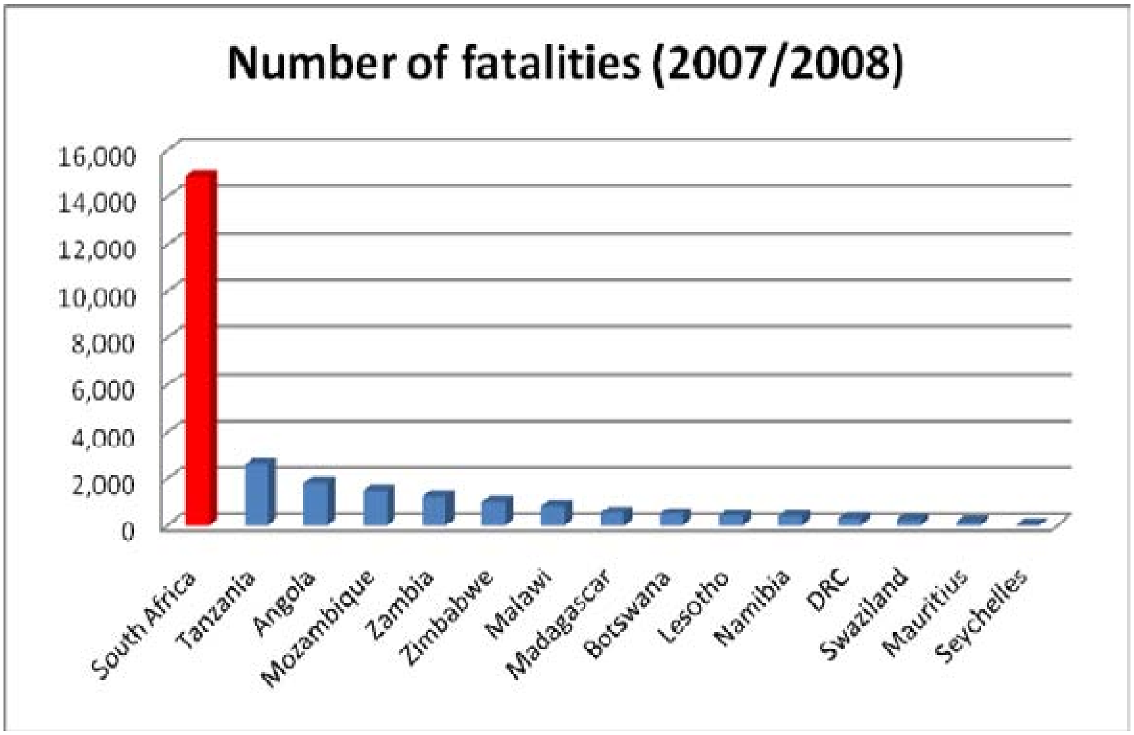
South Africa's status was also appraised using the most recent statistics available for other African countries. It should be noted that the figures in the graphs should be considered indicative only since the accuracy and method of measurement of the data in each country could not be confirmed. The statistics for some of the countries is likely to be under reported to some degree. Many of the countries listed will probably experience a worsening of accident figures as the methods of reporting and the systems through which it is done, improves.



Source: World Health Organisation

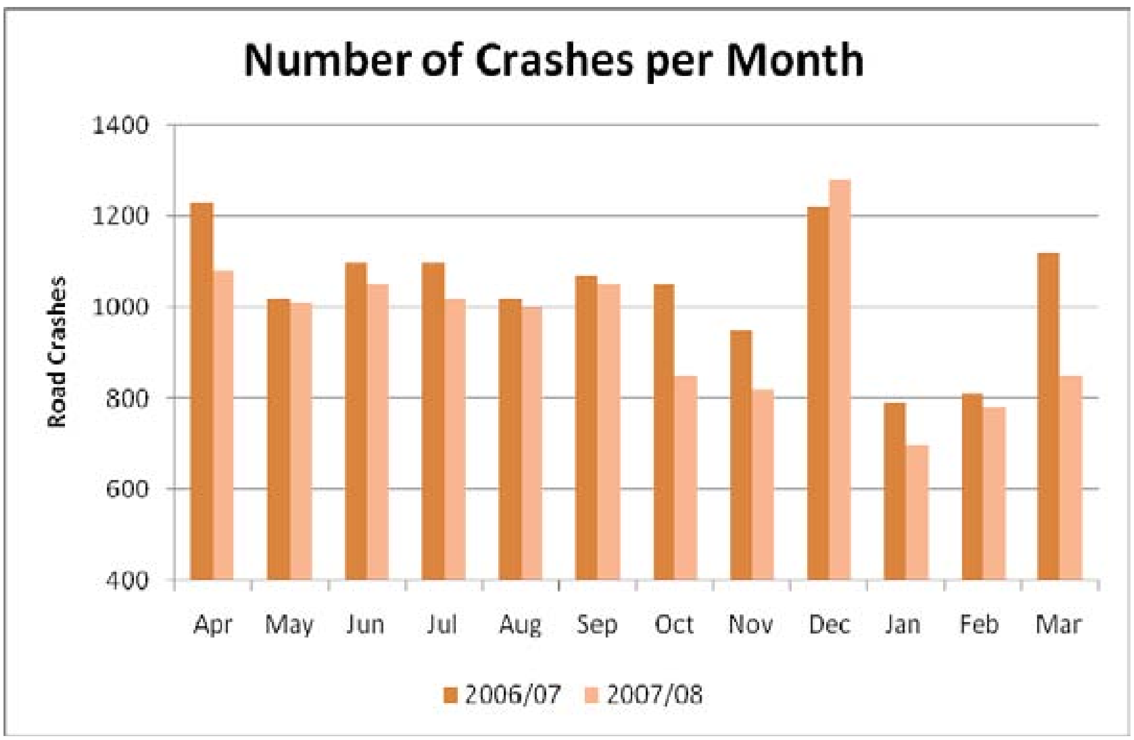
Figure 7.3.J: Selected African Countries Comparison of Road Accident Fatality Ratios

The African country most closely to South Africa in terms of fatalities per 100,000 population is Botswana. A different insight is however gained when the number of fatalities alone is represented – not as a rate or ratio but as a simple number indicating the number of people killed annually as a result of accidents (**Figure 7.3.K**). Approximately 15,000 (rounded up) people are killed annually on South African roads. The next country in this comparison (Tanzania) lies at 2,000 (rounded up) people per annum. Once more, the possible under-reporting in other countries should be considered here. This may close some of the gaps although it is unlikely that the ranking of the respective countries shown will change significantly.



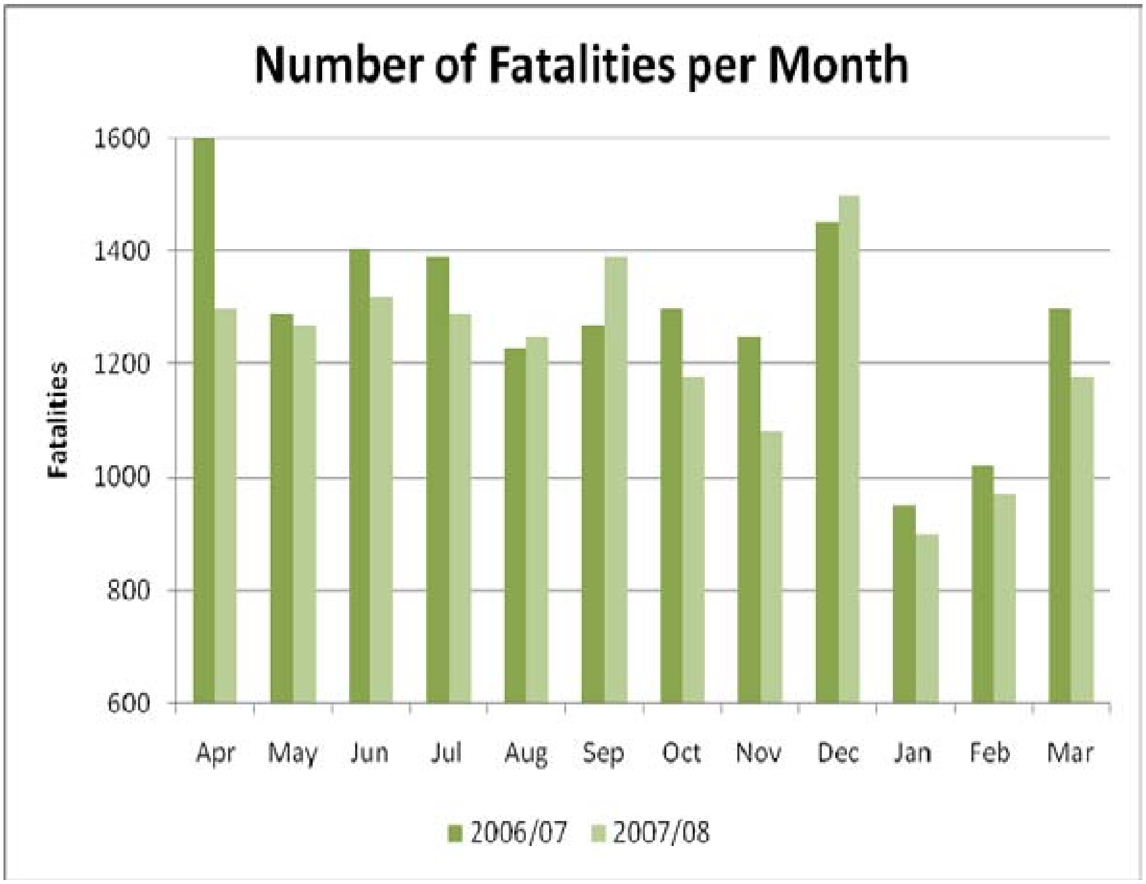
Source: World Health Organisation.

Figure 7.3.K: Selected African Countries Comparison of Road Accident Fatalities



Source: RTMC, 2008. Road Traffic Report. Pg.27

Figure 7.3.L: Number of Road Crashes per Month in South Africa (2007 – 2008)

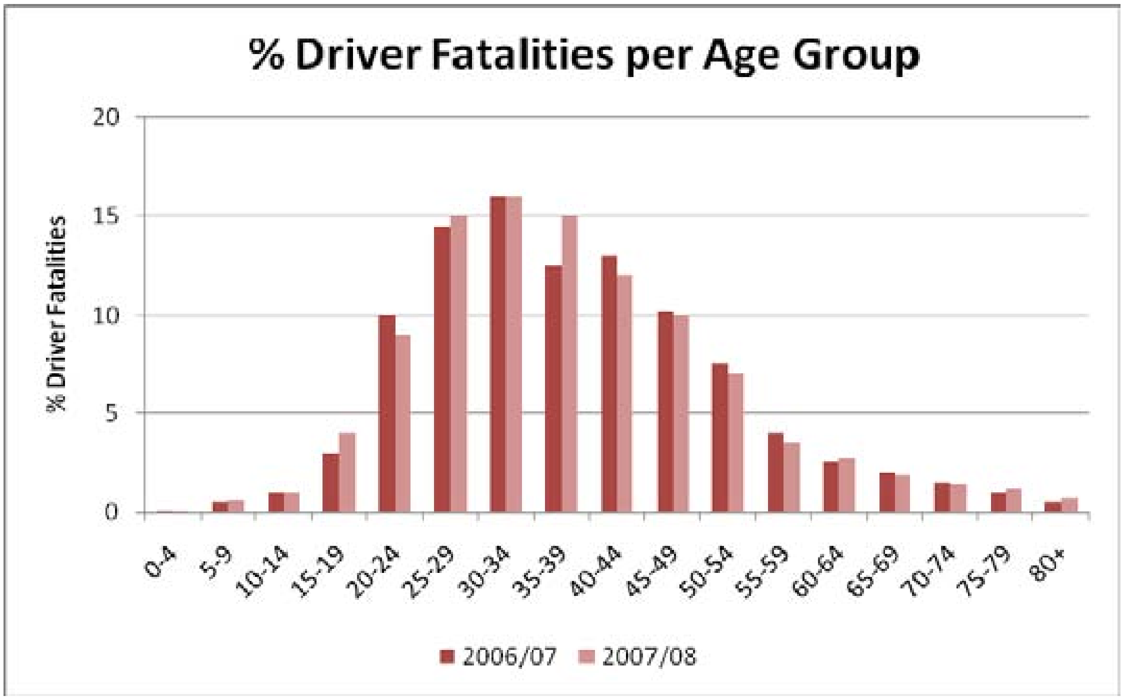


Source: RTMC, 2008. Road Traffic Report. Pg.27

Figure 7.3.M: Number of Fatalities per Month in South Africa (2007 – 2008)

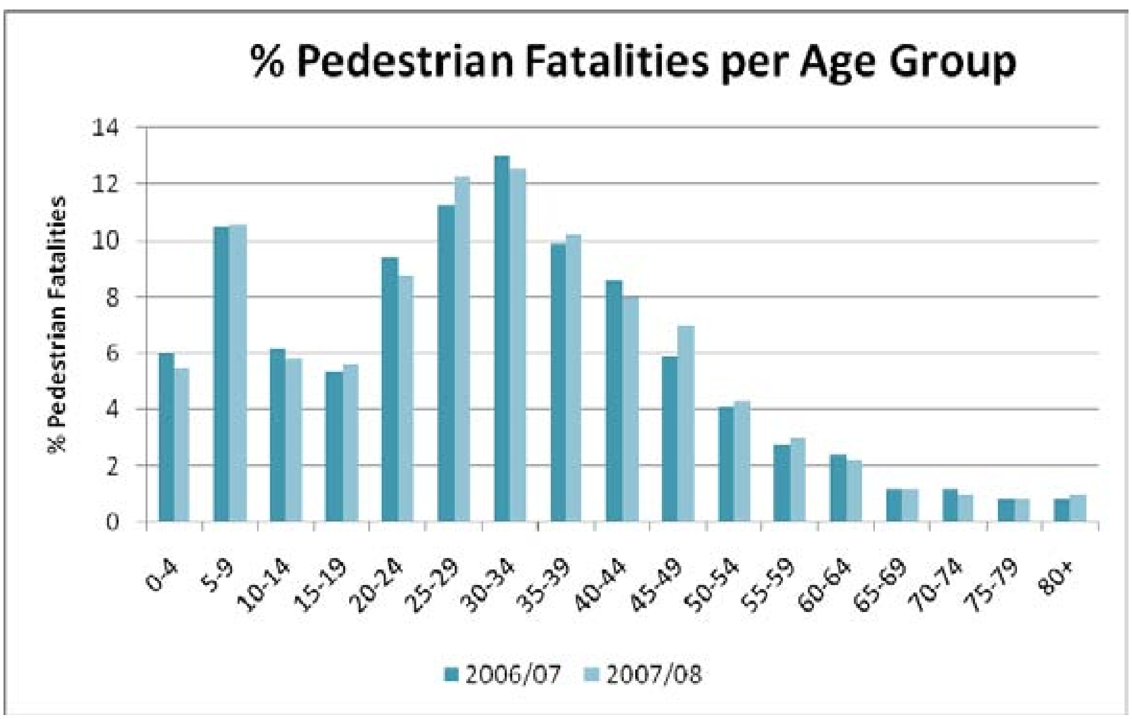
Figure 7.3.M and **Figure 7.3.N** shows the comparison of the number of road crashes and the number of road fatalities per month within South Africa for the 2006/07 and 2007/08 periods. Although there is no discernable trend, the following is evident:

- Road traffic crashes and fatalities are lowest during January and February owing to the lower propensity to travel after the Festive Season holidays;
- Road traffic crashes and fatalities peak during holiday seasons, typically during March and April (i.e. traditionally the eastern holiday weekend) and December (i.e. traditionally the Festive Season holiday) and
- Road traffic crashes and fatalities tend to coincide with higher vehicular volumes on the roads and longer travel distances (i.e. holiday trips).



Source: RTMC, 2008. Road Traffic Report. Pg.31

Figure 7.3.N: Percentage Driver Fatalities per Age Group



Source: RTMC, 2008. Road Traffic Report. Pg.31

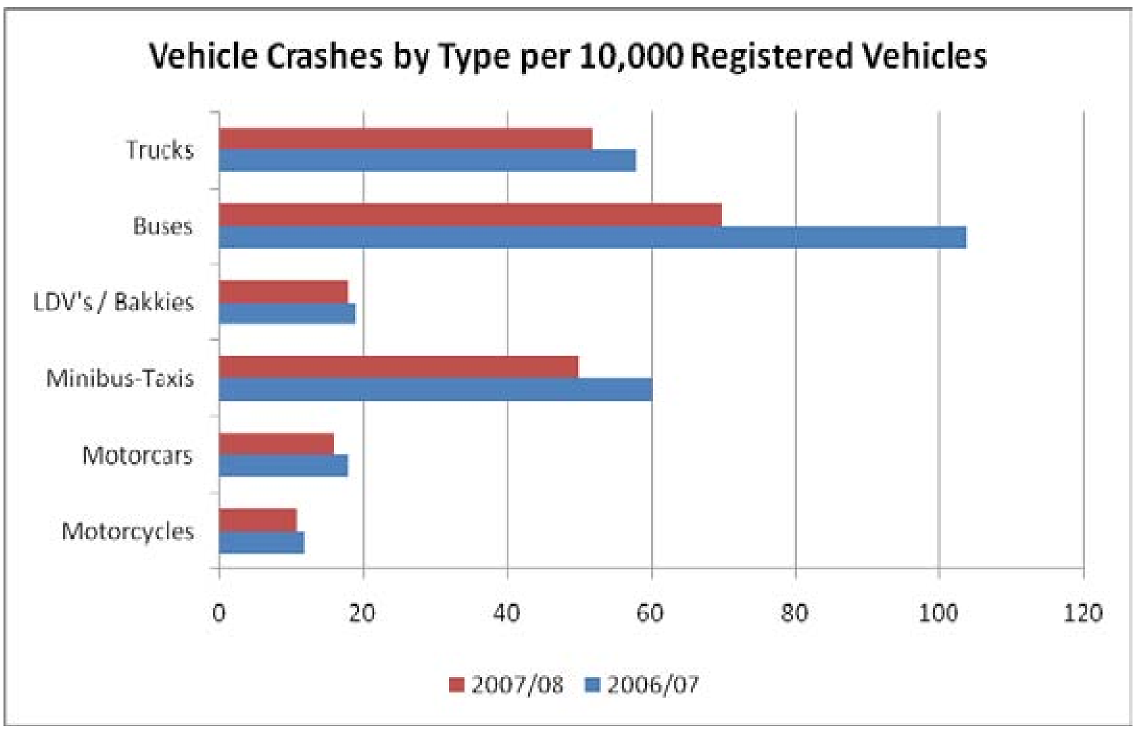
Figure 7.3.O: Percentage Pedestrian Fatalities per Age Group

Figure 7.3.O shows the percentage driver fatalities per age group within South Africa for the 2006/07 and 2007/08 periods. The following observations were made:

- Driver fatalities coincide with age groups which have a higher propensity of travel, typically those age groups that contribute to the economy (i.e. 20 to 55 age group economically active population) and
- The highest driver fatalities occur between the ages of 30 and 40 years old with a peak between the age of 30 and 34 years old.

Figure 7.3.P shows the percentage pedestrian fatalities per age group within South Africa for the 2006/07 and 2007/08 periods. The following observations were made:

- Pedestrian fatalities show a similar trend to driver fatalities for ages 20 to 55 with a peak between the ages of 30 and 35 years old.
- Pedestrian facilities show a peak in pedestrian fatalities between the ages of 4 – 10 years stemming from the inexperience and vulnerability of this group of road users.

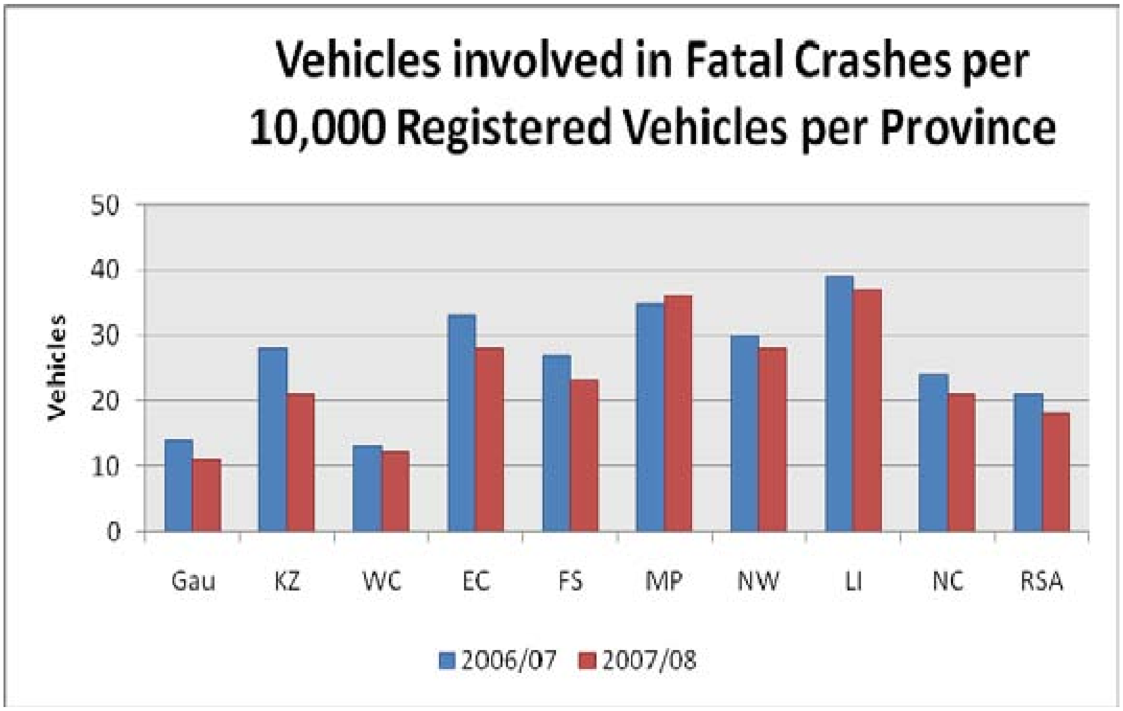


Source: RTMC, 2008. Road Traffic Report. Pg.32

Figure 7.3.P: Vehicle Crashes by Type per 10,000 Registered Vehicles

Figure 7.3.P shows the number of vehicle crashes by type of vehicle for every 10,000 registered vehicles within South Africa for the 2006/07 and 2007/08 periods. The following observations were made:

- Of concern is that vehicles types that show the highest number of crashes are trucks, buses and minibus-taxis.
- These vehicles fall within the heavy vehicle / public transport vehicle category and typically have a higher vehicle occupancy rate than other vehicles classes.



Source: RTMC, 2008. Road Traffic Report. Pg.33

Figure 7.3.Q: Number Vehicles in Fatal Crashes per 10,000 Registered Vehicles per Province

Figure 7.3.Q shows the number of vehicles involved in fatal crashes per 10,000 registered vehicles per Province in South Africa for the 2006/07 and 2007/08 periods. The following observations were made:

- The instances of higher fatality rates are highest in provinces which are predominantly rural and that are, on average, poorer than the other provinces and
- All provinces with exception of Mpumalanga show a decreasing rate of fatal vehicle crashes per 10,000 registered vehicles between 2007 and 2008 – looking at the trend over one year only is however statistically insignificant and trend analysis for accidents should typically be done over extended periods.

A recent study that was conducted by the United Nations concluded that, if something is not done to reduce the number of fatalities associated with vehicular accidents soon, road accidents should become the second highest cause of deaths world-wide by 2015. Although it is difficult to make an accurate determination of figures for South Africa specifically, it is likely that this “tipping” point may be much closer than anticipated for South Africa.

B. Institutional Arrangements of Road Safety in South Africa

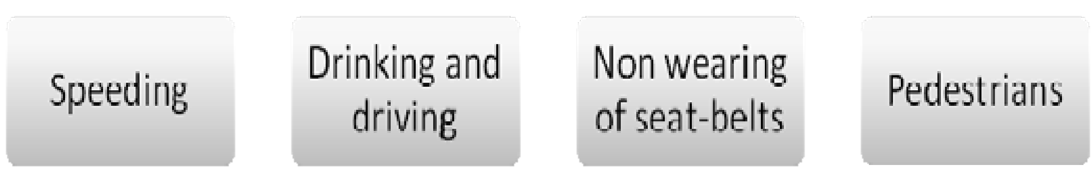
Within South Africa, the National Department of Transport (NDoT) is the overarching institutional authority that is tasked with all matter related to transport. This responsibility is devolved by the NDoT to all of its incumbent provincial and local authorities. In dealing with road safety, the need for an extended structure of facilitating organisations or departments was identified and gave stature to the Arrive Alive Campaign, the Road Accident Fund (RAF) and the Road Traffic Management Corporation (RTMC).

- Arrive Alive

Arrive Alive was instituted by the National Department of Transport in 1997. The purpose of the Arrive Alive Campaign was to reduce the number of fatalities due to road accidents by 5% annually. The Department of Transport has launched the Arrive Alive Road Safety Campaign as a short term initiative to reduce the carnage on roads in South Africa in 1997. The first campaign ran from 1 October 1997 to the end of January 1998. Today the Arrive Alive campaigns have become an important part of the Road Traffic Safety Projects of the Department of Transport.

The funding of Arrive Alive originates from the Road Accident Fund. This is the reason why the Arrive Alive campaign has been in place ever since its inception as a sustainable and visible tool to assist with the improvement of the road safety objectives of national government.

The Arrive Alive campaign is a very effective and a very visible means of mass communication to the road-based driver population. The campaign has managed to highlight a number of major contributory factors in fatal accidents taking place on South African Roadways. Among these are:



The Arrive Alive Campaign essentially gains prominence during annual holiday periods when large-scale, national campaigns with specific focus on roads carrying large volumes of holiday traffic are held.

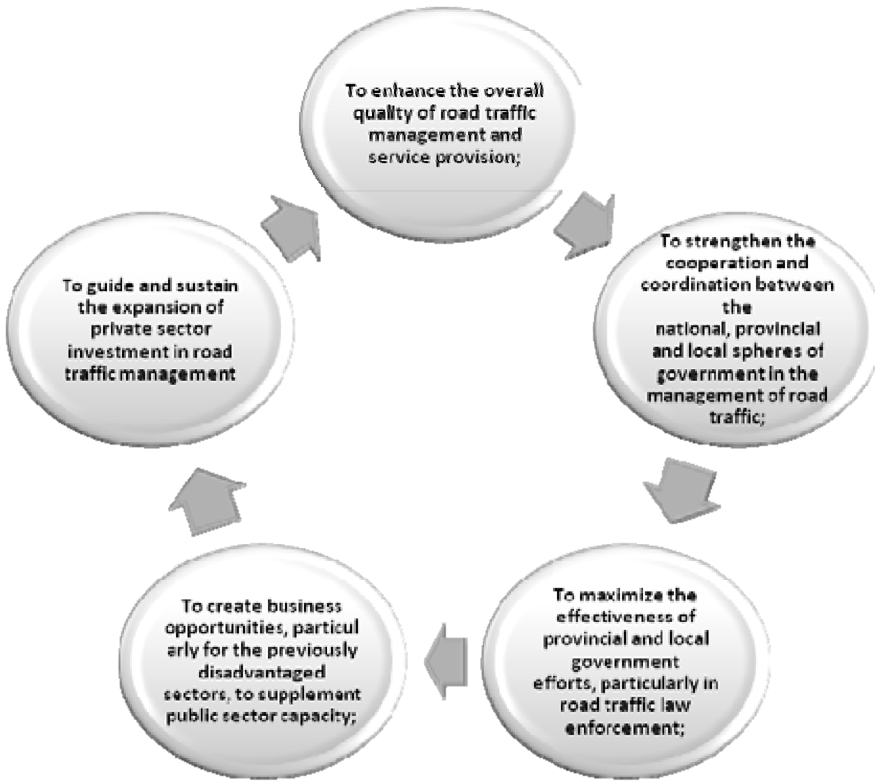
Arrive Alive does however have limitations because it does not address the underlying structural reforms and changes that are required on a continuous basis, to improve traffic safety. These reforms include a variety of educational, institutional, infrastructure and law-enforcement issues.

- The Road Traffic Management Corporation

The Road Traffic Management Corporation (RTMC) was created as an organisation that will focus on improving road safety, security, order, discipline and mobility in South Africa. The RTMC has to establish partnerships with the various spheres of government (national, provincial and local). The RTMC key objectives are:

- To establish the RTMC as a partnership between national, provincial and local sphere of government
- To enhance the overall quality of road traffic services provision, and in particular ensure safety, security, order, discipline and mobility on the roads
- To protect road infrastructure and the environment through the adoption and implementation of innovative technology
- To phase out, where appropriate, public funding and phase in private sector investment in road traffic matters on a competitive basis
- To introduce commercial management principles to inform and guide road traffic governance and decision making in the interest of enhanced service provision
- To optimise the utilisation of public funds
- To regulate, strengthen and monitor inter-governmental contact and co-operation in road traffic matters
- To improve the exchange and dissemination of information and road traffic matters
- To stimulate research in road traffic matters and effectively utilise the resources of existing institutes and research bodies
- To develop human resources in the public and private sectors that are involved in road traffic matters

Recognizing the importance of the regulation of public transport and road traffic to the development, safety and quality of life of all South Africans, the purpose for which the RTMC was established is[i]:



The following 10 functional areas were developed within the RTMC in accordance to the tasks that it has to fulfill. These functional units include (more can be added at a later stage according to the RTMC Act):

- Training of traffic personnel
- Road traffic information
- Accident investigations and recording thereof
- Communication and education
- Infrastructure safety audits
- Road traffic law enforcement
- Vehicle registration and licensing
- Vehicle and roadworthiness testing
- Testing and licensing of drivers
- Administrative adjudication of road traffic offences (AARTO)

The RTMC recently developed the 2009-2015 Road Safety Management Plan with the participation and cooperation of the provinces.

- The Administrative Adjudication of Road Traffic Offences (AARTO)

The Administrative Adjudication of Road Traffic Offences (AARTO) Act, No. 46 of 1998, which was approved by Parliament in 1998 was, amongst others, created with the view to forge a closer and more effective and efficient link between enforcement and the adjudication process, yet which is still objective, transparent and fair.

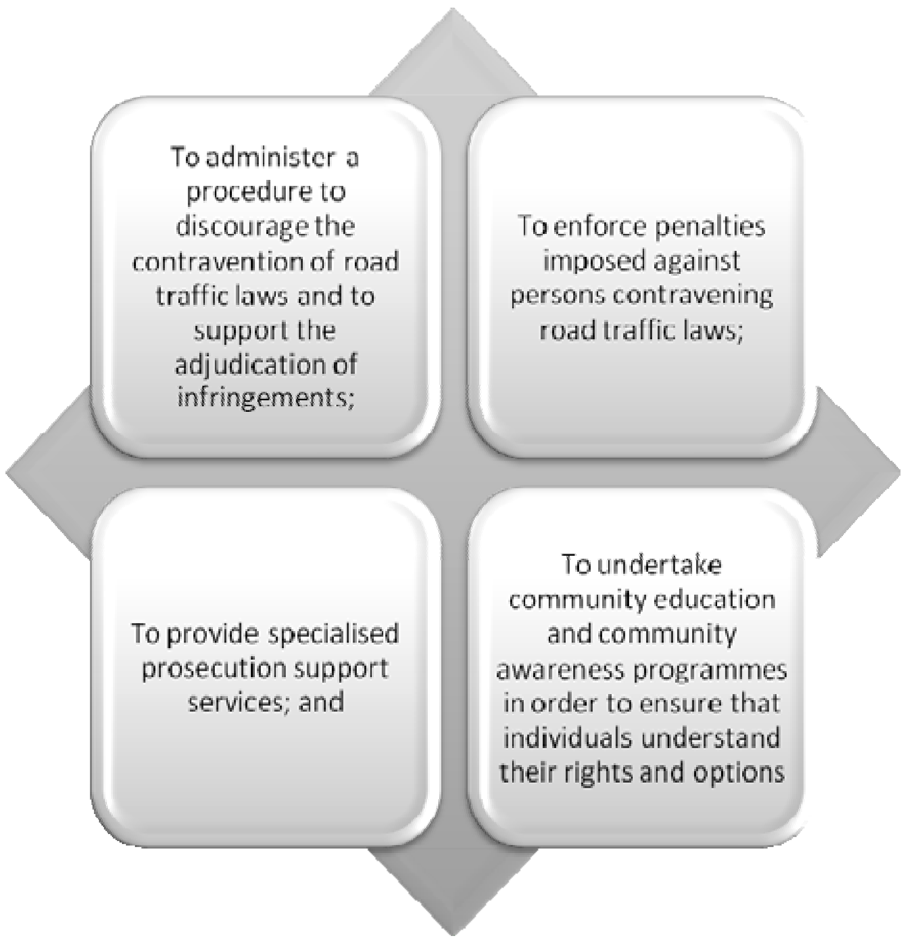
AARTO brings with it parity of fines which will encourage the road using public to take traffic offences and resulting fines much more seriously. It also brings with it improved fine collection procedures and a revenue stream that will be used for improving road safety; as well as more convenient ways of paying fines and more penalties for not paying within the prescribed time, eventually leading to confiscation of movable property and ultimately to being declared unfit to operate a motor vehicle.

The objectives of AARTO are, amongst others:

- Road Traffic Infringement Agency

The Road Traffic Infringement Agency has been established as a juristic person responsible to the Minister. The agency may do anything that is necessary to perform its functions in terms of any law, or assigned to it by the Minister. The Minister may, on request of an issuing authority, assign any function vested in such issuing authority in terms of this Act, to the agency. The agency must establish one national office, and may establish sub-offices at provincial or municipal level[ii].

The objects of the agency are, despite the Criminal Procedure Act, 1977 (Act No. 51 of 1977):



- eNaTIS

The National Traffic Information System (eNaTIS) is the official register for all vehicle, driving licence, contravention, and accident data. eNaTIS is the national register and asset that stores, records, manages and enforces the requirements of the National Road Traffic Act (NRTA) and the National Road Traffic Regulations (NRTR).

It provides for the registration and licensing of vehicles. It manages and records applications for and authorizations of driving and learner's licenses. It is a law enforcement tool which is used to ensure that the details of vehicles that are stolen are circulated and to prevent irregular and fraudulent re-registration of such vehicles. It serves as a register for recording the decisions of safety as provided by the South African Bureau of Standards (SABS). This process, where the SABS is linked to the eNaTIS, ensures that only vehicles that meet our country's stringent safety standards are allowed to be registered in this country.

eNaTIS is seen "as a key resource to provide effective road traffic management". It is used at more than 1,753 sites throughout the country to register, deregister and check the ownership of vehicles. It performs about 40,000 transactions per hour with a turnover of R3 billion per annum[iii].

- The Road Accident Fund (RAF)

The RAF provides compulsory cover to all users of South African roads, resident or foreigners, against injuries or death they may sustain from accidents involving motor vehicles within the borders of South Africa. The role of the RAF is to re-integrate victims of road accidents and their families back into society from a health and economic perspective[iv].

The legal mandate of the RAF stems from the Road Accident Fund Act, 1996 (Act No. 56 of 1996) that governs all claims arising from motor vehicle accidents.

The fund is controlled by government and was formed after the approval of legislation to cover drivers and passengers for any bodily injuries, or death, sustained as a result of a road accident caused by a negligent driver. The negligent driver is not allowed to claim from the fund, only the third parties.

The fund falls under the jurisdiction of the Department of Transport. Money to sustain the fund comes from a levy included in the price of fuel so every motorist in South Africa contributes to the fund every time you fill your car with petrol. Contributions to the Road Accident Fund are also referred to as Third Party Insurance but is should not be confused with Third Party Insurance cover that you will take out to protect yourself against personal claims by third parties, or to pay for the damage to the property of third parties[v].

C. Analysis of Road Safety in South Africa

Road Safety Focus Areas

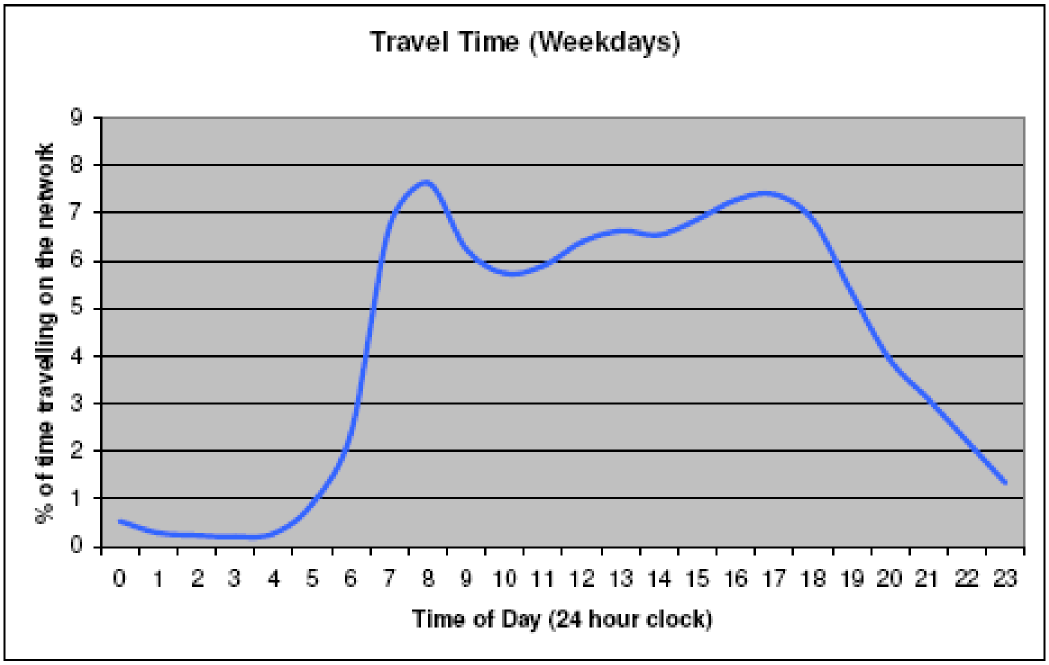
- Road Network Safety

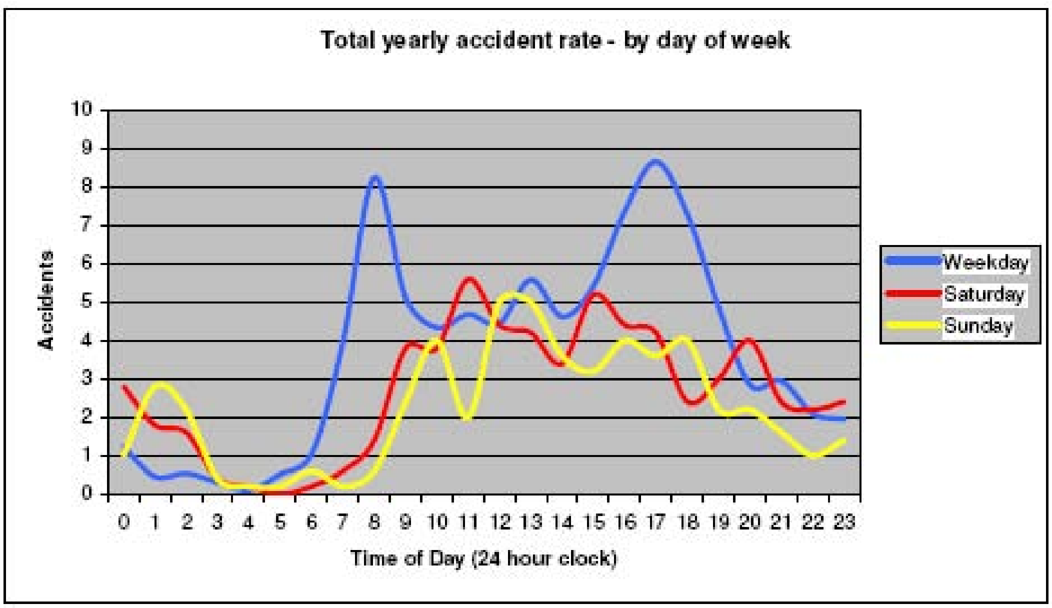
A first order assessment of where road safety problems are more likely to occur on the existing road network was required. This estimation would not have been necessary if South Africa had an accurate database of exactly where each accident has occurred. Unfortunately, the current status of accident reporting and record keeping in South Africa do not allow for accurate analysis and identification of accident hotspot – this requires accident rates at specific, geo-referenced locations.

Alternative means were therefore sought for the purpose of the National Transport Master Plan. Two basic indicators that could be analyzed, making use of existing data were indentified. These indicators are:

- Congestion

A number of studies have been conducted by professionals demonstrating the relationship between increased congestion and increased accidents as a result of the increased accidents. A cautious review of existing literature is however advisable as many of the studies appear to make contradictory claims regarding the relationship. The main reason behind much of the confusion about the nature of the relationship is in the measurements of the relationship. With increased congestion (more vehicles), the number of accidents increase. This phenomena is demonstrated in the graphs shown below taken from a study that was done for the City of York Council.





The results from these graphs shows an observable relationship between the levels of congestion and the accident rates measured over a 24 hour period of the day. What has to be kept in mind though, is that the number of vehicular kilometers increase along with the congestion – this has the implication that the actual accident rate per 10 million vehicle kilometers may in fact not be increasing that dramatically (some studies have shown that it actually decreases). The end result however, still translates to more accidents taking place which, in the mind of the public, is what matters most.

A comprehensive infrastructure analysis was undertaken as part of the NDoT National Transport Plan 2050 Phase 2 report (Chapter 7). The infrastructure analysis included a detailed analysis of all of the higher order roadways in all of the provinces. These roads are all of the roads that provide regional connectivity between towns, regions, provinces and across borders.

The results from the analysis were represented spatially on a series of maps showing a “Level of Service” or “LOS” for each roadway. The LOS was determined based on calculations that were done on estimated 30^{th} Highest Volumes for each roadway. The 30^{th} highest volume is a theoretical value that is used for the design of roadways and represents the design peak hour of the specific road.

The LOS is determined not as a result of congestion alone but as a result of platoon density, operating speed and flow rates. Where a bad LOS is determined, the congestion or traffic density is at a higher than acceptable level and therefore there is an increased probability that that particular location is a place where traffic safety problems are likely be more prevalent.

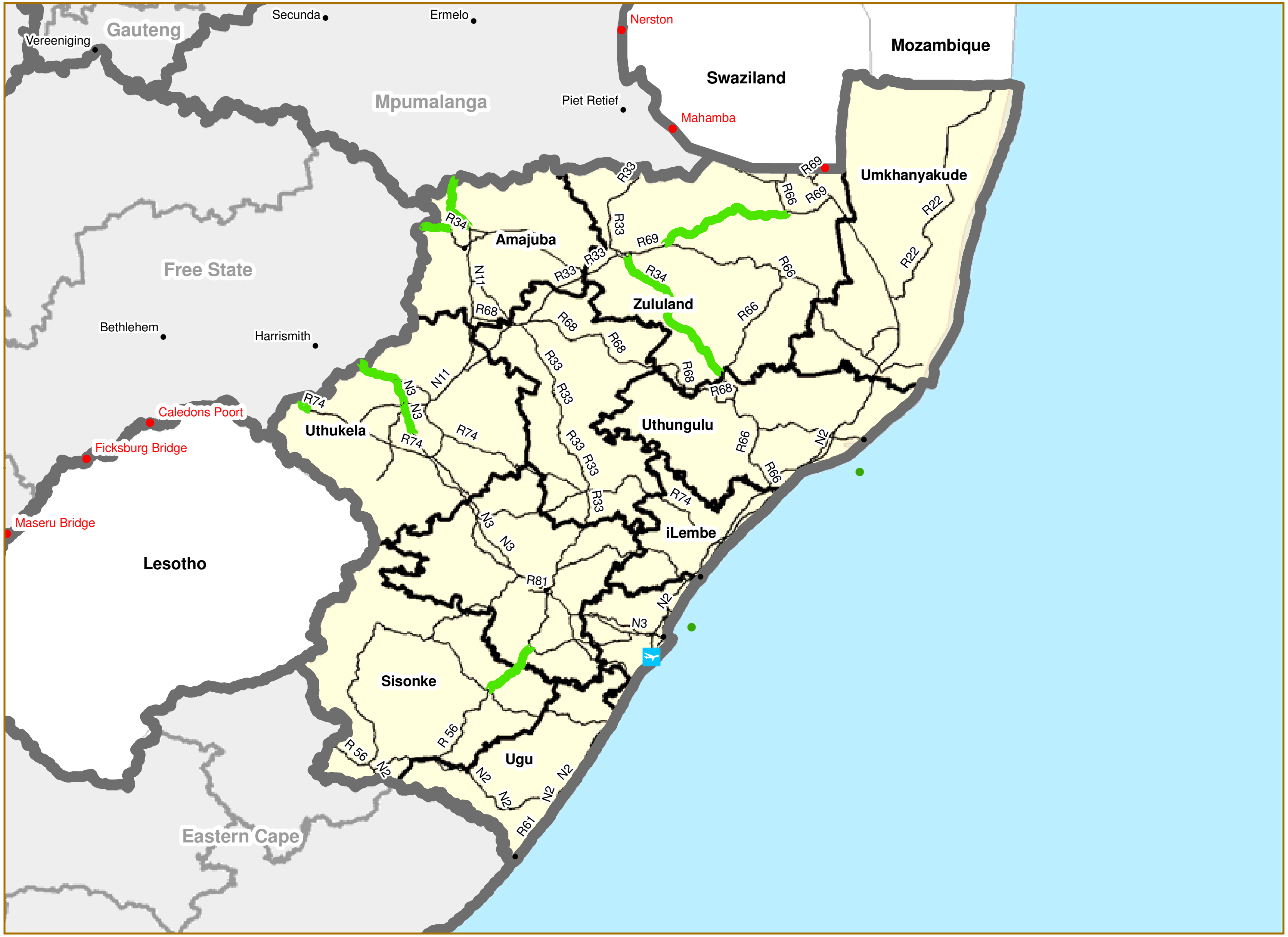
Scrutiny of the maps of each province indicating the LOS on each of the roadways analyzed, show where the roads operating at a LOS “F” are. These are the roads that should receive overall priority on a national and provincial level for the undertaking of <u>road safety assessments</u> (not to be confused with <u>road safety audits</u> which are conducted on planned infrastructure or infrastructure under construction).

- Two-lane facilities with high levels of heavy vehicle traffic

Two lane facilities are roadways that have a single lane per direction that is not divided by any physical means such as a median. When vehicle volumes increase on such roads, the tendency is for long platoons of vehicles to form. Generally, the speed of the platoon is determined by the speed of the front vehicle in the platoon (usually a slower moving vehicle such as a heavy vehicle). When overtaking opportunities are sparse as a result of mountainous or rolling topography, the platoons increase in length and overtaking maneuvers becomes increasingly dangerous.

There is therefore an increased probability of dangerous overtaking maneuvers taking place where the percentage of heavy vehicles on two-lane facilities is relatively high. The challenge is however, to decide on what is considered to be high. There are many variables that have to be considered for each situation to make such a determination. These considerations will include the percentage of no-passing zones, the presence of climbing lanes on uphill and downhill sections, the presence of paved shoulders, the width of paved shoulders, horizontal alignment, vertical alignment and the total volume of vehicles within the analysis period per direction.

Kwazulu Natal Province: AREAS IN MOUNTAINOUS TERRAIN



ROAD SAFETY STRATEGY

ROAD

Mountainous Terrain

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed

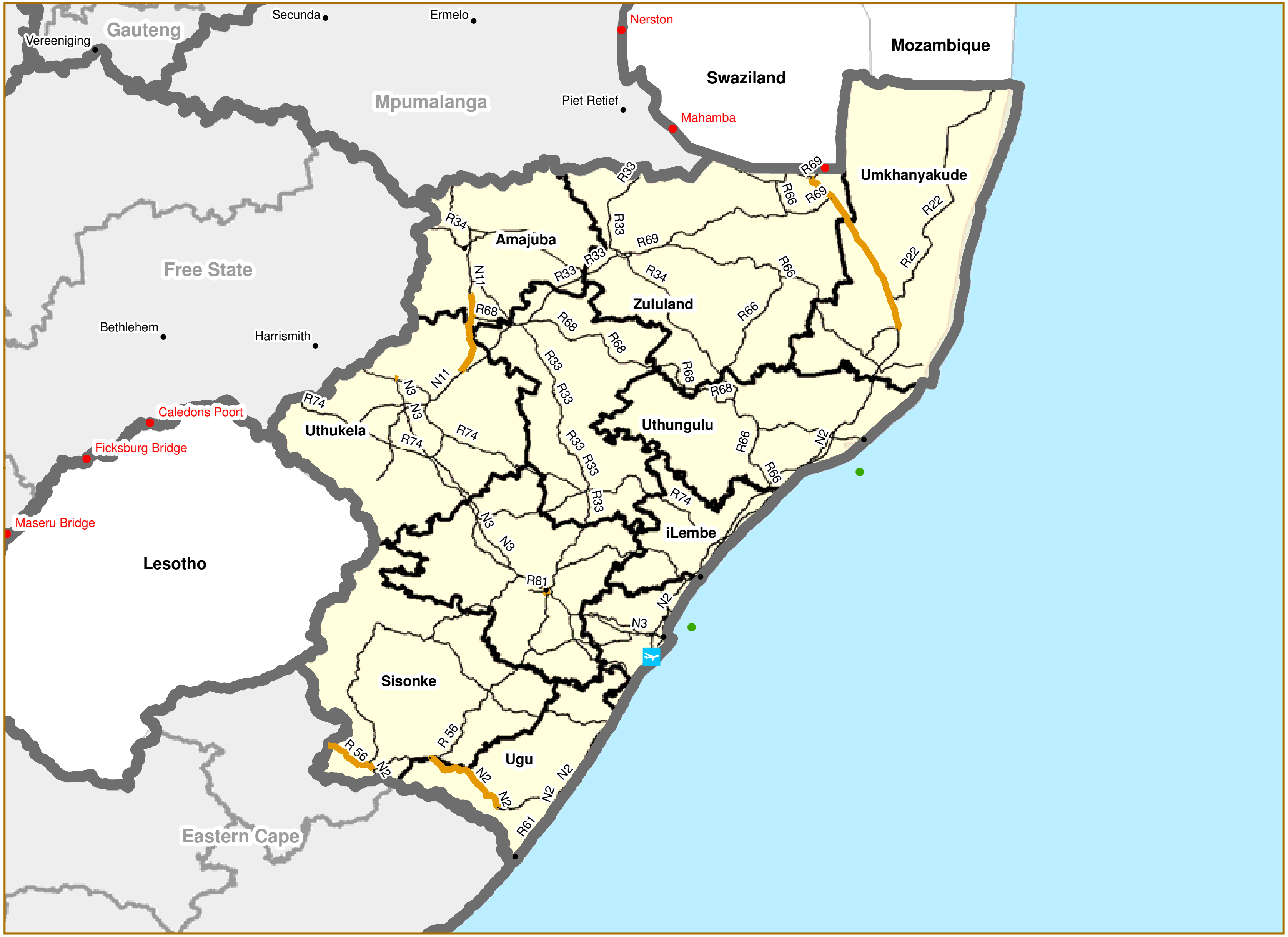
0-15%	25%	50%	75%	80%	90%	100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 7.3J Areas in Mountainous Terrain

Kwazulu Natal Province: SINGLE LANE ROADS WITH HIGH % OF HEAVY VEHICLES



ROAD SAFETY STRATEGY

ROAD

>20% HV & 1 lane p/direction

BASEMAP LEGEND:

Border Posts
Harbours
Airports
Towns
District Municipal Boundary
Provincial Boundaries

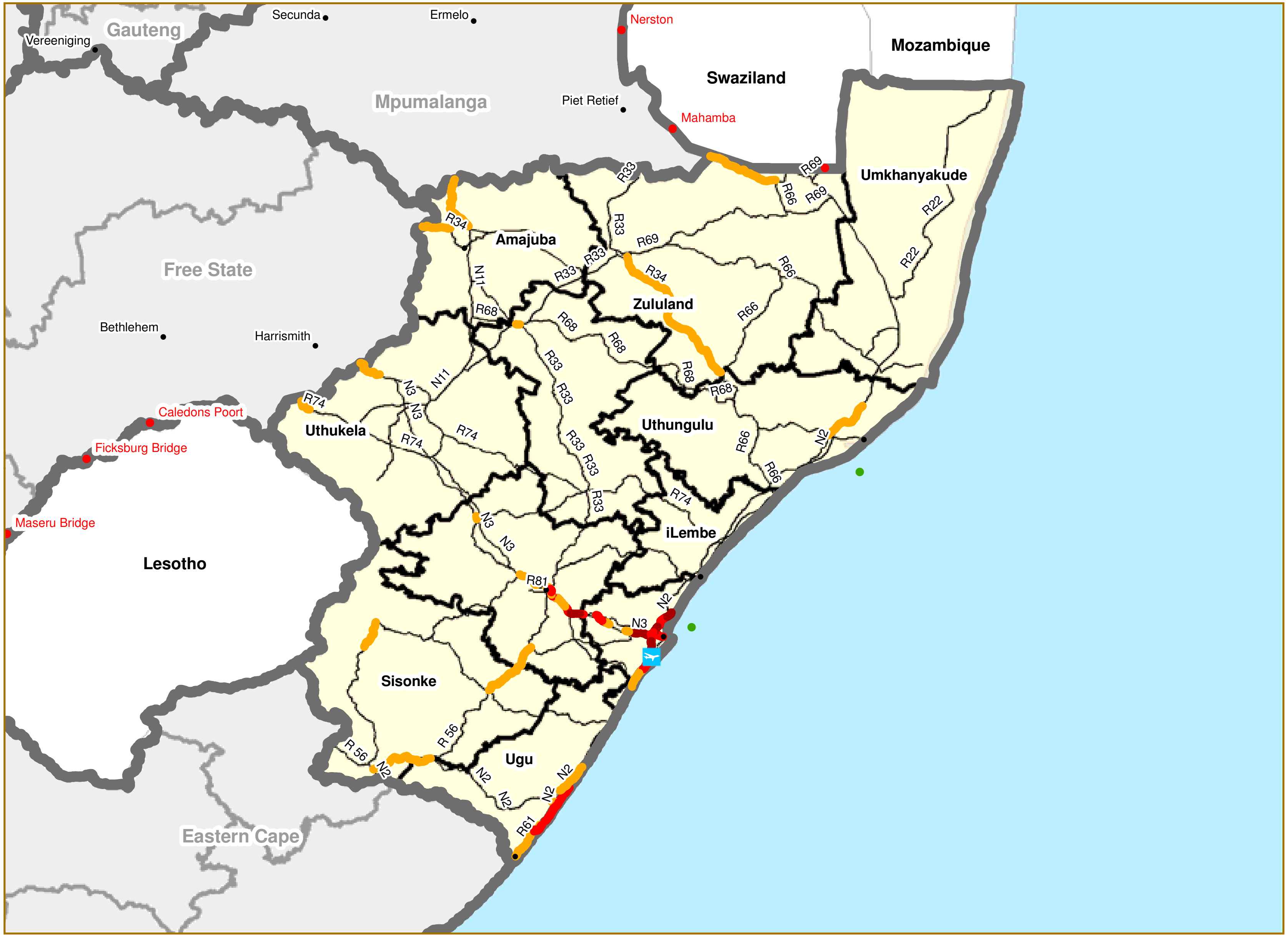
1:3,500,000
0 10 20 40 60 80 Kilometers

Map and Data Current Status Completed
0-15% 25% 50% 75% 80% 90% 100%
February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 7.3K Single Lane Roads with High % of Heavy Vehicles

Kwazulu Natal Province: ROADS WITH CAPACITY PROBLEMS



ROAD SAFETY STRATEGY

LOS

- F - 0 %
- E - 1 %
- D - 5 %

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 10 20 40 60 80 Kilometers

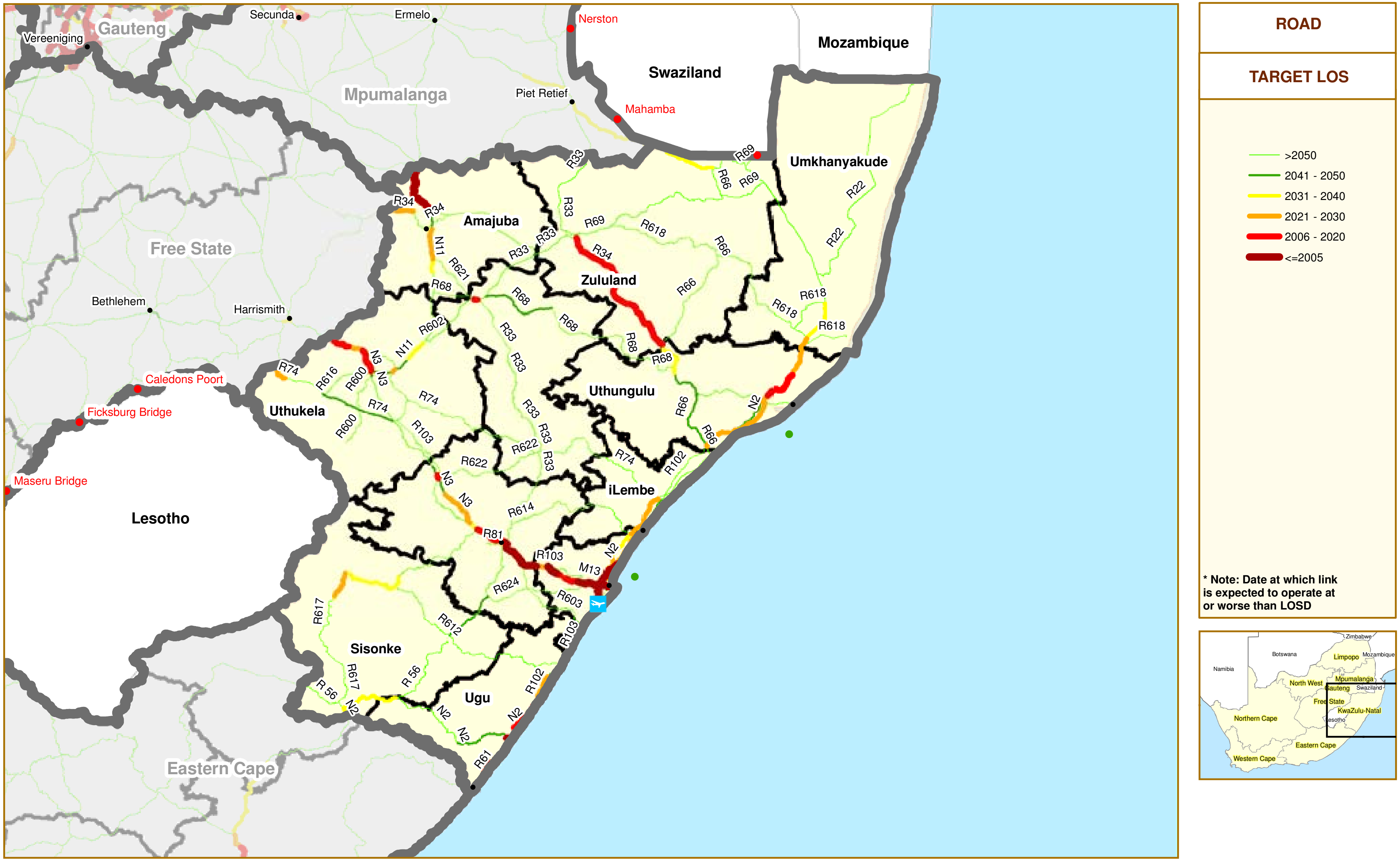
Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 7.3L Roads with Capacity Problems

Kwazulu Natal Province: YEAR AT WHICH ROADS WILL REACH LOS D



BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 12.5 25 50 75 100 Kilometers

Map and Data Current Status Completed

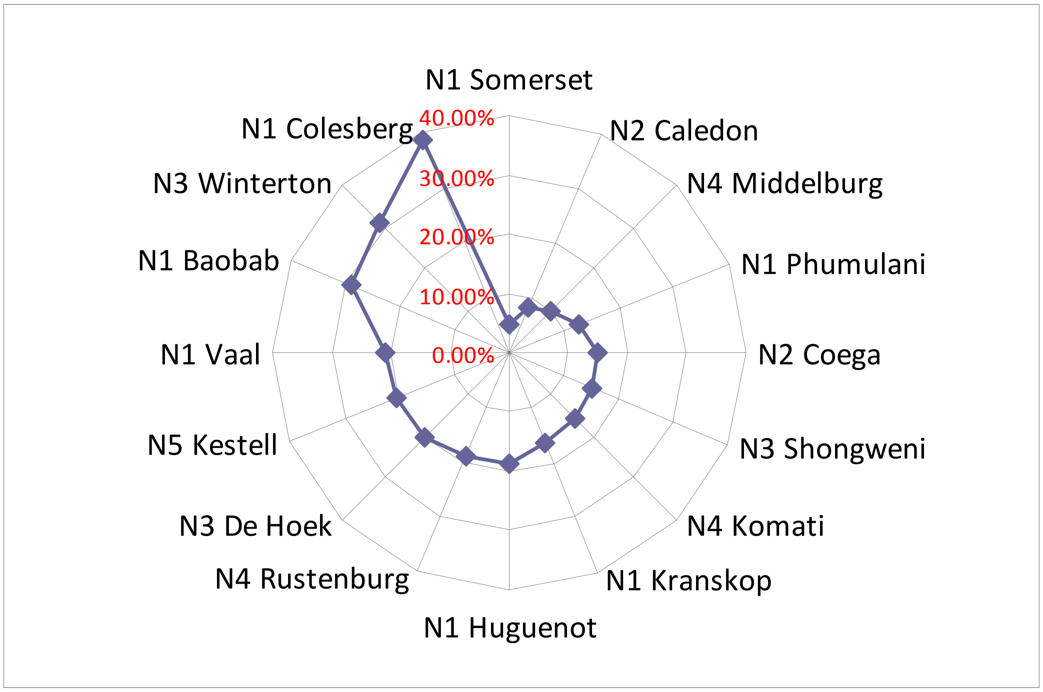
0-15% 25% 50% 75% 80% 90% 100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 7.3M Year at which Roads will Reach LOS D

These following percentages of heavy vehicle were obtained from annual figures on randomly selected national roads: (random points selected on various N roads)



These percentages are a clear indication that there is no acceptable mean value for heavy vehicles on national roadways. It is largely a function of the location of the road and the origin and destinations of the vehicles on that roadway.

For the purpose of this National Transport Strategy, a selected value of 20% was chosen as an indicator. This implies that at least one in five vehicles on the road is likely to be a heavy vehicle. Two-lane roads were selected that have a percentage of heavy vehicles that exceeds 20%. This selection should provide a first order indication of where traffic problems are likely to be more prevalent as a result of overtaking and platooning (ignoring specifics as listed before on each roadway that may to some extent mitigate the problem).

Driver Training

National Minister of Transport, Sibusiso Ndebele plans to introduce training for driver's licences as part of the school curriculum. To obtain a drivers license in South Africa, applicants firstly have to pass a learner's driver license test (desk test) where after they can apply to take a driver's license test.



Driver training is mainly required to prepare incumbent drivers to undertake the driver's license tests. There is no formal or government sanctioned school for the training of drivers. Driver training is currently driven by the private sector and instructors must obtain the necessary knowledge and skills from private training enterprises. There is no obligation to undergo any form of formal driver training before applying for a driver's license – requiring a certificate of proof of having undergone driver training is common practice in many other countries.

A driver's license test determines the ability of drivers for vehicles that fall in particular categories, e.g. light motor vehicle category to legally and safely be in charge of such a vehicle on South Africa's public roadways. The test comprise of a yard test and a road test, jointly examining the proficiency of a vehicle driver to handle the vehicle, the driver's obedience to and understanding of traffic rules. It also tests the driver's ability to cope with traffic problems as they are encountered in the normal driving environment. Only on the successful completion of the driver's license test, can a driving licence be issued to the applicant.

The introduction of sanctioned driver training courses for adults wishing to apply for a driver's license together with the introduction of driver training curricula at school level, will be beneficial for the creation of awareness of road safety among the road using public and will contribute towards the improvement of road safety significantly.

Vehicle Testing

A study that was conducted by L Vogel and CJ Bester from the University of Stellenbosch in 2004, found that vehicle factors attributes between 10% and 15% of the causes of accidents on South African Roads. A further finding was that these percentages are higher contributors in South Africa than factors emanating from the road environment (between 5% and 10%). This is in contradiction with similar research and findings that were done in the United States and in Australia.



In South Africa, vehicle registration is recorded on the National Traffic Information System (NATiS). Legal compliance to the testing of vehicles in South Africa is dealt with in the National Road Traffic Act (Act 93 of 1996). Further prescriptions regarding the testing of vehicles are contained in the SABS 0216 and SABS 047 documents. Roadworthiness certificates are required for private vehicles (light vehicles weighing less than 3500kg) on change of ownership. For taxis, buses and trucks roadworthiness certificates are required annually and are a pre-requisite to the issue of the vehicle license.

A roadworthiness test is a simple test to assess the overall safety of a vehicle’s condition. The items to be tested during this test are contained in the aforementioned SABS047. More comprehensive testing of a vehicle is available from Automobile Association although there is no legal obligation for this test - it is mostly used by private or commercial entities when transacting vehicles as a means of ensuring functionality and quality.

In terms of the act, roadworthiness certificates can be issued by state and privately owned enterprises. To register a roadworthiness testing station, the National Road Traffic Act prescribes certain procedures to be followed and minimum requirements that have to be met.

Some of the criticism1 has been leveled against compulsory motor vehicle inspections in Australia. The bases of this criticism are that:

- There is no apparent proof that regular testing increase the safety of the passenger vehicle fleet;
- It places a financial burden on motorists;
- It is not cost effective and
- It may give motorist a false sense of security.

Despite this criticism, compulsory vehicle inspections were introduced in Australia and were entrenched in the legislation.

[1] RAA, [No date]; Compulsory Motor Vehicle Inspections.

In South Africa, a vehicle is considered un-roadworthy when the owner of such vehicle has failed to submit the vehicle for compulsory annual roadworthy tests or on change of ownership. Between 2007 and 2008, the number of vehicles that are un-roadworthy or unlicensed increased by 18.23%.

The South African roadworthiness test involves the following items:

• **Identification and documentation**	• **Steering**
• **Electrical Systems**	• **Engine**
• **Fittings and Equipment**	• **Exhaust System**
• **Braking Systems**	• **Transmission and Drive**
• **Wheels**	• **Instruments**
• **Suspension and Undercarriage**	• **Dimensions**

Speed law enforcement

The effect of speed on the occurrence and severity of motor vehicle accidents is a contentious issue among road safety practitioners. There are generally two schools of thought about this issue – some saying that there is a definite relationship between speed and accidents and another contesting that there is no such thing as a safe speed to travel at. The latter view holds that drivers should be allowed to elect a speed that is safe for the particular driving circumstances. Examples of this school of thought is found in some Western European countries where high speeds are allowed and where there are still low accident rates.

There is merit in both views but the context wherein certain concessions are made are generally accepted as crucial among all involved. The level of road design standards, the level of road maintenance, the road worthiness of vehicles, the level of unlicensed and/or unskilled drivers, the driving culture and the prevalence of intoxicated drivers and pedestrians are all important factors to consider here.

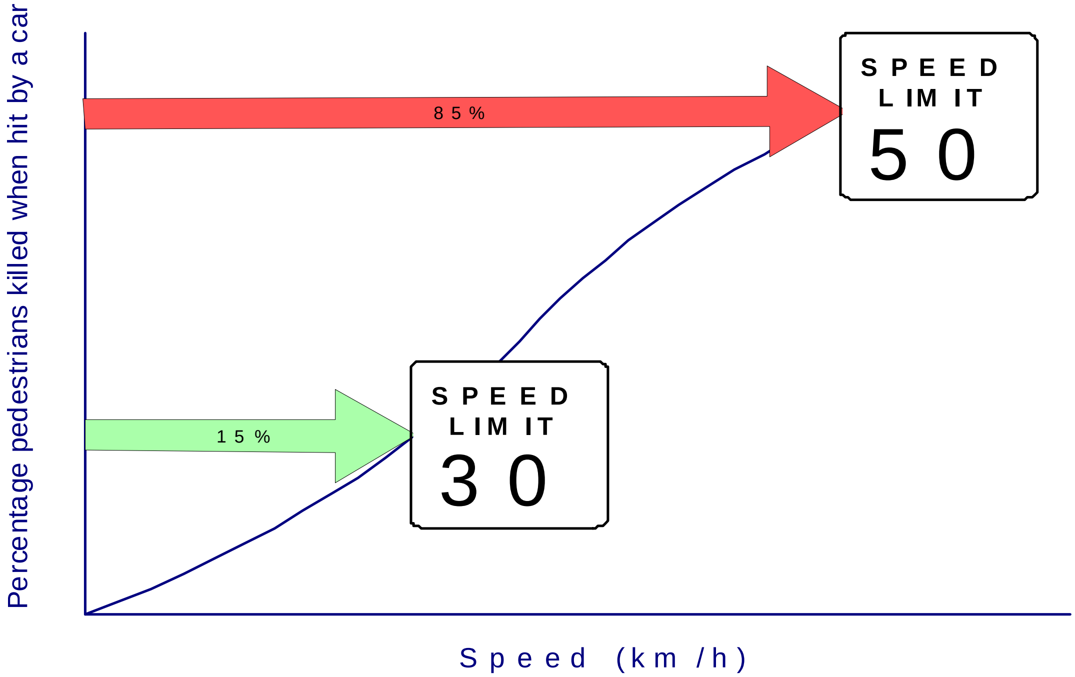
The Commission of the European Communities Road Safety Action Programme, published in June 2003 stated that excessive and improper speed is the cause of approximately a third of fatal and serious accidents and a major factor that influences the severity of injuries.

In a study undertaken in the United States of America (USA) in the late 1990's, it was found that speed contributes to 18,7% of road crashes. The contribution of alcohol was in the order of 18,2%. In Australian research in the 1990's it was found that the risk of involvement in a crash in a 60 km/h zone doubles for every 5 km/h in excess of the speed limit[vi].

A further study was undertaken by the CSIR in the 1970s and 1980s that found that a decrease of 1 km/h in the mean or average vehicle speed in rural areas resulted in a decrease of 9 fatal accidents and 120 total accidents per month.

Speeding vehicles in a environment where there is a prevalence of non-motorised transport (pedestrians and cyclists) is of particular concern. Information obtained from research that was conducted in Sweden, showed that at a speed of 30km/h a pedestrian has a 15%

chance of being killed when hit by a car. At a speed of 50km/h, the chance of being killed increases to 85%.



The diligent enforcement of speed limits is therefore beyond question a very important aspect of improving the overall status of road safety in South Africa. The overall objective of traffic law enforcement is to save lives, Transport Minister Sibusiso Ndebele said in the media (August 2009). The minister stated that "Speed remains a major contributory factor to motor vehicle collisions in the country". He further stated that "Increased traffic volumes have made it no longer safe, for both officers and motorists, to carry out manual traffic enforcement."

The minister was responding to claims that traffic law enforcement was more about making money than contributing to road safety. This followed media reports alleging officers were under-trained, equipment was sub-standard, trapping was carried out illegally and speed cameras were illegally used. Minister Ndebele said camera law enforcement was a necessity, with the primary purpose to address road safety and nothing else.

Cameras constitute not more than 30 percent of all law enforcement activities and must comply with certain prescribed norms and standards. In order to reduce road traffic offences and road accidents, plans are underway to provide traffic officers with wireless, hand-held pocket computers which would enable continuous, fast, real-time electronic access from the road side to the National Traffic Information System. The specially developed software would enable officers to record traffic violations and road crashes electronically at the roadside via a central server to a traffic offence register. A variety of traffic law enforcement reports would be generated from the system, including the monitoring and evaluation of the performance of individual officers and traffic authorities.

Financial Context

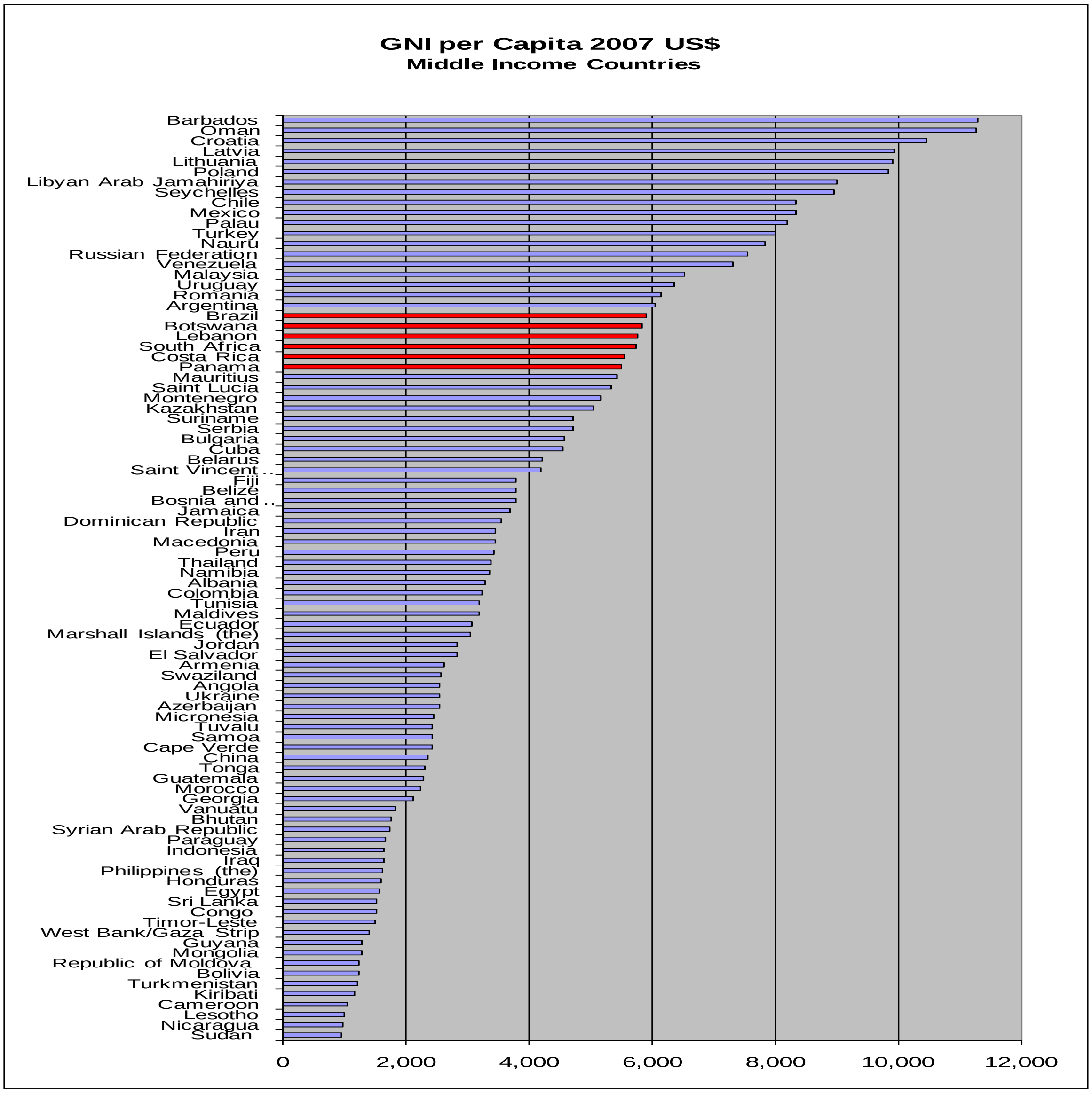
Government has adopted a program for accelerated and shared growth for SA. This program provides for reducing the cost of the economic impact of road deaths and road crashes, currently estimated at around R 70 billion per year, by half in 2014. The program also requires from the traffic industry to create additional employment and to contribute to the reduction of fraud and corruption that currently cost the economy an estimated R 14 billion per year as well.

Currently, the funding of measures and concrete projects spanning the 3 E's of Road Safety (namely Engineering, Education and Enforcement) still lags behind the levels where it should be. Without comparison with other benchmarks, this is most evident in the statistics on road accidents in South Africa. The unacceptably high ratios of accidents on South African roads reported earlier in this report, represent a very good, real-time barometer of the level of expenditure. Although the accidents will not reduce as a result of more funding only, it will definitely over time provide some evidence that funding is reaching the required targets and is being spent in the right places.

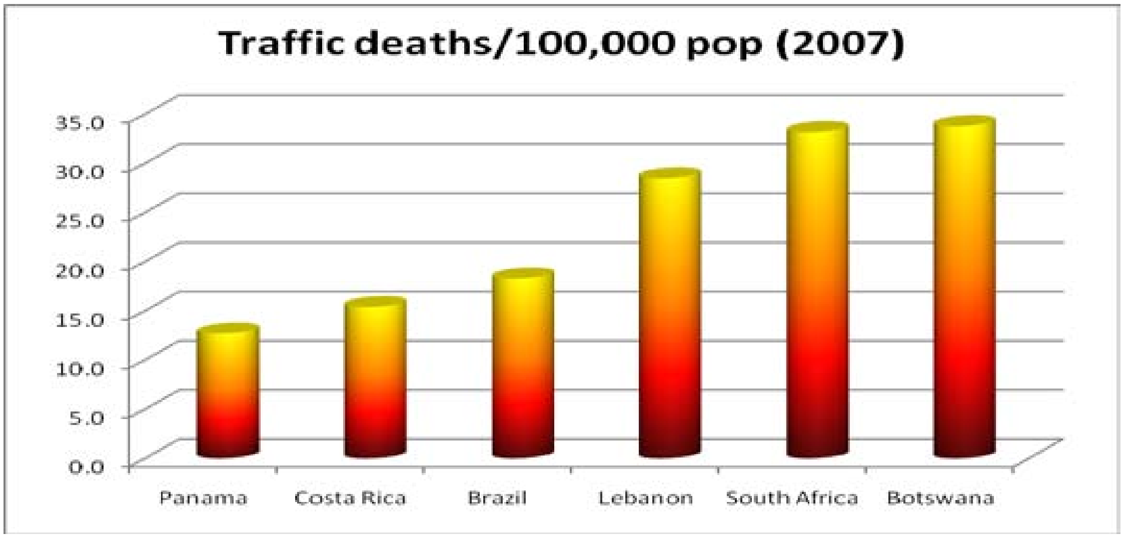
There are many bodies tasked with road safety in South Africa – this most important and official in its role of mandated leadership in the field, is the Road Traffic Management Corporation (RTMC). Having a central focal point for Road Safety Activities in South Africa assist with focussed investment into the road safety realm. Making a difference that impacts on all "levers" that can affect road safety (this includes the aforementioned 3 E's, institutional reform, inter-agency cooperation, emergency services and many more is a complex challenge. In addition to these aspects mentioned here, the efforts should be focussed on the three important phases of motor crashes namely:

- Pre crash (the prevention of accidents),
- During crash (the reduction of injuries and fatalities)
- Post crash (the reaction time to accidents)

When the accident situation of a country is evaluated, the tendency is usually to compare a country's statistics to neighbouring countries. Although it is often reasonable to do so, a factor which needs to be taken into account is Gross National Income (GNI). The table below compares South Africa's GNI to other middle income countries.



The GNI per capita for the countries highlighted in red was further analysed to benchmark the level of road safety achieved in each of the countries listed in the figure below. The picture provides an indication that funding that should be available within the economy is not finding the target of affecting road safety positively optimally.



South Africa is reporting very high rates on road deaths. Statistics South Africa reported in 2006 that 10.6% of unnatural deaths recorded during that year was caused by motor-vehicle accidents. Examination of the figure they have used for this calculation looks like this figure may have been underreported. Irrespective, this percentage was on the same level as deaths caused by assault for the same year. Currently, there is an awareness of crime and the government is performing several tasks to demonstrate a determination to eradicate and address the issue of crime. Yet, road deaths are causing the same levels of despair and loss but this issue is not receiving nearly the same level of awareness and the funding from both private and public sector.

Logistical Constraints

There are some logistical constrains when dealing with road safety in a country like South Africa. Firstly, South Africa is a very large country and with the exception of a small number of relatively big cities, the country is not densely populated. To permeate a road safety culture across all layers of society in such a geographically vast context is not only financially challenging, but also on a logistical level.

This situation is however not unique to South Africa. Many other countries are experiencing the same type of challenges and has devised strategies and structures to meet these challenges.

The RTMC has recently announced a number of structures that will be established to actively drive and monitor the agenda of road safety on a country-wide basis. These structures will include the current Road Traffic Management Coordinating Committee (RTMCC), together with the following additional committees:

- Road Traffic Safety Management Steering Committee (RTSMC);
- Road Traffic Management Coordinating Committee (RTMCC);

- Provincial Traffic Management Committees (PTMCs); and
- Provincial Regional Traffic Management Committees (PRTMCs).

Many other logistical constrains do however remain relating to funding, human capital, capacity building, law enforcement, legislation and inter-agency cooperation.

D. Existing Road Safety Strategies

- Arrive Alive

".. the Road to Safety Strategy .. is not a Utopian wish list but a set of carefully measured, balanced and prioritized actions that are practical, affordable and do-able. Today I want you to see that The Road to Safety is a living document that is already making hard demands on all those at the delivery end who have been tasked with getting results" (Minister of Transport, Abdulah M. Omar, at the launch of the Road to Safety Strategy, 20 November 2001)

The Road to Safety Strategy was launched in 2001 by the former Minister of Transport, Mr Omar. The report has subsequently been revised and updated continuously and the latest version thereof is titled the Road to Safety 2006. The Road to Safety Strategy mentions the important role of the Arrive Alive initiatives in Road Safety in South Africa.

Arrive Alive coordinates and harmonises traffic law enforcement on provincial and local levels. Mass communication supports the law enforcement by illustrating the possible results of these offences. Funding by the Road Accident Fund (RAF) ensures that Arrive Alive is a sustainable project. Arrive Alive has been built into a recognizable brand since the inception of the campaign and its implementation has resulted in a significant year-on-year decline in fatal accidents.

It is now a year-round, rigorously targeted, 7 day-aweek campaign. But while Arrive Alive is a rolling tactical programme, it is not an all-purpose strategic and operational tool. It could not address all the underlying problems such as institutional reforms, the upgrading of the road infrastructure, driver and vehicle fitness and the reformation of regulatory and monitoring institutions. That is why the "Road to Safety Strategy 2001 - 2005" was implemented[vii].

More on Arrive Alive is provided earlier in this section on road Safety of the report.

- Business Plans

The Department of Transport has followed the launch of the Road to Safety Strategy with an implementation business plan for 2002/2003. This plan was the result of detailed planning and research. It sets out an achievable plan of action and identifies key deliverables, which will ensure timeous delivery on the commitments made in the strategy.

- The RTMC

The fragmentation within the road traffic management functions is to be overcome with the RTMC. The shareholders committee for the RTMC consists of the National Minister of Transport, the provincial MEC's responsible for Transport and Traffic as well as local government through the SA Local Government Association (SALGA).

A detailed discussion on the role and functions of the RTMC is provided earlier in this section on Road Safety of the report.

- The Administrative Adjudication of Road Traffic Offenses (AARTO) Act

The Administrative Adjudication of Road Traffic Offences (AARTO) Act provides for the points demerit system and the suspension of driving licences of repeat traffic offenders. In terms of this Act, infringements and offences will be viewed as different categories, with infringers being dealt with administratively and traffic offenders –those who commit serious offences like drinking and driving and reckless driving – going to court. Once drivers reach the threshold of 12 demerit points, their licenses will be suspended. Once a driver's license has been suspended three times, he/she must apply for it afresh.

A detailed discussion on the role and status of AARTO is provided earlier in this section on Road Safety of the report.

- Overload Control

To address the problem of overloaded vehicles, the Department of Transport, in conjunction with provincial traffic authorities, the South African National Roads Agency Limited (SANRAL) and the Council for Scientific and Industrial research (CSIR) has drafted the National Overload Strategy. The strategy covers the issues of self-regulation by the freight industry, funding, training and operational issues and a review of the 5% tolerance on the mass limit that is allowed for in the Road Traffic Act.

The strategy also contains several new and innovative aspects. A strategy map will assist planners in deciding on appropriate locations for additional weighbridges. A database containing information on weigh bridge operations and monitoring, as well as monthly reports will be accessible via a website. This database will also contain information of habitual offenders. Practical guidelines on how to deal with these offenders were developed. Portable scales were evaluated, determining their accuracy and acceptability for prosecution purposes. Legislation to extend the responsibility of overloading to the consigner and the consignee was being drafted[vii].

- Roads Development Plan

A strategy was developed that required the systematic upgrading of road infrastructure with specific focus on accident hotspots and other hazardous locations. The status of this initiative is unknown at this stage.

E. The Development of New Road Safety Strategies

- Introduction

The 3 E's of Traffic Safety is well known among road safety practitioners. They are:

- Education
- Enforcement
- Engineering

An understanding of the proportions of funding going towards each of these aspects on an annual basis will be a good starting point for benchmarking this with other countries, as well as for the development of an understanding where south Africa falls short.

A study that was conducted by the University of Stellenbosch[viii] on the relationship between accident types and causes, concluded that the human factor remains the single biggest cause of accidents in South Africa. This provides clear direction that although engineering is important, crucial pillar of overcoming the road safety problem would be to concentrate of education and enforcement.

- Education

Recent announcements made by the current Minister of Transport (referred to earlier in this section on Road Safety), provides the assurance that road safety will be brought into schools to learn South Africa's scholars about the importance of road safety and the inputs that are required to improve road safety.

Compulsory driver training should also be a serious consideration for those that wish to obtain a drivers license. This compulsory training should also apply to those that have lost there license in terms of the demerit system. The compulsory driver training is already common practice in many other countries and provides a good foundation for new entrants into the road environment.

- Enforcement

Law enforcement has been proven all over the world by numerous case studies to be extremely effective in mitigating the road safety problem. In Peru (South America) a specialised traffic law enforcement group has been established to systematically focus efforts on certain problematic accident hotspot and has yield surprising good outcomes. This is an initiative worth investigating from a South African point of view as well. On a broader base however, the strict enforcement of laws that specifically affects road safety detrimentally is important. This includes speeding, driving under the influence, unlicensed driving, unroadworthy vehicles and reckless and dangerous driving. Effort should also be made to expedite the cycle of fines being issued as well as strategies to decrease the percentage of non payment.

- Engineering

Lastly, the engineering environment is important when planning for road safety. Over the past decade, a number of well publicised failure of bridges and buildings have taken place in South Africa, giving rise to some suspicions that the quality of engineering and quality control may not be strictly enforced to the levels required. The same quality oversights and problems in a roads environment is however not always immediately evident and may manifest much later in the form of high levels of accidents taking place. This is not to say that road safety problems are not found on roads that are designed to very high standards as well.

With this in mind, many countries have instituted the compulsory undertaking of road safety audits on planned new road infrastructure, by registered and qualified road safety auditors. To address problems on existing roads, each provincial and local authority would have to develop a road safety map showing accident hotpots and areas which have been assessed by professionals to be potentially dangerous. Systematic road safety assessments would be required for this. In addition, risk profiles should be developed for selected, strategic roads to inform a hazardous material transport routes network.

The enabling environment for this to take place in, would be the development of a road safety assessment and road safety audit policy, under the auspices of the RTMC. Secondly, the South African Road Safety Manual should be revised and updated to reflect the latest norms and trends on road safety internationally. Lastly, a system should be provided to provide formal training to prospective road safety auditors. The outcome of this system should result in a vetting or certification system for road safety auditors, under the guidance of the RTMC.

The initiatives stated above are currently being investigated by the RTMC.

- Data Management Systems

Currently, the analysis of road accident data on a country wide basis is problematic in that the exact, geo-referenced location of an accident is not recorded. Most process of audits and assessments requires an appraisal of the entire network to ascertain where the most accidents occur. Armed with this knowledge, more detailed investigations can then be prioritised based on the number and severity of accidents taking place at those locations.

The data management system is only as good as the data it contains and therefore the structures providing for the accurate reporting of accidents need to be in place and be controlled from one information hub. Training of police officers on an ongoing basis is therefore very important. The current initiatives by the RTMC into handheld devices for the reporting of accidents are likely to start addressing this challenge.

- The Accra Declaration

As a member of the SADC, South Africa was a signatory of the Accra Declaration of African Ministers responsible for Transport and Health on 8 February 2007 in Accra, Ghana. In terms of the declaration, South Africa is committed to work together to stop the growing epidemic of death and injuries on South Africa' roads. A copy of the full declaration is included in **Table 7.3.J.**

In essence the declaration commits South Africa to implement and strengthen the required legislation, action and enforcement plans to ensure that measureable targets to reduce fatalities due to road accidents are met. In this regard a target of halving fatalities by 2015 has been set.

- Land Use Planning

South Africa is a sparsely populated country. The settlement patterns are different from that of other countries since the population is concentrated in towns, villages and rural settlements. People tend to travel between the locations. The impact of the settlement patterns on road traffic safety needs to be assessed as well as possible changes to the future land use planning policies.

With the advent of a large infusion of formalised public transport being introduced within the big cities, in the form of high speed rail and the bus rapid transit systems, the concept of Transit Orientated Development (TOD) should be investigated and incorporated into the applicable policies and approval processes. TOD entails the densification of land-use in the areas where public transport is available and the introduction of mixed land-uses to minimise the need for trip-making by motorised transport.

- Incident Management Systems

In the early 1990's the Department of Transport initiated the first Incident Management System (IMS) on the N3 in KwaZulu Natal. By the late 1990's Incident Management Plans were in place for approximately 1,300km of the national road network as well as a number of provincial and metropolitan routes.

In 1996 the Incident Management Systems National Technical Committee on behalf of COLTO developed a Guideline Document of the Development, Implementation and Maintenance of Incident Systems. The aim of this document was to ensure co-ordination in the development, implementation and maintenance of Incident Management Systems in South Africa. The committee responsible for the development of the guidelines included road authorities across the three spheres of government as well as all emergency services across the country.

The guidelines included the following:

- o the concept of IMS and what it involves;
- o criteria for the evaluation and prioritisation for the implementation of IMS's;

Table 7.3.J: Accra Declaration

The Accra Declaration of African Ministers responsible for Transport and Health (8 February 2007) in Accra, Ghana.

SADC region countries present at this event were: **Botswana**, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe.

DECLARATION OF AFRICAN **MINISTERS RESPONSIBLE FOR TRANSPORT** AND HEALTH DONE IN ACCRA ON 8 FEBRUARY 2007

We the Ministers responsible for Transport and Health, meeting at the African Road Safety Conference in Accra, Ghana on 8th February 2007 on the importance of road safety;

HEREBY RESOLVE to undertake the following:

Work together to stop the growing epidemic of deaths and injuries on our roads.

1. **Promote road safety** as a health, transportation, law enforcement, education, and development priority for our nations.
2. Set and achieve **measurable national targets** for road safety and traffic-injury prevention in all Member States to contribute to the achievement of Africa's overall targets to **reduce accidents fatalities by half by 2015**. In this regard, Member States should designate a lead agency, with legal backing and adequate and sustainable financial resources, to ensure the achievement of the targets.
3. Take necessary steps to source **sustainable funding** for development and management of transport infrastructure and services and work with multilateral and bilateral donors to develop road safety projects and programmes to build national road safety management capacity.
4. **Strengthen pre-hospital and emergency services** in order to provide timely and appropriate care to road traffic-injured patients to minimize their effects and long-term disability.
5. **Mainstream road safety into new and existing road infrastructure** development programmes. In this regard, convince governments to devote a percentage of their investment in infrastructure development to road safety programmes.
6. **Improve** the collection, management and use of **data on road deaths and injuries** so as to formulate evidence-based policies. In this regard, efforts would be made to address the non-reporting of accidents, and to harmonise data that originate from different sources.
7. Ensure the enactment and **enforcement of laws** associated with driving under the influence of **alcohol and drugs**; inappropriate and excessive **speeding**; **non-use of helmets**; **driver licensing**; **non road-worthy** vehicles; and the use of **mobile phones**.
8. Implement specific **education programmes** among drivers with regard to safe driving, particularly with issues associated with speed. In this regard, promote road safety initiatives at the local, municipal and national levels, for children and other road users.
9. Urge African countries to pay special attention to **rural transport**. In this regard, ensure that adequate resources are provided for studies on rural dimensions of road safety and the implementation of their outcome.
10. Encourage African countries to ratify and adhere to **international treaties** and conventions such as the Vienna Conventions on road traffic and road signs and signals.

Recommendations

Member States should:

- **Harmonise national actions plans** at sub-regional level (databases, regulations, infrastructure and equipment standards.
- Encourage African countries to **enforce road safety legislation**, particularly those related to speed control, use of helmet, and enhancing visibility.
- **Strengthen partnership and collaboration** at sub-regional, regional and global level in advancing the road safety agenda.
- **Mainstream road safety** in national transport policies, with particular attention to rural transport safety.
- Commit to **educating** the general public on road safety matters.
- Set and achieve measurable targets to contribute to achieving the goal of **reducing accident fatalities by half by 2015.**

- o phases in the development, implementation and maintenance of an IMS with examples of the process to be followed to develop an IMS

The guideline document also touched briefly on an action plan for IMS in South Africa and funding. Since the guidelines were developed the Incident Management Systems National Technical Committee has not been active and the responsibility for the implementation of IMS's was with the different road authorities and toll concessionaires.

An IMS framework and guideline document as requested by the TOR is required for the following reasons:

- There is a need to leap forward and make tangible progress to improve traffic safety in South Africa;
- There is need to create and nurture a broad based road safety culture in South Africa;
- There is a need to entrench the sustainability of traffic safety measures by establishing a legal framework compelling participation in processes such as IMS;
- There is a need to address the real need for assistance and knowledge to address and manage road safety and IMS.

7.3.6.3 Travel Demand Management

A. Definition of Travel Demand Management

Travel Demand Management (TDM) is defined as any action or set of actions aimed at reducing the demand for private vehicle travel in a specific area during a specific time period, i.e. influencing people's travel behaviour and encouraging a shift to other modes of transport. Examples of this may include a shift away from the single occupant vehicle use, or avoiding driving during peak traffic hours (City of Colorado Springs, 2001: Intermodal Transport Plan, Pg.65).

These techniques, strategies and programmes lead to a reduction in the need for road-based travel and are generally implemented to counter the following:

- Congestion of roads (demand for travel exceeding capacity).
- Under-utilisation of existing transport infrastructure and services.
- Over-use or dependency of one particular mode of road based transport.
- Inappropriate expenditure on infrastructure not conducive to meeting the objectives of TDM.
- Lack of new and innovative infrastructure and traffic control elements required for a forward compatible and progressive transport solution.
- Vehicles travelling on inappropriate roads to avoid congestion or delays (rat-running).
- Environmental quality reduction based on vehicle emissions associated with congestion and longer travel times.
- The absence of an understanding of what measures will have the most cost effective and efficient impact on the transport network.

Road congestion can typically be addressed by two strategies, namely:

- Infrastructure management (supply side management): Capital expenditure on roads with the aim of increasing capacity through e.g. lane additions, traffic control improvements, the use of ITS, the introduction of an efficient and cost-effective public transport system etc. Infrastructure provision can also be done with the specific aim of providing facilities for specific modes of transport such as HOV and bus lanes.

- o Demand side management: Travel Demand Management techniques that manage the need for travel and reduce the need for travel using a particular mode of transport during a particular point in time i.e. during peak periods. This could also imply land use management to ensure that the need for travel between different land uses are minimised.

TDM measures are often less costly than capital investment initiatives which serve a similar purpose and results in comparable capacity improvement outcomes. Given the dwindling financial resources of road authorities, the increasing cost of construction materials and labour as well as the increasing number of social and community services demanding budget at the cost of infrastructure investment and urban development initiatives, the use of TDM measures is increasingly becoming a priority for many authorities.

Therefore, exercising control over the trip generating characteristics of land use, together with road infrastructure expansion can be used to make the resultant demand consistent with the existing transportation infrastructure and the level of service desired.

G. Goals and Objectives of TDM

TDM measures are primarily implemented in areas of congestion usually associated with urban areas or congested inter-urban transport corridors. The goals and objectives of TDM are similarly divided into four categories relating to the urban environment, namely (Colorado Springs, 2001: Intermodal Transport Plan, Pg.67):

- o Mobility
- o Liveability
- o Intermodalism
- o Implementation

The TDM goals and objectives for each of these categories are summarised in

Table 7.3.K..

Table 7.3.K: TDM Goals and Objectives

Mobility

- Protect and enhance the service level of the transportation system.
- Encourage, promote and facilitate proactive citizen participation to determine the long-term mobility needs of our community.
- Preserve, maintain, enhance and increase efficiency of the existing system by emphasising transportation system management techniques.

Liveability

- Plan, develop and implement a transportation system that protects and enhances air and water quality, scenic routes and vistas, and minimizes noise impacts on residential areas.
- Encourage land use decisions that facilitate implementation of the planned transportation system.
- Manage both on-street and off-street parking to support access and transportation objectives.

Intermodalism

- Develop programs and infrastructure to encourage the use of high occupancy vehicles (HOVs), such as buses, vans and carpools.
- Manage demand placed on the roadway system in terms of need, timing, and mode.
- Consider the costs and benefits of each transportation mode when considering mobility improvement alternatives.

Implementation

- New development should implement approved transportation plans and provide the transportation improvements needed to accommodate that development.
- Consider the traffic impacts of new development on existing neighbourhoods and infrastructure when prioritizing major transportation improvements.
- Maintain transportation facilities to protect the community's investment in capital infrastructure.

In short, the primary purpose of TDM is to reduce the number of vehicles using the road system while providing a wide variety of mobility options to those who wish to travel.

B. Typical Travel Demand Management Measures

A number of TDM measures have been implemented both domestically and internationally, some of which with more success than others. Currently, TDM measures are at the forefront of traffic planning and management and as such research initiatives to expand the body of knowledge and the field of expertise is ongoing. Therefore, no single list of TDM measures can ever be exhaustive as new TDM measures are being researched, developed, piloted and implemented constantly.

The list of TDM measures in the table below therefore seeks to illustrate the extensive nature of TDM measures available for implementation but does not claim to represent an exhaustive list.

Table 7.3.L: TDM Measures

Demand side measures

- Work schedules
- Ride-share programmes
- Parking management
- Land use / Zoning policies
- Private vehicle restriction zones
- Taxation policy
- Public transport subsidies
- Tele-commuting, conferencing and education
- Pre-Trip Travel Information
- Improved public transport service / image
- Shadow tolling
- Travel pricing
- Freight management

Supply side measures

- Parking Supply Limitations
- Congestion pricing
- In-vehicle Travel Information
- On-road Travel Information
- Freeway ramp control
- Traffic signal settings
- Network capacity
- HOV Lanes
- Park and ride
- Connector / Feeder Services
- Non Motorised Transport Facilities

The TDM measures listed in the table above is discussed in more detail in the following paragraphs:

- Demand side measures

  - **Work schedules: Flexi-time and alternative working times will allow for off-peak travel. Compressed working hours allow employees to work the required number of hour in fewer days, thereby reducing the demand for travel.**
  - **Ride-share programmes also referred to as car pooling, where commuters travel** together often sharing vehicles on alternate days (it should be noted that in South Africa car pooling schemes where only one vehicle is used and the owner is compensated by other occupants is in conflict with legislation and therefore illegal).
  - Parking management: Management of the need for parking by adjusting the cost of parking. Some schemes even compensate employees if they wave their allocated parking bays, or allocate parking to car pool vehicles at a lower cost. Preferential parking can also be provided to off-peak travellers.

- o Land use / Zoning policies should enable the provision of sustainable public transport, as well as opportunities for effective non motorised transport. Mixed land use might reduce the need for travel between different land uses and high density development ensures sufficient demand for travel required for a sustainable high service level public transport system.
- o Private vehicle restriction zones: Prohibition of access to specific zones for private vehicles to encourage the use of public transport.
- o Taxation policy can be used to discourage private vehicle subsidies and for tax rebates where public transport is actively promoted.
- o Public transport subsidies for companies or developments which actively support public transport usage.
- o Tele-commuting, conferencing and education is where telecommunication infrastructure is used ensure that work, shopping and education is done at the place of residence or in some cases as the place of employment to prevent travel to a different location to participate in one of these activities.
- o Pre-Trip Travel Information: To be provided with travel information, ride-share information, public transport information, congested route information before you travel. The information is provided in attempt to influence mode choice as well as the time of travel to avoid congested roads or peak period.
- o Improved public transport service / image: Make public transport an attractive safe, frequent, reliable and accessible service in order to be able to encourage a mode shift to public transport.
- o Shadow tolling is where land owners or businesses pay toll to the road infrastructure implementation agency for the use of the infrastructure on behalf of the patrons of that specific development. Although it could be seen as a supply side TDM measure to recover the cost of infrastructure, it could be used as a demand side measure if the shadow toll is related to the degree to which public transport is promoted by a specific development. I.e. if no public transport plan is actively promoted, shadow tolls will be higher. The inverse, i.e. lower shadow tolls, if the development actively promotes public transport and limits the extent to which private vehicle trips are generated by the development.
- o Travel pricing: Eg. freeway tolling, tolling of urban roads by means of electronic toll, fuel levies and cordon tolling around a CBD are all measures which can be used to discourage the use of private vehicles, whilst generating income to fund basic transport infrastructure or infrastructure specifically related to promote TDM measures.
- o Freight management attempt to influence delivery times of goods to ensure that heavy vehicle do not take up too much road capacity during peak times.
- o Supply side measures
- o Parking Supply Limitations: Parking provision requirements can be reduced during the development stages of development to encourage the use of public transport.

However, such strategies are only effective where alternative modes of transport are available.

- Congestion pricing in general is associated with higher or variable toll during peak periods or on very congested roads to influence travel and mode choice patterns.
- In-vehicle Travel Information is used to provide travel information or congested route information in the vehicle while travelling e.g. traffic reports (RDS system). This is a management technique which attempts to route vehicles to uncongested routes, thereby using available infrastructure optimally.
- On-road Travel Information: To be provided with travel information along-side the road via fixed or variable message signs providing information on public transport, ride-sharing, alternative routes, toll or parking information.
- Freeway ramp control: Traffic signals controlling the flow of vehicles onto a freeway, thereby ensuring that the traffic flow on the main road is maintained at an optimum level. It can also be used to give preference to specific vehicle types such as public transport or HOV vehicles.
- Traffic signal settings can be adjusted to favour certain movements if used by public transport, or pre-emption by public transport vehicles (e.g. bus/taxi priority systems). The provision of advanced traffic signal control systems can also optimise the flow of traffic and minimise lost time, thereby maximising the capacity of a section of road.
- Network TDM capacity improvements: Increase or decrease in network capacity can be done to the advantage of public transport specifically.
- HOV Lanes: Dedicated lanes for public transport and / or high occupancy vehicles (HOV). Such lanes can also be tolled in which case it is referred to High Occupancy Toll Lanes (HOT).
- Park and ride: For private vehicles to access a public transport hub easily via accessible routes, park their cars and use HOV / small busses / taxis to travel to high congested areas.
- Connector / Feeder Services to high capacity public transport services such as BRT, rail and light rail. It implies the provision a frequent, reliable connector / circulation bus / mini-bus service to reduce private traffic to the congested areas - may be integrated with a park and ride facility.
- Non Motorised Transport facilities: The provision of cycle lanes and safe pedestrian walkways to ensure that these modes of transport are accommodated safely within the road reserve to minimise the risk of accidents and injury.

C. Effectiveness of TDM measures

Although the TDM measures listed in the previous section has been classified as either demand side of supply side measures, all measures have an impact on both the supply side and demand side to greater or lesser extent. The figure below illustrates the impact of different TDM measures on the supply side, i.e. on the provision of road infrastructure which is primarily to the benefit of private vehicles, as well as on the supply side, i.e. on the expected impact of the measure in terms of achieving a modal shift away from private transport.

Figure 7.3.R: Effectiveness of TDM measures

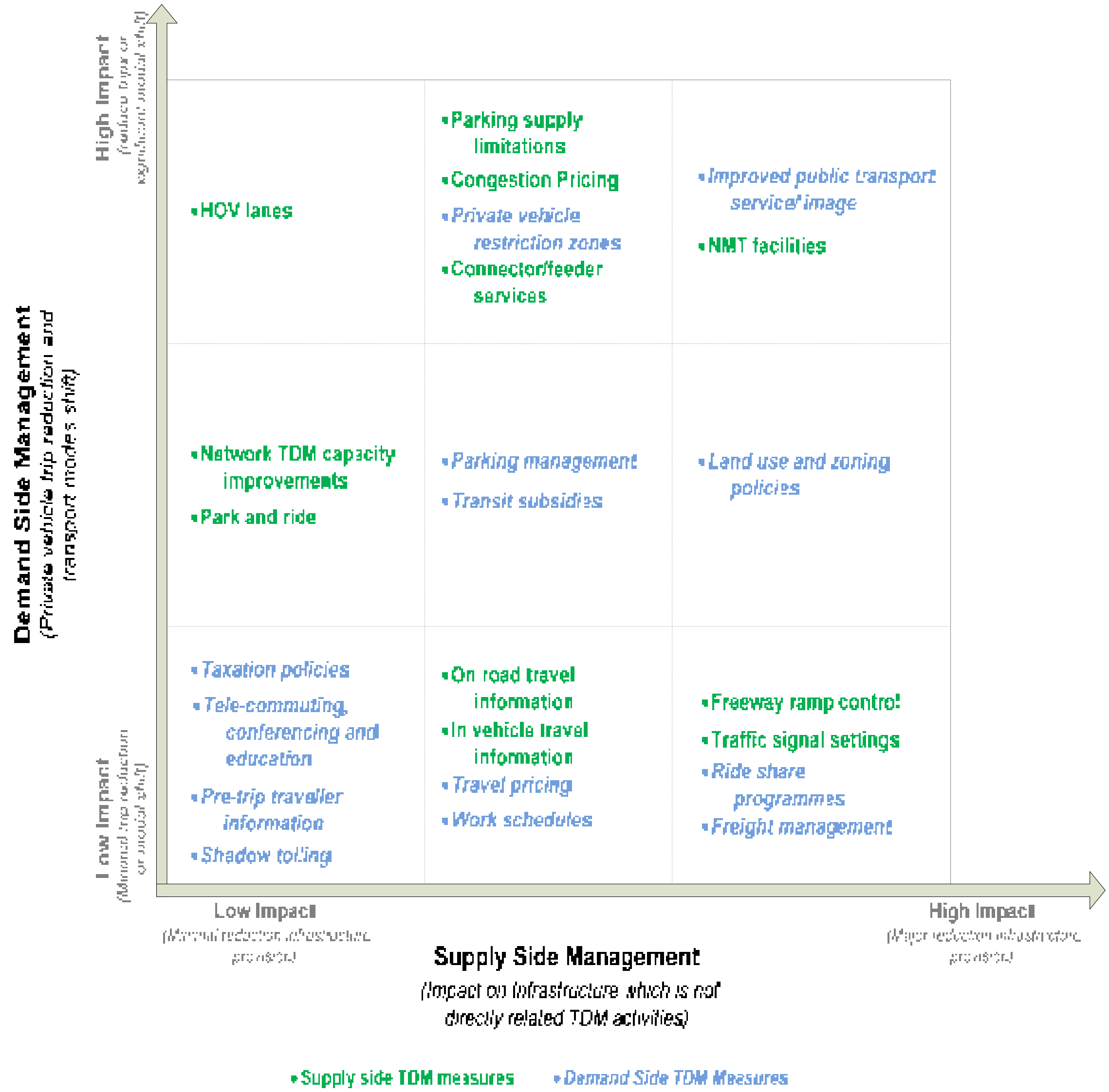


Figure 7.3.S: Effectiveness of TDM measures

The classification of the measures in the figure above as being effective as supply side and/or a demand side management measures should be considered indicative only. The manner and extent to which a measure is rolled out might have an impact on it efficacy on achieving the goals and objectives of TDM.

D. Stages of TDM implementation

The four stages of TDM implementation is summarised in the table below (Gauteng Department of Public Transport, Roads and Works – TDM Framework for Gauteng, October 2002).

Table 7.3.M: The stages of TDM implementation

Parity	• Provision of Infrastructure • Provision of alternative modes of transport • Improve quality of existing modes of transport
Pull	• Provide benefits to encourage use of TDM programmes • Could include discounted tolls, preferential parking and parking rates, access to HOV lanes.
Promotion	• Market benefits of TSM • Promote TDM "pull" programmes specifically • Target large employers and businesses. • Aim to achieve critical mass required for the successful implementation of TDM programmes
Push	• Implement disincentives to force a mode shift or behavioural change • Could include measures such as congestion charging, private vehicle zone restrictions and taxation policies

The effective implementation of TDM typically includes the four stages as indicated above:

- Parity
  - Before the implementation of TDM can be considered, it is a requirement that there should be parity between competing modes of transport. This is required to ensure that different transport modes have the opportunity to compete as well as to ensure that commuters have a choice between different modes.
  - Planning authorities must ensure that the planning process is not biased towards one specific mode of transport. In the past the conventional planning process tended to favour private vehicle transport. Planning policies must ensure that provision for public transport is also made in the planning process.
  - The provision of basic infrastructure is also required to ensure that commuters have access to different transport modes. This includes the construction of roads to a specific standard and with sufficient capacity to accommodate all modes of transport, bus and taxi stops, lay-bys, pedestrian and cycle facilities.
  - The above implies that the planning process should be changed to include integrated transportation impact assessments, as opposed to traditional traffic impact studies which focussed primarily on private vehicle usage.
- Pull
  - Once parity has been achieved, incentives should be provided to attract more commuters to alternative modes of transport.
  - Few commuters will make a mode shift simply because it is the right thing to do.
  - TDM programmes should emphasise the benefits of participating in TDM programmes and should actively market the benefits.
  - For example, ride share programmes could receive benefits such as preferential parking, reduced parking rates, reduced toll fees, access to HOV lanes etc.
- Promotion
  - Public awareness needs to be created of the benefits of TDM programmes as well as specific TDM measures which have been implemented.
  - Employers and businesses are important targets for creating awareness as they can often influence the behaviour of employees in a cost effective manner.
  - For example, large employers can often distribute TDM marketing material at a very low cost using internal electronic communication channels.
  - Marketing activities should be aimed at the “pull” actions which have been implemented to ensure that the required critical mass is achieved to ensure the sustainability of the pull measures.
- Push
  - Once the previous steps have been implemented to a sufficient degree, commuters might have the pushed or forced away from private vehicle usage as the only means of transport.

- o This implies that disincentives might have to be implemented to discourage the use of private vehicles.
- o This stage might require political buy in as it often involves measures which might be unpopular and could include congestion charging, private vehicle restriction zones and taxation policies.

E. TDM implementation Methodology

The implementation of TDM strategies is primarily reliant on accurate, robust and current traffic information. The process of determining the need for TDM implementation is highlighted in the following table. (Bureau of Transportation Statistics, 1994: Overview of Travel Demand Management Measures, Pg. 11):

Table 7.3.N: TDM Implementation Methodology

Understanding the Local Transportation Context

- Develop a thorough understanding of the transport system that needs to be optimised. This includes all relevant infrastructure (i.e. roads, rail, stations, public transport stops etc.), services (e.g. public transport, road-based private transport, freight etc.) and the capacities of these respective elements.

Determine the true nature and severity of your problem

- Prior to implementing a TDM strategy, traffic information should be collected and analysed in order to determine the transport demand and how this relates to the available capacity as identified in the previous step. Each problem should be quantified where possible in order to determine the severity and consequently the priority of addressing the problem.

Evaluate current planning

- Assess where current transportation plans (i.e. Integrated Transport Plans, Public Transport Plans etc.) are likely to lead to resolving the identified problems and identify shortfalls where TDM strategies could provide a solution.

Best Practice

- Using available domestic and international best practice, explore a range of TDM options available and assess the impact these will have on the municipal transportation problems.
- It should be noted that this literature survey should show little concern to the practicality and degree of implementation of the TDM measures. The appropriateness of the TDM measures will be assessed in subsequent steps.

Analyse alternative

- Analyse the trade-offs among the different alternative approaches regarding cost, timing, impact and other criteria important to local decision makers and culminate the analysis in a decision or recommendation of which TDM measures would be most effective to implement.

Implementation Mechanisms

- Decide what mechanisms are required to implement the chosen solution.

As shown in the figure below, the above implementation strategy requires time for implementation. Ideally, TDM measures will be planned so that it can be implemented at the time when it is required and when it will have the desired impact. In the long run any specific TDM measure is unlikely that result in an indefinite improvement in the performance of the transportation system on its own. The performance of the system will deteriorate with time as the demand for travel increases at which point additional TDM measures need to be implemented to achieve the desired improvement in the network operational performance.

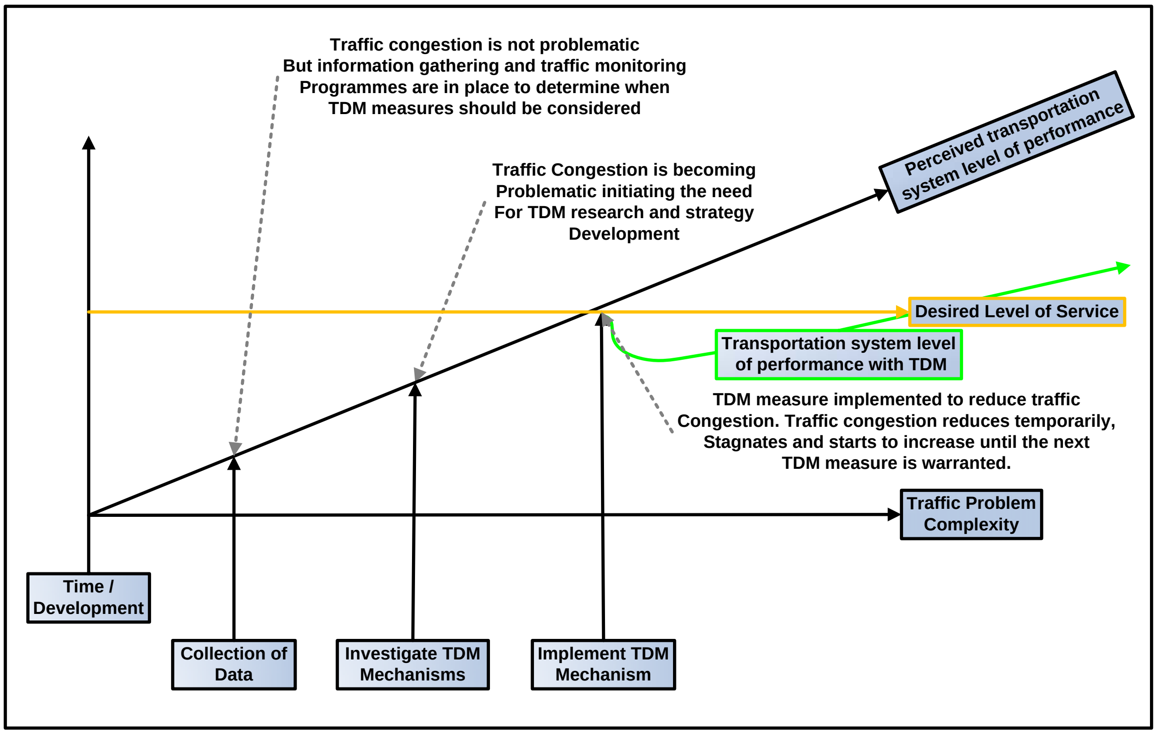


Figure 7.3.T: Travel Demand Management Implementation Methodology

7.3.7 Identification of Critical Projects

7.3.7.1 List of Critical Projects

Liaise with the eThekwini Transport Authority, the KwaZulu Natal Provincial government and the Port's Authority on the future of the Umhlatuzana Freight Corridor as a possible exclusive heavy vehicle corridor from the Durban port to the N2 and extended to the N3 (Cato Ridge area).

7.3.7.2 Proposed projects to be considered during Phase 4

The following projects are proposed for consideration during Phase 4 of the project:

- Compile a road inventory which should list the roads identified for lane additions and/or reductions in freight volumes and/or private vehicle volumes. The inventory should also show the date when these additions or reductions will be required and should describe the plans/ actions required to achieve it;
- Integrate the provision of road infrastructure and services with the introduction of the proposed development, industrial and tourism corridors in the province. A formal liaison structure with other government departments and stakeholders should be established to ensure that proper integrated planning takes place;
- Undertake a road safety audit which could be used to develop and implement road safety plans which are “custom”-designed for each road of national importance in the province;
- Develop a Traffic Demand Management plan for each road of national importance in the province;
- Determine the carbon footprint for the KwaZulu Natal road network and develop an action plan to limit Greenhouse Gas (GHG) emissions on the network in order to meet South Africa’s targets in this regard;
- Revise the Province’s overload control initiative in line with the proposed location of weighbridges and conduct a comprehensive investigation into the economic efficiency of the existing weighbridges. Aspects which should be investigated include the infrastructure, equipment, management and operations. Outsourcing of the operations of the entire weighbridge network should be considered as well;
- Investigate the reduction of the transport costs component of the domestic costs of the supply chain logistics in KwaZulu Natal. On average these costs are higher in South Africa than in the rest of the world. It is recommended that the KwaZulu Natal province engage with the supply chain industry in this regard;
- Develop a long term sustainable funding strategy for KwaZulu Natal which could allow for public and private funding;
- Introduce a well-designed and reliable comprehensive traffic data collection programme for the province. The lack or inaccuracy of traffic data seriously hampered the planning of roads in the province and
- Investigate traffic congestion caused by national roads passing through small towns and prepare guidelines on the feasibility (or not) of by-passes at such towns

7.3.7.3 Road Related Costs – Typical Unit Rates

The unit costs in the following table can be used for planning purposes of road infrastructure projects.

DESCRIPTION	UNIT	COST
NEW CONSTRUCTION / UPGRADE		
CONSTRUCTION OF NEW ROAD (SINGLE CARRIAGEWAY)	M^2	R 1 200
CONSTRUCTION OF NEW ROAD (DUAL CARRIAGEWAY)	M^2	R 1 200
CONSTRUCTION OF NEW ROAD (HIGHWAY)	M^2	R 1 600
ADDING A LANE TO EXISTING PAVED ROAD	M^2	R 1 400
UPGRADING OF UNPAVED ROAD TO PAVED STANDARD	KM	R 6 MILLION
MAINTENANCE – PAVED ROADS		
RESEAL (SEAL LAYER)	M^2	R 130
RESURFACE (ASPHALT LAYER)	M^2	R 350
LIGHT REHABILITATION	M^2	R 350
HEAVY REHABILITATION	M^2	R 750
ROUTINE MAINTENANCE	KM/YEAR	R 7 500
MAINTENANCE – UNPAVED ROADS		
REGRAVEL	KM	R 450 000
ROUTINE MAINTENANCE (BLADING, GRADING ETC)	KM/YEAR	R 1 000

7.4 RAIL NETWORK

7.4.1 Summary of Rail Network

The rail lines in the Kwazulu-Natal are shown in Error! Reference source not found.**-C** below. The rail lines are described in detail in the phase 1 and 2 NATMAP reports.

Transnet divided their rail network into a Core Network and Branch Lines.

The core network includes all the rail lines which are core to the Transnet rail freight business. The Core Network in the Kwazulu-Natal includes the following categories of lines:

- Port – Rail Corridors,
- Port Interconnect
- Cross-border Interconnect
- Network Operational Flexibility and
- High Volume Feeder lines.

The branch lines are classified as:

- Lines Uplifted,
- Closed Lines and
- High Volume Active Lines
- Low Volume Active Lines.

The rail lines in the Kwazulu-Natal are summarised for easy reference in **Tables 7.4.A-C** below as follows:

- **Table 7.4.A** – Transnet Core Network;
- **Table 7.4.B** – Transnet Branch Lines and
- **Table 7.4.C** – Corridors use for Suburban Services (PRASA & Transnet lines)

The suburban network belongs to PRASA (Passenger Rail Agency of South Africa) and is operated by their division Metrorail. The freight network belongs to Transnet and is managed by the division TFR (Transnet Freight Rail). There are also various private sidings in the province that belongs to municipalities and other businesses.

The following rail sections link the province with other provinces and countries:

- Durban – Gauteng Main Line: Limpopo, Freestate and Gauteng;
- Richards Bay – Ermelo Coal Line: Mpumalanga and
- Richards Bay – Golela:: Swaziland and Mpumalanga

The capacity of a rail section is expressed as the theoretical number of trains that can use the line in a twenty four hour period. The number of trains is determined by the train authorization system in use (signalling), the number of lines and crossing facilities and the characteristics of the trains that will use the line (fast moving sort trains or slow moving long trains). The freight tonnage that a line can carry is determined by the characteristics of the freight, load capacity of the rolling stock and the train lengths. The utilization of the rail lines is expressed as the % of the theoretical line that is or will be used. The acceptable norm is that only 80% of the theoretical capacity could effectively be utilised over an extensive period of time. The balance is required for maintenance work and variations in traffic patterns. It must also be kept in mind that scheduled trains tend to decrease the usable capacity. A portion of a slot before a scheduled train cannot be used by a non-scheduled train. The freight capacity of a line could be increased by increasing the average capacity of the trains or by increasing the theoretical number of trains that could be accommodated over a 24 hour period.

The average capacity of the trains could be increased by increasing the average train length (longer trains and/or eliminate shorter trains) and/or by increasing the average load per truck.

The theoretical number of trains could be increased by improving the train authorization system (signalling), reducing the length of sections, providing more crossing facilities or providing additional lines and by increasing the average speed of the trains.

Table 7.4.A: Core Network Rail Lines in Kwazulu-Natal

SECTION	OWNER	TRACTION	LENGTH (Km)	CLASSIFICATION	MAIN USAGE
Palmford – New Castle	Transnet	3 kV DC	87	Core Network	Port – Rail Corridor
New Castle - Glencoe	Transnet	3 kV DC	58	Core Network	Port – Rail Corridor
Glencoe - Danskraal	Transnet	3 kV DC	61	Core Network	Port – Rail Corridor
Danskraal - Ennerdale	Transnet	3 kV DC	56	Core Network	Port – Rail Corridor
Ennerdale - Pietermaritzburg	Transnet	3 kV DC	126	Core Network	Port – Rail Corridor
Pietermaritzburg – Cato Ridge	Transnet	3 kV DC	35	Core Network	Port – Rail Corridor
Cato Ridge - Booth	Transnet	3 kV DC	61	Core Network	Port – Rail Corridor
Booth – Wests (Bayhead)	Transnet	3 kV DC	13	Core Network	Port – Rail Corridor
Harrismith - Danskraal	Transnet	Diesel	97	Core Network	Operational Flexibility
Glencoe - Dundee	Transnet	Diesel	8	Core Network	Operational Flexibility
Dundee - Vryheid	Transnet	Diesel	82	Core Network	Operational Flexibility
Vryheid – Vryheid East	Transnet	Diesel	7	Core Network	Operational Flexibility
Booth – Umbogintwini	PRASA	3 kV DC	23	Suburban Network	High Volume Feeder
Umbogintwini – Umkomaas	PRASA	3 kV DC	23	Suburban Network	High Volume Feeder

SECTION	OWNER	TRACTION	LENGTH (Km)	CLASSIFICATION	MAIN USAGE
Umkomaas – Kelso	PRASA	3 kV DC	20	Suburban Network	High Volume Feeder
Kelso – Umtentwini	Transnet	3 kV DC	47	Core Network	High Volume Feeder
Untentwini – Port Shepstone	Transnet	3 kV DC	5	Core Network	High Volume Feeder
Nsese – Empangeni	Transnet	3 kV DC	12	Core Network	Port Interconnect
Empangeni – Felixton	Transnet	3 kV DC	8	Core Network	Port Interconnect
Felixton – New Guelderland	Transnet	3 kV DC	90	Core Network	Port Interconnect
New Gelderland – Tongaat	Transnet	3 kV DC	41	Core Network	Port Interconnect
Tongaat – Mount Edgecombe	Transnet	3 kV DC	24	Suburban Network	Port Interconnect
Mount Edgecombe - Booth	PRASA	3 kV DC	37	Suburban Network	Port Interconnect
Piet Retief-Paulpietersburg	Transnet	25 kV AC	55	Core Network	Port – Rail Corridor
Paulpetersburg – Vryheid East	Transnet	25 kV AC	66	Core Network	Port – Rail Corridor
Vryheid East – Ulundi	Transnet	25 kV AC	108	Core Network	Port – Rail Corridor
Ulundi – Nsese	Transnet	25 kV AC	130	Core Network	Port – Rail Corridor
Nsese – Richards Bay	Transnet	25 kV AC	14	Core Network	Port – Rail Corridor
Golela – Kwa-Mbonambi	Transnet	Diesel	180	Core Network	Cross-border Interconnect
Kwa-Mbonambi - Nsese	**Transnet**	**Diesel**	**29**	**Core Network**	**Cross-border Interconnect**

Table 7.4.B: Branch Lines in Kwazulu-Natal

SECTION	OWNER	TRACTION	LENGTH (Km)	CLASSIFICATION	MAIN USAGE
Pietermaritzburg - Greyton	Transnet	Diesel	104	Active Branch	Freight
Greyton - Kranskop	Transnet	Diesel	51	Active Branch	Freight
Greyton – Mount Alida	Transnet	Diesel	45	Active Branch	Freight
Dalton - Glenside	Transnet	Diesel	19	Active Branch	Freight
Schroeders - Bruynshill	Transnet	Diesel	24	Active Branch	Freight
Pietermaritzburg - Donnybrook	Transnet	Diesel	129	Active Branch	Freight
Donnybrook - Underberg	Transnet	Diesel	62	Active Branch	Freight
Donnybrook - Franklin	Transnet	Diesel	92	Active Branch	Freight
Franklin - Matatiele	Transnet	Diesel	77	Closed Branch	
Franklin - Kokstad	Transnet	Diesel	41	Closed Branch	
Pentrich - Richmond	Transnet	Diesel	42	Active Branch	Freight
Ennerdale - Bergville	Transnet	Diesel	68	Active Branch	Freight
New Castle - Utrecht	Private	Diesel	48	Active Branch	Freight
Empangeni - Nkwalini	Transnet	Diesel	64	Active Branch	Freight
Gingingluvu - Eshowe	Transnet	Diesel	34	Closed Branch	
Umtentwini - Simuna	Transnet	3 kV DC	14	Active Branch	Freight
Port Shepstone - Harding	**Transnet**	**Steam**		**Closed Branch**	**610 mm gauge**

Table 7.4.C: Rail corridors use for suburban services in Kwazulu-Natal

SECTION	OWNER	TRACTION	LENGTH (Km)	CLASSIFICATION	MAIN USAGE
Durban - Kelso	PRASA	3 kV DC	68	Suburban	Metro & Freight
Durban - Umlazi	PRASA	3 kV DC	10	Suburban	Metro
Durban - Crossmoor	PRASA	3 kV DC	13	Suburban	Metro
Durban – Cato Ridge	PRASA & Transnet	3 kV DC	72	Suburban	Metro & Freight
Durban - Pinetown	PRASA	3 kV DC	27	Suburban	Metro
Durban - West	PRASA & Transnet	3 kV DC	19	Suburban	Metro & Freight
Durban – Springfield Flats	PRASA	3 kV DC		Suburban	Metro maintenance facilities
Durban - Kwa-Mashu	PRASA	3 kV DC	19	Suburban	Metro & Freight
Durban - Stanger	**PRASA & Transnet**	**3 kV DC**	**75**	**Core Network**	**Metro & Freight**

Transnet used in their National Infrastructure Plan (NIP) the legend and colour coding shown in Error! Reference source not found. to indicate the utilization of the theoretical capacity of a rail section.

Table 7.4.D: Legend to indicate relative usage of the rail lines.

	Light Traffic - <60% Utilisation: No Action Required
	Moderate Traffic - 60-80% Utilisation: Consider Operational Re-engineering
	Heavy Traffic - 80-95% Utilisation: Operational Redesign Essential. Limited Infrastructure Upgrades
	Traffic Limit - 95-105% Utilisation: Operational Redesign Limit Reached. Infrastructure Upgrades Essential.
	Exceed Traffic Limit - 105-130% Utilisation: Operational Redesign Limit Reached. Infrastructure Upgrades Essential
	System Failure - Significant Infrastructure Improvements Required. Possible Doubling or New Lines.

The same legend is used in the NATMAP reports to ensure uniformity and easy interpretation

The % utilization is expressed as a percentage of the theoretical line capacity.

Table 7.4.E: Utilization of the Core Freight Network in Kwazulu-Natal in 2005.

LINE SECTION	TRAIN AUTHO-RIZATION	TRACTION	NUMBER OF LINES	DIST. (Km)	AXLE LOAD (Ton)	CAPACITY (Slots)	UTILIZATION (%)
Palmford – New Castle	CTC	3 kV DC	Double	87	20	67	35%
New Castle - Glencoe	CTC	3 kV DC	Double	58	20	72	31%
Glencoe - Danskraal	CTC	3 kV DC	Double	61	20	62	36%
Danskraal - Ennerdale	CTC	3 kV DC	Double	56	20	67	34%
Ennerdale - Pietermaritzburg	CTC	3 kV DC	Double	126	20	55	41%
Pietermaritzburg – Cato Ridge	CTC	3 kV DC	Double	35	20	94	26%
Cato Ridge - Booth	CTC	3 kV DC	Double	61	20	85	54%
Booth - Bayhead	CTS	3 kV DC	Double	13	20	85	54%
Harrismith - Danskraal	CTC	3 kV DC	Single	97	20	18	1%
Glencoe - Dundee	TWS	Diesel	Single	8	20	27	1%
Dundee - Vryheid	TWS	Diesel	Single	82	20	12	1%
Vryheid – Vryheid East	CTC	Diesel	Double	7	20	81	1%
Booth – Umbogintwini	CTC	3 kV DC	Double	23	20	85	40%
Umbogintwini – Umkomaas	TWS	3 kV DC	Single	23	20	30	82%
Umkomaas – Kelso	TWS	3 kV DC	Single	20	20	30	51%

LINE SECTION	TRAIN AUTHO-RIZATION	TRACTION	NUMBER OF LINES	DIST. (Km)	AXLE LOAD (Ton)	CAPACITY (Slots)	UTILIZATION (%)
Kelso – Umtentwini	TWS	3 kV DC	Single	47	20	20	3%
Untentwini – Port Shepstone	TWS	3 kV DC	Single	5	20	36	0%
Nsese – Empangeni	RTO	3 kV DC	Double	12	20	55	7%
Empangeni – Felixton	TWS	3 kV DC	Double	8	20	55	9%
Felixton – New Guelderland	TWS	3 kV DC	Single	90	20	20	25%
New Gelderland – Tongaat	TWS	3 kV DC	Double	41	20	67	31%
Tongaat – Mount Edgecombe	CTC	3 kV DC	Double	24	20	78	27%
Mount Edgecombe - Booth	CTC	3 kV DC	Double	37	20	78	81%
Piet Retief-Paulpietersburg	CTC	25 kV AC	Double	55	26	39	54%
Paulpietersburg – Vryheid East	CTC	25 kV AC	Double	66	26	33	64%
Vryheid East – Ulundi	CTC	25 kV AC	Double	108	26	46	48%
Ulundi – Nsese	CTC	25 kV AC	Double	130	26	51	43%
Nsese – Richards Bay	CTC	25 kV AC	Double	14	26	32	59%
Golela - Kwambonambi	TWS	Diesel	Single	180	20	16	45%
Kwambonambi - Nsese	**TWS**	**Diesel**	**Single**	**29**	**20**	**24**	**33%**

Table 7.4.E above contains the current utilisation information of the core freight rail network in the province. The following is contained in the table:

- Line sections listed are only those on the **core freight rail network** on which Transnet operate freight services. They are sections over which operational capacity are the same, or where traffic volumes remain the same due to the network configuration. Sections shaded in light-blue are interprovincial and therefore appears in more than one provincial table;
- Train Authorization: The signalling and train control systems in use to authorize a train to travel over a section of the rail line:
  - CTC: Centralised Traffic Control;
  - RTO: Radio Train Order and
  - TWS: Track Warrant System
- Capacity indicates the theoretical number of trains that could move over the rail section in 24 hours and
- Utilization indicates the average percentage of the theoretical slots that were used by trains during 2005.

The rail network in the Kwazulu-Natal had significant spare capacity during 2007. The practical capacity of the Umbogintwini – Umkomaas and Mount Edgecombe – Booth sections that were shared with the suburban services were fully utilised. The utilization of the section of the coal line between Paulpietersburg and Vryheid indicated that capacity constraints could develop in the near future.

Transnet is busy to develop a strategy to concession the branch lines to private operators through a public bidding process.

7.4.2 Future Rail Technologies

NATMAP undertook the following two studies to obtain an indication of the strategies that should be followed in future for the technological development of the rail business in South Africa:

- Rail Gauge Study and
- Passenger Rail Technology Study

7.4.2.1 Rail Gauge Study (August 2009)

The purpose of the study was to analyse the consequences and implications of the 1067 mm gauge of the South African rail network and to recommend future strategies to be followed regarding the rail gauge in South Africa.

Issues addressed by the study report include inter alia the following:

- More than 60% of the world's railway lines operate on standard gauge (SG) (1 435mm between the rails). North America, Europe and China account for more than 90% of this;
- 16% are narrow gauge (914 to 1 067mm). The dominant narrow gauge (NG) countries are South Africa, Japan, Australia (all on 1 067mm) and Brazil (1 000mm). More than 85% of the railways in Africa operate on narrow gauge;
- South Africa dominates the railway scene in Africa and ranks about 14th in the world based on number of kilometres and freight conveyed per year;
- Breaks-of-gauge are serious operational impediments. Australia, India and Spain have (and continue to) invested heavily to alleviate this problem;
- The pace of railway development for the last four decades has been set by heavy haul, high speed intercity, and heavy intermodal. Only heavy haul is present on narrow gauge;
- In 2007 the Africa Union resolved that standard gauge should be adopted for the construction of new railway lines in order to promote interoperability on the continent. Member countries were encouraged to keep the proposed standard gauge corridors and radials in mind whenever new lines are considered;
- The underlying fabric of Transnet's masterplan points towards increasing use of heavy haul type technologies on its narrow gauge lines. The plan makes no mention of and takes no position regarding the AU resolution and
- The report presents a number of case studies, such as a new high speed standard gauge line from Johannesburg to Durban, conversion of Transnet's core network to standard gauge, as well as a comparison between new narrow and standard gauge.

The main findings of the report include amongst others the following:

- Standard gauge generally holds the trump in terms of better, faster, more economic, economy of scale, quality of R&D etc. Only the cost of the track infrastructure for narrow gauge has an advantage (about 5 to 7%);
- Conversion of the existing Transnet core network to standard gauge is discussed in some detail with the conclusion that it is not economically justifiable and
- South Africa should gradually move towards standard gauge via a new standard gauge network, based on a masterplan from a separate study.

The report recommends that:

- Existing network should not be converted to standard gauge as this cannot be justified economically. Investment should continue in the existing network whilst keeping the to-be-developed masterplan in mind and
- South Africa to fit in reactively (rather than pro-actively) with whatever happens across our borders in terms of the AU guidelines.

7.4.2.2 Passenger Rail Technology Study

The Passenger Rail Technology Study was undertaken on behalf of PRASA to give PRASA guidance on the most appropriate technologies for future development of the rolling stock and infrastructure.

The findings of the study include inter alia:

- Positioning of passenger rail in South Africa is fundamentally constrained by the trains currently operated under the Metrorail and Shosholoza Meyl brands;
- Their technologies are dated, and have consequently not demanded high performance infrastructure, which is consequently also dated;
- Metrorail offers a one-size-fits-all solution, which is generally not able to match the performance of contemporary higher capacity, lower cost, and/or faster rail solutions and
- Shosholoza Meyl is handicapped by limited speed on narrow gauge track, and cannot differentiate itself competitively from offerings by other transport modes.

The potential for new investment include the following:

- In urban heavy rail, there are immediate opportunities for investment in contemporary metro rolling stock, without risk of entering a strategic dead end. This could add capacity to the existing fleet, and possibly replacing existing stock, thereby increasing mission reliability, and making services more attractive. Maximum capacity requires closely-matched signalling and train performance characteristics, and contemporary rolling stock could not deliver its full potential under existing signalling systems;
- Given the existing investment backlog, and the need to maximize the impact of new investment, the existing basic urban narrow gauge track infrastructure can be considered good for at least another rolling stock generation. After that time, it would be appropriate to revisit the question of track gauge, to assess whether the relative benefits of standard gauge, as well as the state of the supply industry, had changed sufficiently to yield a different answer;

- Any new infrastructure-plus-rolling-stock projects, which can operate as standalone entities, or which have the potential to grow into larger networks, should of course be built to preferred international standards of track gauge, body width, platform height, and power supply. This would accelerate introduction of new technology, and concurrently secure the most competitive pricing for such projects;
- At the lower end of the capacity scale, Light Rail, Light Metro, and Automated Light Metro address the capacity market space below Metro, offering safe, efficient solutions. They warrant attention as South Africa looks to move commuters from road to rail;
- Regional rail has the potential to provide a foundation for integrated mass mobility solutions outside the approximately 35km radius in which metro optimizes the trade-off between capacity and speed. It is the first level at which standard gauge track would be required, to support speeds of 160-200km/h, to yield reasonable journey times over longer distances. In the 40-400km range, regional rail has the potential to serve as backbone for integrated mass mobility solutions, and to provide inter-regional links;
- High-speed rail, i.e. services at a maximum speed of 200km/h, has limited potential in South Africa. Due to South Africa's narrow-gauge heritage, in particular the large number of small-radius curves, high speed would be feasible on very few routes without substantial reconstruction, including changing to standard gauge and
- Ultra-high-speed rail provides service in the 300-400km/h range on dedicated infrastructure. The first potential application would be Gauteng-Durban. However, at this time it seems as if economic viability might be some way off. A proposal has been made regarding developing an understanding of what drives adoption of ultra-high-speed rail in developing economies.

Key recommendations of the study include the following:

- Examine minimum interoperability requirements carefully, and relax them to the extent necessary, to create space within which migration to contemporary passenger rail solutions can take place;
- Deal with the question of narrow track gauge. In the market spaces between metro and ultra-high-speed intercity, progress will in the first instance require accommodation with Transnet Freight Rail, by dual-gauging, re-gauging, or reallocating track. When those options do not meet aspirations or requirements, new construction will need to be considered;
- Recognize that rail solutions in general require close matching of infrastructure (curvature, gradients, signalling, and several others) and train (braking, speed, traction, and several others) characteristics, to maximize capacity and minimize journey time;
- Consider alternatives to existing steel-wheel-on-steel-rail passenger rail technology, such as rubber-tyre solutions, that allow passenger rail to compete effectively against road competitors over a wide range of capacities;
- Physically separate metro and freight operations, to develop fully the potential of urban rail, without interference from incompatible trains

- Consider technologies such as automatic train protection and automatic train operation, to mitigate passenger exposure to undue risk, and to utilize infrastructure and rolling stock more intensely and
- Revisit local content and the state of the supply industry, which aspects will need to support effective implementation of contemporary rail solutions in South Africa.

The study came to the following conclusions:

- The global railway renaissance generated a range of attractive, competitive mass mobility solutions with potential to restore contribution of passenger rail to SA;
- By comparison with its legacy passenger rail system, both South Africa's socio-economic challenges, and the available technological solutions, are now vastly different. The future national mass mobility solution is likely to lean towards a new departure rather than to an extension of the past;
- Contemporary passenger rail technology offers competitive rail positioning that addresses different opportunities: Its application must therefore lead to outcomes different from the past;
- Portions of the legacy may nevertheless be recyclable: Leveraging them will maximize the return on new investment and
- However, one should recognize that many constraints impede their adoption, and that overcoming them will pose high challenges. South Africa's back-to-rail aspiration is achievable if the task is reduced to manageable portions. Clear insight and firm resolve can guide its realization.

7.4.3 Projections for Future Years

Transnet developed a comprehensive freight demand model which they used to analyse the freight market. The results of the model were used determine the percentages of the different freight segments that could effectively be attracted to their rail transport services. Transnet main objectives are:

- Provide capacity ahead of demand;
- Ensure sustainability of development plans;
- Integrate port, rail and pipeline planning;
- Align with national road and electricity supply planning;
- Provide capacity through operational efficiencies before infrastructure provision and
- Ensure proper environmental and social integration

The Transnet model take amongst others into account the potential growth of the different commodities, the minimum transport distance over which rail could be competitive, the market share of each commodity that rail could attract.

Table 7.4.F below indicates the actual and estimated average daily number of trains that will travel over the Core Freight Network in the Kwazulu-Natal up to 2050. The future usage is based on the actual rail freight in 2005 and the Transnet modelled projections for their medium scenario.

The average daily number of trains is indicated in averaged train loads and lengths based on the same configurations as during 2005. It should be noted that the number of trains for the year 2010 is in most cases lower than the actual for 2005. This is the result of expected operational optimisation which is seen as the first step in improving capacity utilisation. For the periods after 2035 (shaded in column headings of tables) the traffic growth between 2030 and 2035 was assumed to continue and calculated for the purposes of NATMAP.

Table 7.4.F: Transnet's Estimated Daily Number of Trains on the Core Freight Network in Kwazulu-Natal

LINE SECTION	TRACTION	CAPA-CITY	ESTIMATED DAILY NUMBER OF TRAINS IN YEAR:									
			2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Palmford – New Castle	3 kV DC	67	23.5	18.1	24	31	42	56	75	101	137	184
New Castle - Glencoe	3 kV DC	72	22.3	17.3	22	30	40	53	74	101	131	182
Glencoe - Danskraal	3 kV DC	62	22.3	16.7	22	29	39	53	73	99	136	189
Danskraal -Ennerdale	3 kV DC	67	22.8	17.4	22	30	40	54	74	101	130	191
Ennerdale - Pietermaritzburg	3 kV DC	55	22.6	17.1	22	30	40	54	74	101	138	188
Pietermaritzburg – Cato Ridge	3 kV DC	94	24.4	17.9	24	31	41	56	77	105	144	197
Cato Ridge - Booth	3 kV DC	85	45.9	40.8	49	58	70	87	110	139	175	221
Booth - Bayhead	3 kV DC	85	45.9	40.8	49	57	70	86	109	138	175	221
Harrismith - Danskraal	3 kV DC	18	0.2	0.2	0.2	0.2	0.4	0.4	0.5	0.8	1.2	1.8
Glencoe - Dundee	Diesel	27	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Dundee - Vryheid	Diesel	12	0.5	0	0	0	0	0	0.1	0.1	0.1	0.1
Vryheid – Vryheid East	Diesel	81	0.8	0.8	0.8	0.8	0.8	1.6	1.6	1.6	1.6	1.6
Booth – Umbogintwini	3 kV DC	85	34.0	34	37	42	46	51	58	66	74	84
Umbogintwini – Umkomaas	3 kV DC	30	24.6	25	27	30	32	35	39	42	46	51
Umkomaas – Kelso	3 kV DC	30	15.3	16	17	19	20	22	24	26	28	30
Kelso – Umtentwini	3 kV DC	20	0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.1	1.2	1.4

LINE SECTION	TRACTION	CAPA-CITY	ESTIMATED DAILY NUMBER OF TRAINS IN YEAR:									
			2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Untentwini – Port Shepstone	3 kV DC	36	0	0	0	0	0.4	0.4	0.4	0.4	0.4	0.4
Nsese – Empangeni	3 kV DC	55	3.9	4	5	6	7	8	11	13	17	21
Empangeni – Felixton	3 kV DC	55	5.0	5	6	7	8	10	12	15	18	22
Felixton – New Guelderland	3 kV DC	20	5.0	4	6	7	8	10	12	15	20	25
New Gelderland – Tongaat	3 kV DC	67	20.8	21	23	26	28	32	36	40	43	52
Tongaat – Mount Edgecombe	3 kV DC	78	21.1	21	23	26	28	32	36	40	45	51
Mount Edgecombe - Booth	3 kV DC	78	63.2	65	70	76	84	91	100	110	122	134
Piet Retief-Paulpietersburg	25 kV AC	39	21.1	21	25	27	30	35	41	49	57	67
Paulpietersburg – Vryheid East	25 kV AC	33	21.1	21	25	27	30	35	41	49	57	67
Vryheid East – Ulundi	25 kV AC	46	22.1	22	25	28	32	37	43	51	60	70
Ulundi – Nsese	25 kV AC	51	21.9	22	26	29	32	37	43	51	60	71
Nsese – Richards Bay	25 kV AC	32	18.9	14	21	26	34	43	55	72	92	119
Golela - Kwambonambi	Diesel	16	7.2	5	8	10	13	16	21	27	36	46
Kwambonambi - Nsese	**Diesel**	**24**	**7.9**	**6**	**8**	**11**	**14**	**18**	**23**	**30**	**39**	**50**

Note: Figures prepared from information sourced from Transnet Group Planning.

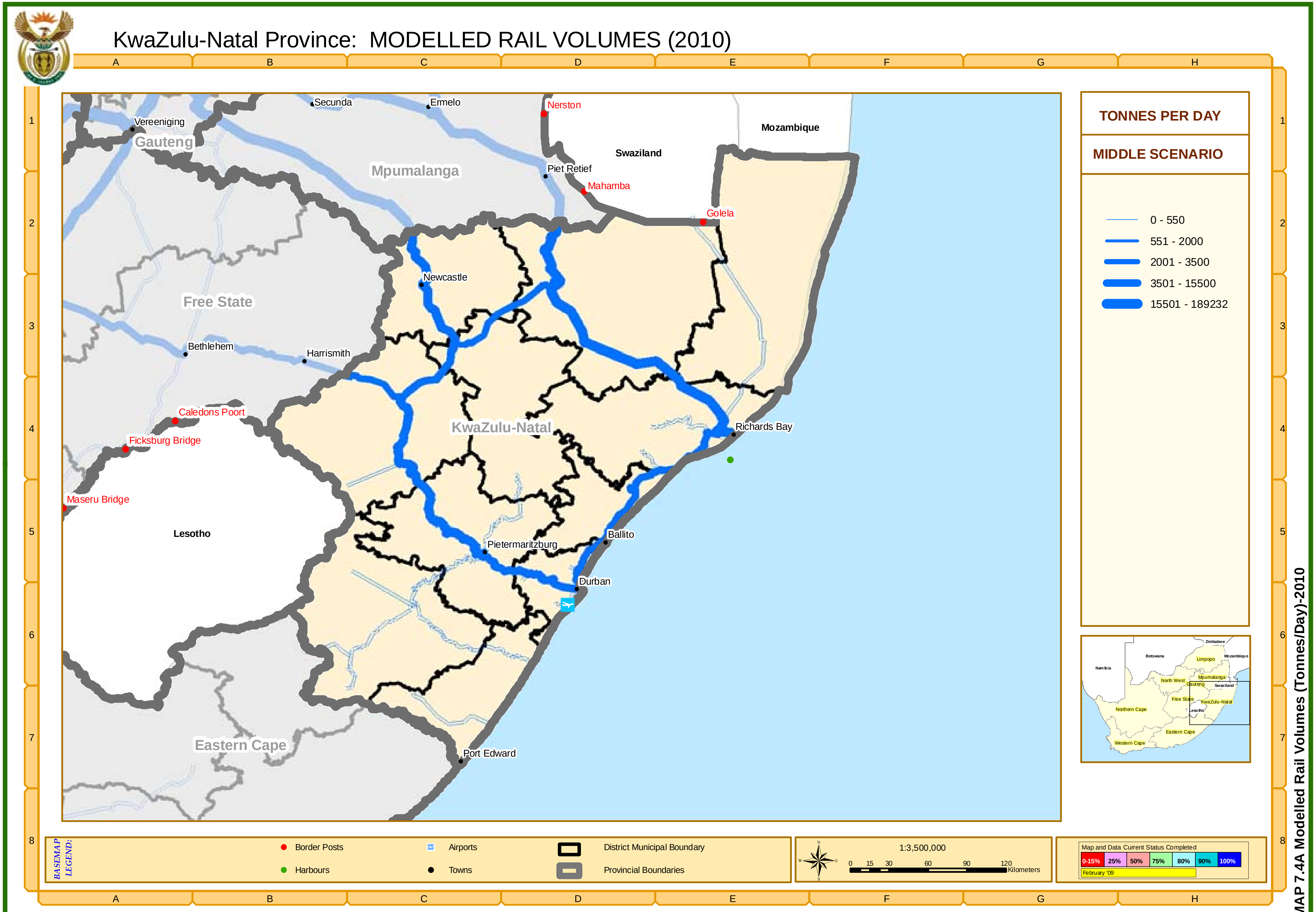
The estimated rail volumes as determined by the NATMAP model for the middle scenario are shown on **Maps 7.4A to 7.4C** as follows:

- Map 7.4.A: Modelled Rail volumes for 2010.
- Map 7.4.B: Modelled Rail volumes for 2030.
- Map 7.4.C: Modelled Rail volumes for 2050.

The estimated utilization of the rail network as based on the NATMAP modelling and the average train load as determined form the actual freight in 2005 are shown on **Maps 7.4.D to 7.4.F** as follows:

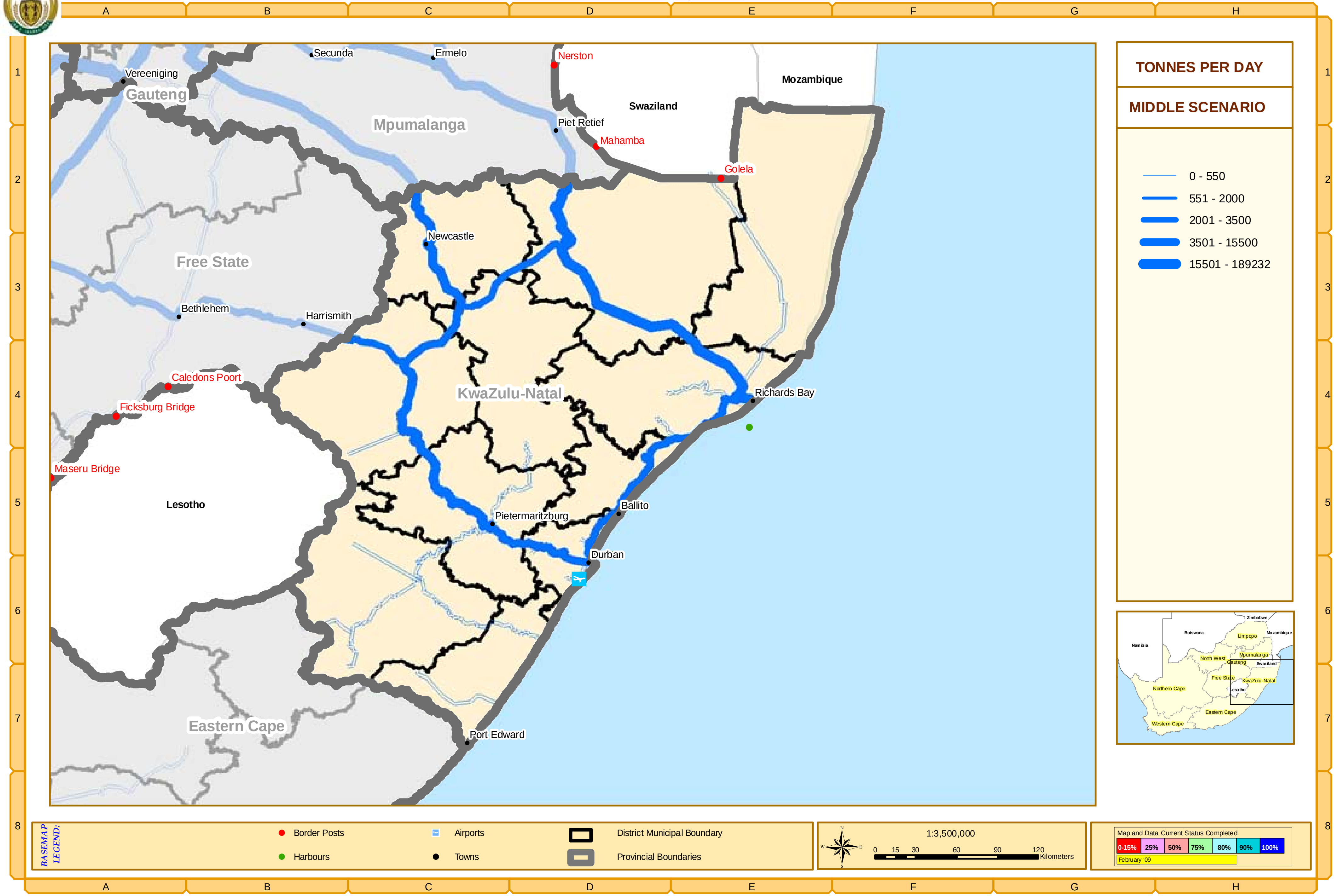
- Map 7.4.D: Utilization of rail network for 2010
- Map 7.4.E: Utilization of rail network for 2030
- Map 7.4.F: Utilization of rail network for 2050

KwaZulu-Natal Province: MODELLED RAIL VOLUMES (2010)



MAP 7.4A Modelled Rail Volumes (Tonnes/Day)-2010

KwaZulu-Natal Province: MODELLED RAIL VOLUMES (2030)



MAP 7.4B Modelled Rail Volumes (Tonnes/Day)-2030

KwaZulu-Natal Province: MODELLED RAIL VOLUMES (2050)

TONNES PER DAY

MIDDLE SCENARIO

- 0 - 550
- 551 - 2 000
- 2 001 - 3 500
- 3 501 - 15 500
- 15 501 - 297 389

BASEMAP LEGEND:

- Border Posts
- Harbours
- Airports
- Towns
- District Municipal Boundary
- Provincial Boundaries

1:3,500,000

0 15 30 60 90 120 Kilometers

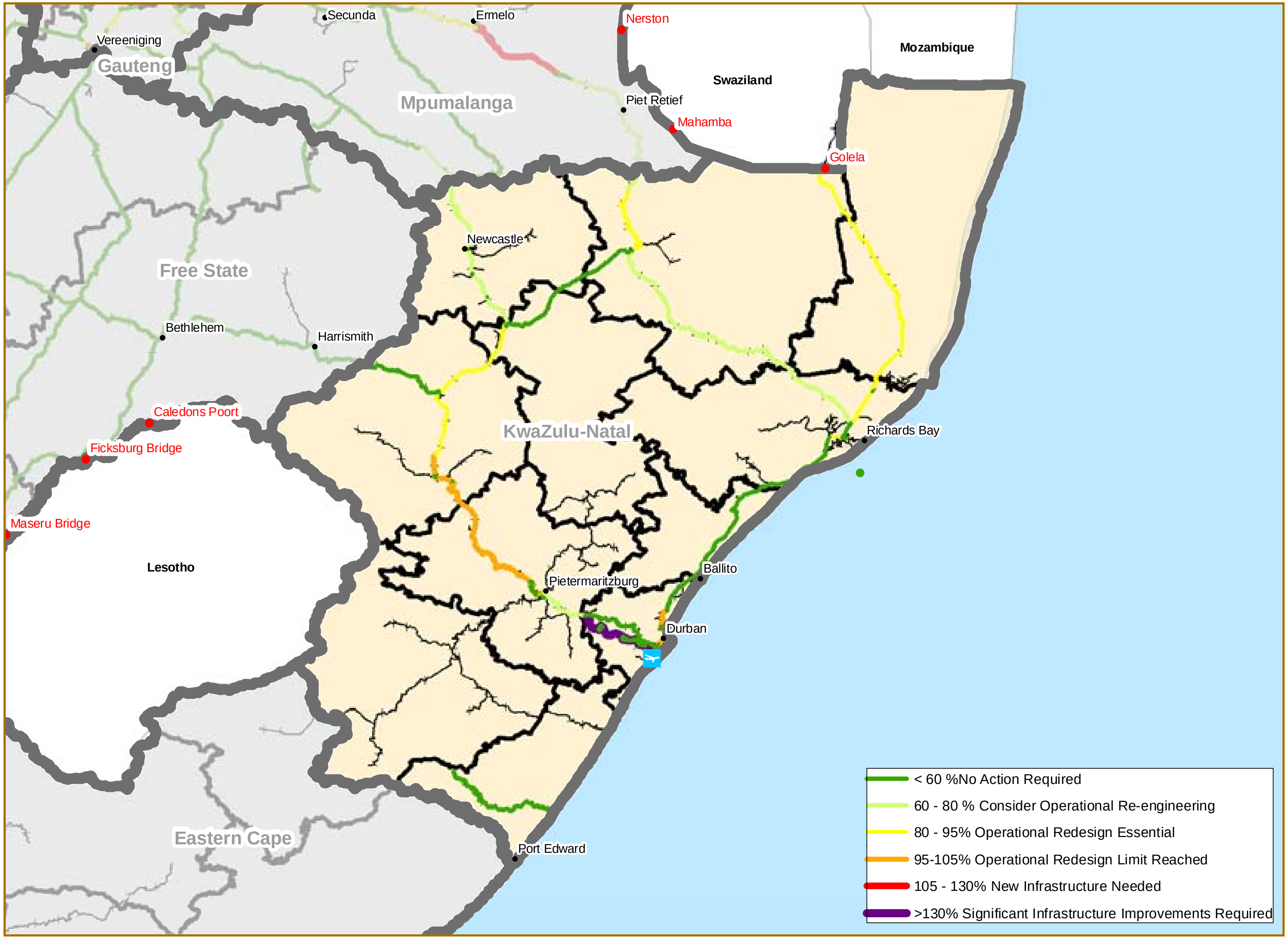
Map and Data Current Status Completed

0-15% 25% 50% 75% 80% 90% 100%

February '09

MAP 7.4C Modelled Rail Volumes (Tonnes/Day)-2050

KwaZulu-Natal Province: UTILISATION OF RAIL NETWORK (2010)



OPERATIONAL SLOT CAPACITY UTILISATION

MIDDLE SCENARIO

BASEMAP LEGEND:

Railway Network
Border Posts
Harbours
Airports
Towns
District Municipal Boundary
Provincial Boundaries

1:3,500,000

0 15 30 60 90 120 Kilometers

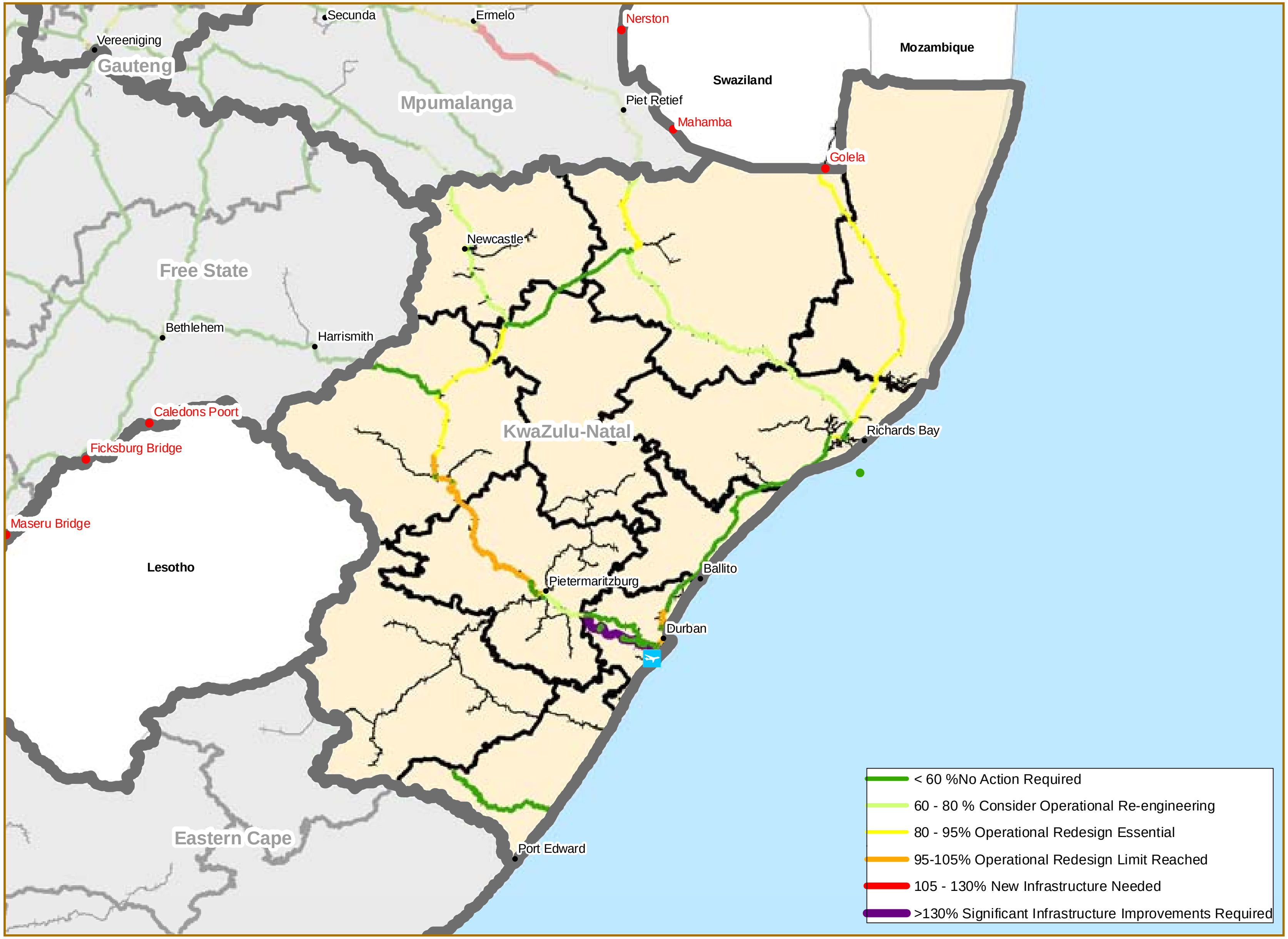
Map and Data Current Status Completed

0-15%	25%	50%	75%	80%	90%	100%

February '09

MAP 7.4D Utilisation of Rail Network -2010

KwaZulu-Natal Province: UTILISATION OF RAIL NETWORK (2030)



OPERATIONAL SLOT CAPACITY UTILISATION

MIDDLE SCENARIO

BASEMAP LEGEND:

Railway Network	Border Posts	Harbours
Airports	Towns	
District Municipal Boundary	Provincial Boundaries	

1:3,500,000

0 15 30 60 90 120 Kilometers

Map and Data Current Status Completed

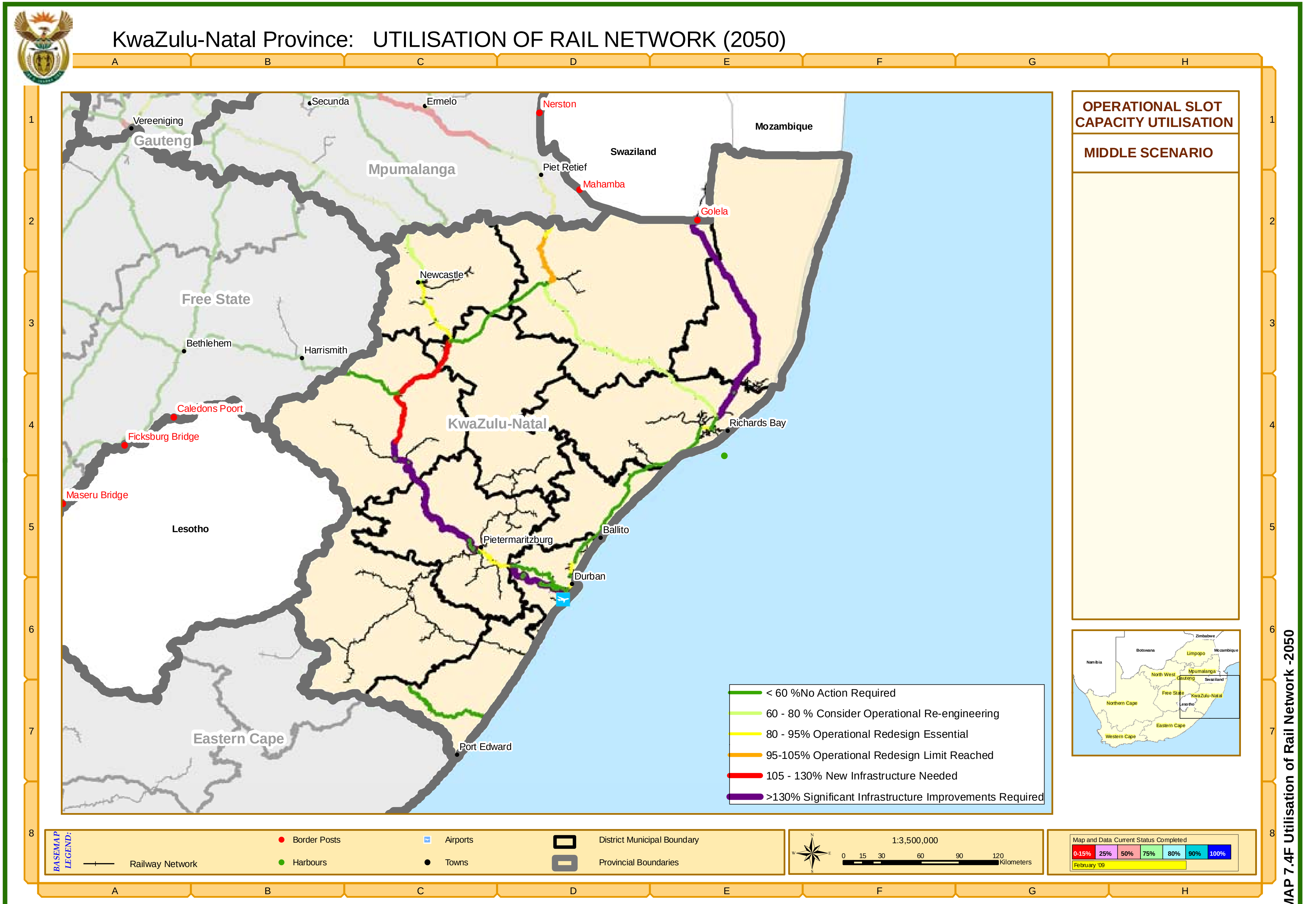
0-15%	25%	50%	75%	80%	90%	100%

February '09

NATIONAL TRANSPORT MASTERPLAN 2050

MAP 7.4E Utilisation of Rail Network -2030

KwaZulu-Natal Province: UTILISATION OF RAIL NETWORK (2050)



MAP 7.4F Utilisation of Rail Network -2050

Table 7.4.G: Transnet's Estimated Utilization of the 2005 Line Capacity of the Core Freight Network in Kwazulu-Natal

LINE SECTION	TRAC-TION	CAPA-CITY	% UTILIZATION OF CAPACITY IN YEAR:									
			2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Palmford – New Castle	3 kV DC	67	35	27	35	46	62	83	112	118	124	130
New Castle - Glencoe	3 kV DC	72	31	24	31	41	55	74	102	107	113	118
Glencoe - Danskraal	3 kV DC	62	36	27	35	47	63	85	117	123	129	136
Danskraal -Ennerdale	3 kV DC	67	34	26	33	44	59	80	110	116	122	128
Ennerdale - Pietermaritzburg	3 kV DC	55	41	31	40	54	72	98	134	141	148	156
Pietermaritzburg – Cato Ridge	3 kV DC	94	26	19	25	33	44	60	82	86	91	95
Cato Ridge - Booth	3 kV DC	85	45	48	57	68	82	102	129	136	142	150
Booth - Bayhead	3 kV DC	85	54	48	57	67	82	101	128	136	141	149
Harrismith - Danskraal	3 kV DC	18	1	1	1	1	2	2	3	3	3	3
Glencoe - Dundee	Diesel	27	1	1	1	1	2	2	3	3	3	3
Dundee - Vryheid	Diesel	12	1	1	1	1	1	1	1	1	1	1
Vryheid – Vryheid East	Diesel	81	1	1	1	1	1	2	2	2	2	2
Booth – Umbogintwini	3 kV DC	85	40	40	44	47	54	60	68	71	80	85
Umbogintwini – Umkomaas	3 kV DC	30	82	84	91	99	108	118	129	136	142	150
Umkomaas – Kelso	3 kV DC	30	51	53	56	62	67	73	79	83	87	92
Kelso – Umtentwini	3 kV DC	20	3	3	4	4	5	6	7	8	8	8
Untentwini – Port Shepstone	3 kV DC	36	0	0	00	1	1	1	1	1	1	1
Nsese – Empangeni	3 kV	55	7	7	8	10	12	15	19	20	21	22

LINE SECTION	TRAC-TION	CAPA-CITY	% UTILIZATION OF CAPACITY IN YEAR:									
			2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
	DC											
Empangeni – Felixton	3 kV DC	55	9	8	10	12	14	18	22	23	24	26
Felixton – New Guelderland	3 kV DC	20	25	21	27	33	40	49	62	65	68	72
New Gelderland – Tongaat	3 kV DC	67	31	31	34	38	42	48	53	56	59	63
Tongaat – Mount Edgecombe	3 kV DC	78	27	27	30	33	36	41	46	52	58	65
Mount Edgecombe - Booth	3 kV DC	78	81	83	90	98	107	116	128	130	141	149
Piet Retief-Paulpietersburg	25 kV AC	39	54	53	63	69	78	89	105	110	116	122
Paulpietersburg – Vryheid East	25 kV AC	33	64	63	75	83	93	107	126	132	139	146
Vryheid East – Ulundi	25 kV AC	46	48	47	55	61	69	80	94	99	104	109
Ulundi – Nsese	25 kV AC	51	43	43	50	56	63	72	85	89	95	100
Nsese – Richards Bay	25 kV AC	32	59	45	65	82	105	134	173	182	191	201
Golela - Kwambonambi	Diesel	16	45	33	48	63	80	101	131	138	146	152
Kwambonambi - Nsese	Diesel	24	33	25	35	45	58	73	95	100	105	110

Note: Figures prepared from information sourced from Transnet Group Planning.

Table 7.4.G above shows the utilization of the 2005 capacities of the different sections of the core rail freight network in the Kwazulu-Natal as determined by the medium scenario of the Transnet freight model. The figures for 2005 are the actual utilization for that year. The figures for the years 2010 to 2035 were obtained from the Transnet National Infrastructure Plan (NIP). The NIP has been prepared for a 30 year period which required that the figures for 2040 to 2050 be calculated by using the same average traffic growth as for the 2010 to 2035 period. The utilization includes passenger trains

The rail freight volumes as obtained from the mean scenario of the NATMAP modelling were used to calculate the potential utilisation of the core network should these volumes realise. The utilisation as estimated by Transnet for 2010 was used as base for the future projections.

Table 7.4.H: Comparison between the Estimated Utilization of the 2005 Line Capacity by the Transnet and the NATMAP Freight Model Respectively for the Years 2030 and 2050

LINE SECTION	TRAC-TION	CAPA-CITY	% UTILIZATION OF CAPACITY IN YEAR:					
			BASE YEARS		TRANSNET MODEL		NATMAP MODEL	
			2005	2010	2030	2050	2030	2050
Palmford – New Castle	3 kV DC	67	35	27	83	130	61	76
New Castle - Glencoe	3 kV DC	72	31	24	74	118	63	80
Glencoe - Danskraal	3 kV DC	62	36	27	85	136	88	125
Danskraal -Ennerdale	3 kV DC	67	34	26	80	128	81	110
Ennerdale - Pietermaritzburg	3 kV DC	55	41	31	98	156	97	133
Pietermaritzburg – Cato Ridge	3 kV DC	94	26	19	60	95	69	95
Cato Ridge - Booth	3 kV DC	85	45	48	102	150	147	208
Booth - Bayhead	3 kV DC	85	54	48	101	149	147	204
Harrismith - Danskraal	3 kV DC	18	1	1	2	3	37	46
Glencoe - Dundee	Diesel	27	1	1	2	3	1	1
Dundee - Vryheid	Diesel	12	1	1	1	1	1	1
Vryheid – Vryheid East	Diesel	81	1	1	2	2	1	1
Booth – Umbogintwini	3 kV DC	85	40	40	60	85	40	40
Umbogintwini – Umkomaas	3 kV DC	30	82	84	118	150	82	82
Umkomaas – Kelso	3 kV DC	30	51	53	73	92	51	51
Kelso – Umtentwini	3 kV DC	20	3	3	6	8	3	3
Untentwini – Port Shepstone	3 kV DC	36	0	0	1	1	0	0
Nsese – Empangeni	3 kV DC	55	7	7	15	22	9	8
Empangeni – Felixton	3 kV DC	55	9	8	18	26	11	10
Felixton – New Gelderland	3 kV DC	20	25	21	49	72	31	28
New Gelderland – Tongaat	3 kV DC	67	31	31	48	63	37	31

Tongaat – Mount Edgecombe	3 kV DC	78	27	27		41	65		32	27
Mount Edgecombe - Booth	3 kV DC	78	81	83		116	149		95	81
Piet Retief-Paulpietersburg	25 kV AC	39	54	53		89	122		79	87
Paulpietersburg – Vryheid East	25 kV AC	33	64	63		107	146		94	103
Vryheid East – Ulundi	25 kV AC	46	48	47		80	109		70	76
Ulundi – Nsese	25 kV AC	51	43	43		72	100		63	68
Nsese – Richards Bay	25 kV AC	32	59	45		134	201		86	94
Golela - Kwambonambi	Diesel	16	45	33		101	152		84	166
Kwambonambi - Nsese	Diesel	24	33	25		73	110		62	122

Table 7.4.H above gives a comparison between the estimated utilization of the 2005 line capacity by the Transnet and the NATMAP freight model respectively for the years 2030 and 2050. The Table indicates that the estimated utilization of the line capacity as determined by the NATMAP model will on all the core line rail sections in Kwazulu-Natal be lower than the utilization as determined by the Transnet model. The difference could mainly be contributed to the strategies of Transnet to increase their market share in the commodities that are more rail-friendly while the NATNAP model is based on the current modal split between road and rail for these commodities.

The Transnet model also included the growth in passenger trains while the NATMAP model only reflects the growth in freight.

7.4.4 "Do Nothing Scenario" – Future Capacity Constraints

The freight volumes as determined by the Transnet model create a larger pressure on the available capacity of the network than the NATMAP model.

Table 7.4.H above indicates that the capacity of the rail network in Kwazulu-Natal is, apart from a few pressure sections, adequate for the demand until 2015. The current 5 year program of Transnet does not make provision for any projects to increase the capacity of any corridor in Kwazulu-Natal.

The following constraints could develop on the rail network in the Kwazulu-Natal should no actions be undertaken to increase the capacity of some lines.

7.4.4.1 Durban – Gauteng main line:

- The capacity of the section of this corridor in Kwazulu-Natal would be sufficient for the estimated traffic, in accordance with both the Transnet and NATMAP modelling, to 2025;
- The sections between Ennerdale – Pietermaritzburg, Cato Ridge – Booth and Booth – Bayhead would require, in terms of the Transnet as well as the NATMAP modelling, actions to increase the capacity by 2030. The action could be limited to increased average train lengths and improved train authorization and
- The Transnet model indicates that the capacity of the corridor would need to be significantly increased by 2050. The NATMAP model however indicates that only the capacity of the Ennerdale – Pietermaritzburg, Cato Ridge – Booth and Booth – Bayhead sections could require infrastructure projects to increase the capacity.

7.4.4.2 Richards Bay – Ermelo coal line:

- The capacity of the section of the coal line in Kwazulu-Natal would be sufficient until 2020 for the demand of both the Transnet and NATMAP models;
- The Transnet and NATMAP modelling indicate that the capacity of the Paulpietersburg – Vryheid East and Nsese – Richard Bay sections would need to be increased from 2020 and
- The Transnet modelling indicates that that the capacity of the sections Paulpietersburg – Vryheid East and Nsese – Richards Bay would need to be increased by approximately 50% by 2050 and the other sections by up to 20%. The NATMAP modelling however indicates that only moderate capacity improvements would be required by 2050 which could be achieved with operational re-design and limited infrastructure projects.

7.4.4.3 Richards Bay – Durban North Coast line:

The section between Durban and Duff's Road is extensively being used for the suburban services. A lower intensity suburban service is also provided to Stanger.

- The practical capacity of the section between Mount Edgecombe and Booth are already full used and would require operational re-design. This section is used for the freight service between the harbours of Durban and Richards Bay as well for the suburban service to Kwa-Mashu. The proposed rail link to Bridge City will also use this section of the corridor. The available capacity outside the suburban morning and evening peaks should be sufficient for the freight trains until at least 2030. The freight service would however experience considerable delays while waiting for available slots between the metro trains and
- The Transnet modelling also indicates that the 90 kilometre single line section between Felixton and New Gelderland would come close to the practical maximum utilization. Infrastructure projects (improved signalling, additional crossing loops, etc.) to increase the capacity after should this line be used as an alternative route from the Port of Durban to the inland could be undertaken at relative low cost.

- A suburban service might be introduced in future to the new airport which could increase the metro trains on this line.

7.4.4.4 Durban – Port Shepstone South Cost line:

The line between Durban and Kelso is mainly used for suburban services. The freight service on this line is limited.

- The practical capacity of the 23 kilometre single line section between Umbogintwini and Umkomaas is already being fully used. The capacity could be increased with improved train authorization (TWS currently in use) and the provision of additional crossing loops and
- The practical capacity of the 20 kilometre section between Umkomaas and Kelso will, according to the Transnet modelling, be fully used by 2040. The capacity could also be increased with improved train authorization and the provision of additional crossing loops.

7.4.4.5 Richards Bay - Swaziland

The line between Richards Bay and Swaziland is providing a link to the export activities in the Phalaborwa area of Limpopo Province as well as a link to the port of Maputo.

The Transnet modelling indicates that the capacity of the 180 km section between Golela and Kwambonambi would require upgrading by 2030.The Capacity of the line would need to be increased by approximately 50% by 2050. The capacity could be increased at relative low cost with improved train authorization (TWS currently in use) and the provision of additional crossing loops.

7.4.5 "Current Planning" – Evaluation of Strategy

Transnet currently has the responsibility of maintaining the core freight rail network as well as planning and providing for additional capacity as and when required. In this regard Transnet has developed a complex demand model based on commodities, demand and supply at magisterial/station level as well as taking into account the operational characteristics and the network capacity characteristics. The demand forecasts for freight rail transport (based on Transnet target markets and commodities) are then applied to the network from origin to destination in order to determine the network capacity utilisation.

The strategy of Transnet is to plan capacity improvements (operational and/or infrastructural) when the utilization of a section of the network would exceed 60% and to implement improvements before the utilization of a section exceeds 80%.

7.4.5.1 Impact of Current Planning on Capacity Utilisation

Table 7.4.I below list all the infrastructure projects identified by Transnet in Kwazulu-Natal up to 2037. These projects were identified to increase the capacity of the corridors by the time that it will be required as shown below. The strategy of Transnet is to continuously monitor

the rail freight and to update their freight model in order that the necessary new projects could be included in the rolling 5 year program. Additional projects would be required to increase the capacity beyond 2035 should the rail freight increased in accordance with the Transnet model. These projects could however provide all the required capacity for the freight in accordance with the NATMAP model. The dates when the projects would need to be implemented will also be substantially later for the NATMAP model than the Transnet model.

Table 7.4.I: Infrastructure improvement projects planned by Transnet for the Core Network in Kwazulu-Natal

LINE SECTION	LOCATION	DESCRIPTION	MOTIVATION	DATE NEEDED
Natcor	Kaydale to Palmford	Implement CTC. signal infill scheme to reduce headway to approximately 8 min.	To increased operational capacity	2028
Natcor	Palmford to Ennerdale	Implement CTC. signal infill scheme to reduce headway to approximately 8 min.	To increased operational capacity	2031
Natcor	Ennerdale to Pietermaritzburg	Implement CTC. signal infill scheme to reduce headway to approximately 8 min.	To increased operational capacity	2028
Natcor	Kaydale to Pietermaritzburg	Provide 3rd line electrified with 3 kV DC and CTC	To increase operational capacity	2035
Natcor	Bayhead to Cato Ridge	New Bypass	To increase operational capacity and to segregate freight from suburban	2030
North Coast Line	Durban to Stanger	Upgrade double line and provide 3rd line for suburban service.	To increased operational capacity	2017
North Coast Line	Durban to Richards Bay	Double the single line section between Stanger and Richards Bay	To increase operational capacity if traffic is to be diverted from Natcor	2035
Mpumalanga to Richards Bay	Swaziland to Golela	Provide intermediate loops, upgrade the line and signalling system	To increased operational capacity	2023
Mpumalanga to Richards Bay	Golela to Kwambonambi	Provide intermediate loops, upgrade the line and signalling system	To increased operational capacity	2027
Mpumalanga to Richards Bay	Kwambonambi to Nsese	Upgrade the line and signalling system to improve the headway	To increased operational capacity	2034
Coal Line	Vryheid East Yard	Cross-over from block-road 4 to GF vacuum yard	To increased operational capacity	2027
Coal Line	Richard Bay Port Infrastructure	Install cross-overs to link coal line directly with Empangeni line	To increased operational capacity	2016

LINE SECTION	LOCATION	DESCRIPTION	MOTIVATION	DATE NEEDED
Coal Line	Richard Bay Port Infrastructure	Arrival & Departure lines for 150 wagon GF trains in harbour area; with crossovers for 3 x 50-wagon combinations	To increased operational capacity	2016
Coal Line	Richard Bay Port Infrastructure	Provide wagon maintenance inspection facilities	To increased operational capacity	2016
Coal Line	Richard Bay Port Infrastructure	Provide lighting	To increased operational capacity	2016
Coal Line	Richards Bay Port: Island View Storage	Equip TRF link to siding with OHTE fanning	To increased operational capacity	2016
Coal Line	Sikame	Grade separation bridge at Sikame	To increased operational capacity	2027
Coal Line	Ilangakazi	Grade separation bridge at Ilangakazi	To increased operational capacity	2027
Coal Line	Ilangakazi	Double Overvaal Tunnel	To increased operational capacity	2017
Coal Line	Vryheid	OHTE refurbishment and increased carrying capacity & changeover yard at Vryheid	To increased operational capacity	2027
Coal Line	Electrified lines	Install/re-instate OHTE linking sidings for ECP braking/WDP project	To increased operational capacity	2017
Coal Line	Ermelo to Richards Bay	Replace traction transformers at substations, with low impedance transformers to increase electrical capacity	To increased operational capacity	2027
Coal Line	Richards Bay	Upgrade Diesel loco depot at Richards Bay (including cranes)	To increased operational capacity	2027
Coal Line	Richards Bay	Add spur on pedestals: 2279 loco (brake inspections)	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Additional HBD's on branch lines to protect coal line	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Ultrasonic broken rail detection	To increased operational capacity	2017

LINE SECTION	LOCATION	DESCRIPTION	MOTIVATION	DATE NEEDED
Coal Line	Vryheid to Broodsnyersplaas	Long stress movement	To increased operational capacity	2017
Coal Line	Nsese	Wheel profile measuring device	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Skew bogie detection systems x 2	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Wim systems x 2	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	1:20 set monitoring systems	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Video imaging – 2 sites	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Pollution/contamination projects	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Environmental mitigation projects	To increased operational capacity	2027
Coal Line	Ermelo – Richards Bay	Fencing	To increased operational capacity	2027
Coal Line	Ermelo – Richards Bay	Emergency Equipment	To increased operational capacity	2027
Coal Line	Ermelo – Richards Bay	Increase Eskom Power Supply from the 88kV grid to TFR substations	To increased operational capacity	2027
Coal Line	Ermelo – Richards Bay	Additional substations on the coal line	To increased operational capacity	2027
Coal Line	Nsese	Nsese yard upgrade to accommodate 150 wagon General Freight trains (4 arrivals & departures lines & 2 run around	To increased operational capacity	2017
Coal Line	Nsese	Signalling of Nsese yards for 150 wagons in AC/DC change-over yard.	To increased operational capacity	2017
Coal Line	Ermelo – Richards Bay	Double line from Nsese to Richards Bay harbour	To increased operational capacity	2026

There are no committed planning projects (5 year capital program) of Transnet to increase the capacity of the rail network in Kwazulu-Natal.

The two sections where the practical capacity will be fully utilise by 2015 are PRASA lines that are mainly utilised for suburban services. The off-peak capacity will be sufficient for the freight service although freight trains would need to wait for suburban trains. These sections are:

- The single line section between Umbogintwini and Umkomaas on the south coast and
- The double north coast line between Mount Edgecombe and Booth. The proposed new line to Bridge City will also increase the suburban traffic during the peak periods.

It should be borne in mind that the approach followed by Transnet is to continuously monitor the estimated capacity demand and to provide capacity ahead of demand in order to ensure that at no point capacity run out unexpectedly.

7.4.5.2 Additional Upgrade Requirements to 2050

The Transnet projects listed in Error! Reference source not found. above include all the projects identified to increase the capacity of the freight network in Kwazulu-Natal to provide for the traffic growth in accordance with the Transnet model for the following 20 years.

The additional projects that would be required as identified in section 7.4.4 above are the following:

i) Durban – Gauteng main line:

- The sections between Ennerdale – Pietermaritzburg, Cato Ridge – Booth and Booth – Bayhead would require that the capacity be increased by 2030 with operational optimization and thereafter with infrastructure projects to add significant capacity and
- The Transnet model indicates that the capacity of the almost the entire corridor would need to be increased from 2025 onwards. A higher growth rate than reflected in the medium scenario could create the opportunity to provide a new standard gauge rail system in this corridor that would accommodate the higher speed freight train and high speed passenger trains between Durban and Gauteng by 2035.

ii) Richards Bay – Ermelo coal line:

The NATMAP modelling indicates that the moderate capacity improvements that will result for the Transnet identified projects in table 7.4.7 above would provide sufficient capacity to 2050. Some minor additional operational re-design and limited infrastructure projects might be required by 2050 should the growth in export coal on this corridor increase.

Transnet estimated that the growth rate in export coal volumes from Mpumalanga would decrease. Transnet made provision in their long term planning to transport export coal from the Waterberg region in Limpopo on this line as well which resulted in the high growth rate reflected in their model from 2030. The proposed Trans-Kalahari rail line from Botswana to Walfish Bay could however provide an alternative route for these coal fields that could reduce the future growth on the coal line.

iii) Richards Bay – Durban North Coast line:

The identified Transnet projects could provide sufficient capacity for the freight service as well as for the suburban service up to 2050 should the third rail be provided in the metropolitan areas.

PRASA could require further capacity increases for their suburban services.

iv) Durban – Port Shepstone South Cost line:

PRASA would need to increase the capacity of the single line sections for their suburban services.

v) Richards Bay - Swaziland

The projects identified by Transnet would provide sufficient capacity for the estimated demand to 2050. Developments in the Mozambique ports might attract some of the export business from Limpopo which could decrease the demand for rail capacity on this corridor.

7.4.6 "Alternative Strategies" – Evaluation of Strategies

7.4.6.1 Addition of Links

An additional link could be required between Durban and Gauteng during the 1940's should the demand for rail freight grow in accordance with the Transnet model. This link would also provide opportunities for high speed passenger services.

7.4.6.2 Maintenance of Rail Infrastructure

Transnet is currently maintaining the infrastructure to be fit for the purpose that Transnet wants to use it for. Speed and ride comfort is in general not critical for freight trains apart from that lower speed could reduce the line capacity. Speed is however critical for passenger trains. Pressure could be applied on Transnet by PRASA to reduce speed restrictions and to improve the rail alignment for passenger travelling comfort.
The recovery of cost of increased maintenance could become a contentious point in future.

7.4.6.3 Alternative Strategy 1

Open the rail infrastructure to other operators and rolling stock owners in order to increase the role of rail in the transport market and to provide competition within the rail transport business. Initiatives to provide niche and customise services could be developed and investments in specialised rolling stock would be attracted.

7.4.6.4 Alternative Strategy 2

Transnet is planning to further develop Freight Hubs and Terminals for Intermodal and Breakbulk freight at Durban MPT, Pietermaritzburg, Richards Bay and New Castle. Car terminals would also be further developed at Isipingo and Point.

The development of the inland terminals in Gauteng, Freestate, Mpumalanga and Limpopo is part of the strategy to attract more freight to rail. Theses developments are incorporated in the Transnet model.

The pressure on the road corridor between Durban and Gauteng could also be relieved with the development and promotion of these terminals.

7.4.6.5 Alternative Strategy 3

There is a strong possibility that the technologies to convert the energy into gas at the coal mines could become viable and economical. This could reduce the transportation of inland coal significantly. The influence on the infrastructure in KwaZulu-Natal should however be limited.

7.4.6.6 Clean Energy

The carbon footprint of electricity is limited to area around the power stations. The footprint in the rail corridor is very small. The promotion of electrical energy will contribute significantly to the reduction of pollution in built up areas.

7.4.6.7 Summary and Recommended Strategies

(i) Monitor the Transnet projects to improve infrastructure capacity.
(ii) Open the rail infrastructure for other operators.
(iii) Promote development of freight hubs to attract more freight to rail and reduce the road traffic between the port, Pietermaritzburg and Gauteng.
(iv) Promote “cleaner” energy.

7.4.7 Identification of Critical Projects

7.4.7.1 List of Critical Projects

See **Table 7.4.I** for a list of the identified projects in KwaZulu-Natal.

7.4.7.2 Rail Related Costs – Typical Unit Rates

Each rail infrastructure project is unique and attracts different costs. Typical unit costs (in 2009 prices) that could be used for an indication of the possible cost of projects are shown **Table 7.4.J** below. Additional provision must be made for procurement of land, drainage, extraordinary earthworks, road structures, tunnels and viaducts. Rolling stock and maintenance facilities should also be included in addition to the rail infrastructure cost.

Table 7.4.J: Indicative unit costs for capacity improvement projects.

ITEM	DESCRIPTION	UNIT	UNIT COST (Rm)	COMMENTS
1.	**EARTHWORKS**			
	Extensions to crossing loops	km	2.0	No heavy earthworks, clay and marshy areas
	Link lines - Plain & Open areas	km	2.5	No heavy earthworks, clay and marshy areas
	Link lines – Ridges & valleys	km	4.5	No clay and marshy areas and rock cuttings
	Link lines - Ridges & Mountainous	km	11.0	Excluding tunnels and viaducts
	Doubling existing of lines	km	3.0	Excluding deep cuttings and High banks
2.	**RAIL STRUCTURE**			
	48 kg Yard lines	km		700 mm crs concrete sleepers & ballast
	57 kg Main lines	km	4.2	650 mm crs concrete sleepers & ballast
	60 kg High axle load lines	km		600 mm crs concrete sleepers & ballast
3.	**TURNOUTS**			
	1:9 complete	each	0.5	Including ballast, Etc.
	1:12 complete	each	0.72	Including ballast, Etc.
	1:20 complete	each	1.1	Including ballast, Etc.
4.	**SIGNALLING**			
	Expand CTC	km	1.1	
	New & re-signalling to CTC	km	1.2	Excluding control centres
5.	**TUNNELS & VIADUCTS**			
	Single road grade separation structures	each	3.6	=/- 90 degree crossing
	Single line tunnel	km	150	In competent rock
	Double line viaduct	km	250	Average height & good foundation conditions
6.	**ELECTRIFICATION**			
	Eskom: 132 kV transmission lines	km	0.86	Lines from Main network to substations
	Eskom: 132 kV Substations	each	11.5	
	3 kV DC Single line	km	2.2	

ITEM	DESCRIPTION	UNIT	UNIT COST (Rm)	COMMENTS
	electrification			
	25 kV AC Single line electrification	km	2.2	
	3 kV Traction sub-stations	each	4.6	
	25 kV Traction sub-stations	each	3.6	
7.	**NEW ELECTRIFIED DOUBLE LINES**			Including rail line, signalling & electrification
	Plain & open areas	km	18	
	Ridges & valleys	km	35	
	Mountainous terrain	**km**	**45**	

7.5 AIRPORTS

7.5.1 Summary of Airports

There are four airports of national importance within KwaZulu Natal:

- International Airport at La Mercy;
- Pietermaritzburg Airport;
- Richards Bay Airport and
- Margate Airport.

The new International Airport at La Mercy near the Dube Tradeport (also referred to as the King Shaka International Airport) is planned to be commissioned in 2010. When the International Airport at La Mercy is commissioned, Durban International Airport will be decommissioned.

Durban, Pietermaritsburg and Richards Bay have been identified as the main growth points within Kwa Zulu Natal. No other areas have been identified that will require an airport of national importance (scheduled flights or a freight hub) over the planning period (2005-2050) of this project.

7.5.2 Projections for Future Years (Demand)

7.5.2.1 NATMAP modelled growth rates

The NATMAP modelled growth rates for Durban for the various growth scenarios are indicated in **Table 7.5.A**. It should be noted that the NATMAP model only investigates domestic movements and not international movements.

Table 7.5.A: Durban growth rates (NATMAP Model output)

Scenario	Yearly Growth Rates (%) [1]			
	2010-2020	2020-2030	2030-2040	2040-2050
Medium [2]	0.0	1.6	1.2	0.3
Low [2]	0.0	0.0	0.0	0.0
High [2]	2.9	2.9	0.4	0.4

Note 1: Domestic passengers only, exclude international movements

Note 2: Low scenario = high rural development, high scenario = high urbanized development, medium scenario is both rural and urban development

The implied passenger growth rates for Durban, is very low (between 0.0% per year and 1.6% per year for the Medium Growth Senario). Therefore, the ACSA Airport Traffic Forecast prepared by ACI/DKMA in February 2009 will be used as guide to be more 'conservative' when determining the demand for the various planning periods.

The NATMAP model does not give output for the other airports. The growth rates for Margate and Pietermaritzburg was based on the "ACSA smaller airports" growth rates as noted in the ACSA Airport Traffic Forecast (Feb, 2009) as these two airports did not have their own growth projections. The growth rates for Richards Bay Airport were based on the airport masterplan (Sept, 2009).

7.5.2.2 ACSA Airport Traffic Forecast

The ACSA Airport Traffic Forecast (February 2009) as indicated in **Table 7.5.B** was used to determine the demand for the New International Airport at La Mercy. The ACSA growth rate for the smaller ACSA airports was applied to Pietermaritzburg and Margate.

Table 7.5.B: ACSA AirportTraffic Forecast growth rates for ACSA airports

Airport	2007-2015 [1]	2015-2020 [1]	2020-2030 [1]	2030-2050 [2]
Durban	4.0%	7.0%	5.9%	4.9% - 3.4%
Other small airports	5.5%	7.6%	6.5%	5.5% - 4.0%

Note 1: ACSA Airport Traffic Forecast, ACI/DKMA, (February 20090

Note 2: Growth rate assumed, reducing at 0.5% every 5 years

Note 3: Domestic and international passengers growth rates combined

7.5.2.3 Richards Bay Airport Masterplan

The Richards Bay Airport Masterplan (September, 2009) growth rates forecasts as indicated in **Table 7.5.C** were used to determined the demand for Richards Bay. The growth is relative low at 2.0 to 2.5% per year.

Table 7.5.C: Richards Bay Airport Masterplan forecast growth rates

2011,2012 [1]	2012-2020 [1]	2020-2030 [1]	2030-2050 [2]
2.0%	2.5%	2.0%	2.0%

Note 1: Richardsbay Airport masterplan, September 2009

Note 2: Growth rate assumed

7.5.2.4 Demand

New International Airport at La Mercy

The peak hour demand for Durban is indicated in the table below. Ultimately the demand is 40-45 MAP which will be reached after 2050.

Table 7.5.D: New International Airport at La Mercy demand

Year	2010	2015	2020	2025	2030	2040	2050
MAP [1]	4.72	6.20	8.77	12.48	15.55	24.50	35.06

Note 1: Source ACSA Airport Traffic Forecast, February 2009

Pietermaritzburg Airport

The peak hour demand for Pietermaritzburg is indicated in **Table 7.5.E** below. The 2050 demand is estimated at 1.18 MAP (Million Air Passengers) per year. By the end of this planning period (2050) it is expected that this airport would have grown to about the current (2009) size of Port Elizabeth Airport (PLZ).

Table 7.5.E: Pietermaritzburg Airport demand

Year	2010	2015	2020	2025	2030	2040	2050
MAP [1]	0.12	0.15	0.22	0.31	0.42	0.74	1.18

Note 1: Source ACSA Airport Traffic Forecast, February 2009. Growth rates for other small airports were used

Margate Airport

The peak hour demand for Margate is indicated in **Table 7.5.F** below. The 2050 demand is estimated at 0.37 MAP per year.

Table 7.5.F: Margate Airport demand

Year	2010	2015	2020	2025	2030	2040	2050
MAP 1	**0.04**	**0.05**	**0.08**	**0.11**	**0.15**	**0.26**	**0.42**

Note 1: Source ACSA Airport Traffic Forecast, February 2009 Growth rates for other small airports were used

Richards Bay Airport

The peak hour demand for Richards Bay is indicated in **Table 7.5.G** below. The 2050 demand is estimated at 0.244 MAP per year.

Table 7.5.G: Richards Bay Airport demand

Year	2010	2015	2020	2025	2030	2040	2050
MAP [1]	0.097	0.108	0.122	0.135	0.149	0.191	0.244

Note 1: Source Richards Bay Airport Masterplan (September 2009)

7.5.3 "Do Nothing Scenario" – Future Capacity Constraints

7.5.3.1 New International Airport at La Mercy

The capacity horizons for the various components are:

- Airspace: >2050;
- Runway and taxiway: 2025;
- Aircraft parking: 2025;
- Terminal: 2020;
- Landside parking: 2020;
- Landside area: >2050; and
- Landside access: >2050.

The "existing" airport capacity will be 7.5-8.0 MAP per year. This capacity will be reached by 2020 in the "Do Nothing Scenario". The ultimate capacity is 40-45 MAP, which will be reached after 2050 at the projected growth rates.

7.5.3.2 Other airports in KwaZulu Natal of national importance

The capacity horizons for the various components for the other three airports of national importance in KwaZulu Natal are summarised in **Table 7.5.H**.

Table 7.5.H: Other airports of national importance capacity horizons "do nothing" scenario

Component	Airport Reach Capacity For The "Do Nothing Scenario" By (Discussion On Current Capacity)		
	Pietermaritzburg	Margate	Richards Bay
Airspace	> 2050	> 2050	> 2050
Runway and taxiway	2030 (Code 3C with restrictions)	2030 (Code 3C with restrictions)	2015 (Code 3C with restrictions)
Aircraft parking	2030	2030	2015 (2 x Code C parking, 1 x freight)

Component	Airport Reach Capacity For The "Do Nothing Scenario" By (Discussion On Current Capacity)		
	Pietermaritzburg	**Margate**	**Richards Bay**
Domestic arrivals terminal	2030 (Capacity 200 pax per hour)	2020 (Capacity 30 pax per hour)	2025 (Capacity 100 pax per hour)
Domestic departures terminal	2015 (Capacity 80 pax per hour)	2020 (Capacity 30 pax per hour)	2025 (Capacity 100 pax per hour)
Landside parking	2020 (Supply additional parking)	2030 (Supply additional parking)	2025 (Supply additional parking)
Landside area	> 2050 Sufficient for 2050 demand	> 2050 Sufficient for 2050 demand	> 2050 Sufficient for 2050 demand
Landside access	> 2050 Sufficient for 2050 demand	> 2050 Sufficient for 2050 demand	> 2050 Sufficient for 2050 demand

7.5.4 "Current Planning" – Evaluation of Strategy

7.5.4.1 Impact of Current Planning on Transport Demand

New International Airport at La Mercy

The airport will have a capacity of 7.5-8.0 MAP when opened and an ultimate capacity with its two parallel independent runway system 40-45 MAP.

7.5.4.2 Additional Upgrade Requirements to 2050

New International Airport at La Mercy

- Upgrade airport from current capacity of 7.5-8.0 MAP to capacity of 35 MAP over the planning period;
- Construct additional parallel independent runway to upgrade the airport to two paralled independent runway system with an ultimate capacity of at least 80 ATM's per hour;
- Upgrade terminal building to capacity of 9,200 passengers per hour; and
- Provide additional aircraft parking (total of 60 x Code C parking, 5 x Code E parking).

Pietermaritzburg Airport

- Upgrade airport from current capacity of 0.6 MAP to capacity of 1.2 MAP over the planning period;
- Upgrade runway to Code 4C (Lengthen runway from 1,537m to 2,400 m, widen runway from 30m to 45m);
- Upgrade terminal building from 280 passengers per hour to capacity of 600 passengers per hour (1.2 MAP); and
- Provide additional aircraft parking (total of 6 x Code C parking).

Margate Airport

- Upgrade airport to capacity from 0.2 MAP to 0.42 MAP over the planning period;
- Upgrade runway to Code 3C (Lengthen runway from 1,370m to 1,800 m);
- Construct new terminal building with capacity of 300 passengers per hour; and
- Provide additional aircraft parking (total of 4 x Code C parking).

Richards Bay Airport

- Upgrade airport capacity to 0.3 MAP over the planning period;
- Upgrade runway to Code 4C (Lengthen runway from 1,500m to 2,400 m, widen runway from 22m to 45m);
- Provide additional aircraft parking (total 4 x Code C bays); and
- Upgrade terminal building to 250 passengers per hour capacity.

7.5.5 "Alternative Strategies" – Evaluation of Strategies

The New International Airport at La Mercy could reach capacity by 2055, by when a new international airport will be required. Assuming that the planning and construction of a new airport will take about 20 years, the site for the new airport should be identified by 2035.

Alternative strategies are discussed in **Table 7.5.I**.

Table 7.5.I: Summary of alternative strategies

Additional Strategies	New International Airport At La Mercy	Other Smaller Airport
Addition of Airports	The New International Airport at La Mercy could reach capacity by 2055, by when a new international airport will be required	No additional airport is required within the time period of the National Transport Masterplan (2005-2050)
Maintenance of Airports Infrastructure	Routine	Routine
ATM's and ATNS	The ultimate capacity of airport is 80+ movements per hour with the addition of a second parallel and independent runway. Should the need arise, the GA could be relocated to another airfield.	This could in the future be increased to to meet the demand
Additional runway	The available land is sufficient to expand the airport to 2 independent and parallel runways.	1 runway is sufficient for the planning phase
Lengthen runway	NA	Increase runway length to 2,400m (Code 3C) strengthen and widen to 45m
Aircraft parking	There is sufficient space to add additional parking bays when the demand necessitates this.	There is sufficient space to add additional parking bays when the demand necessitates this.

Additional Strategies	New International Airport At La Mercy	Other Smaller Airport
Landside access	Landside access could be upgraded to meet the demand	Landside access could be upgraded to meet the demand
Landside parking	Sufficient land available to address parking when required	Sufficient land available to address parking when required

7.5.6 Aviation freight hubs

Durban, Richards bay and Pietermaritzburg will remain the freight hubs for KwaZulu Natal. No additional freight hubs with reference to aviation freights have been identified over this planning period.

7.5.7 Identification of Critical Projects

7.5.7.1 List of Critical Projects

The critical projects to be implemented at the airports of national importance in the east are summarised in Table 7.5.J

Table 7.5.J: Critical projects for KwaZulu Natal Airports of National Importance

Planning Horizon	New International Airport At La Mercy	Second Airport Around Durban	Pietermaritzburg	Margate	Richards Bay
2010-2015	Complete construction of new airport		Construction of parallel taxiway Construction of link taxiway ro parallel taxiway Relocation of fuel farm Upgrade of terminal building		Lengthen runway 1,500m to 1,800m Widen runway 22m to 30 m New terminal building in new location (200 pax/hr) New aircraft parking (3 x Code 3C)
2015-2020	Upgrade landside parking Terminal Upgrade 13 MAP		Upgrade runway to Code 3C (lengthen from 1,537 to 1,800m)	Upgrade terminal building	Upgrade terminal building
2020-2025	Increase apron parking Terminal upgrade 17 MAP		Upgrade terminal building 300 pax/hr		
2025-2050	Second Runway (with taxiways and aviation aids) Aircraft parking Landside and terminal upgrade to 42 MAP Rail access	Identify location Reserve land for airport (4,000 ha) Design and construction of airport Airport to be operational by 2055	Upgrade runway to Code 4C (2,400m x 45m) Upgrade terminal building to capacity of 600 passengers per hour Parking 6 x Code 3C	Upgrade runway to Code 3C Construct new terminal building with capacity of 300 passengers per hour Parking 4 x Code 3C	Upgrade runway to Code 4C Upgrade terminal building to capacity of 300 passengers per hour Parking 4 x Code 3C

7.5.7.2 Airport Related Costs – Typical Unit Rates

Rates for development and construction of major airport infrastructure facilities include:

1. Runway: R1,000/m2 (civil works only), R3,000 (including electrical works, lights, road marking)
2. Aprons: R2,000/m2
3. Taxiways: R1,000/m2 (civil works only), R1,500 (including electrical works, lights, road markings)
4. Terminal Building: R10,000/m2 (Regional airport) – R25,000/m2 (International airport)
5. Vehicle Parking: Open R900/m2, Multi storey parkade R80,000/parking bay (25m2)

7.5.8 Summary

The New International Airport at La Mercy near the Dube Tradeport will be commissioned in 2010. When the International Airport at La Mercy is commissioned, Durban International Airport will be decommissioned.

An independent task team needs to evaluate the future role of the current Durban International Airport land ito of its strategic value to South Africa, to Durban, the Durban harbour/port, job creation, aviation and general aviation.

Durban, Pietermaritsburg and Richards Bay have been identified as the main growth points within Kwa Zulu Natal. No other areas have been identified that will require an airport of national importance (scheduled flights or a freight hub) over the planning period (2005-2050) of this project.

The New International Airport at La Mercy near the Dube Tradeport needs to be developed to its ultimate capacity of 40-45 MAP. The site of an additional airport will have to be identified by 2030 based on the projected growth rates.

An independent study by the stakeholders needs to occure to identify the location of the new airport to reserve the land for the development thereof.

The other airports of national importance need to be developed to about 1-1.2 MAP each over the planning period.

The economic role of each airport and hierarchy needs to be defined with specific reference to airport within the new International Airport at La Mercy airspace.

7.6 SEA PORTS

7.6.1 Summary of Sea Ports

KwaZulu Natal’s two complimentary ports of Durban and Richards Bay in 2008 accounted for 68% of South Africa’s total sea-borne cargos handled, both in bulk, break bulk and non-containerized cargos, and in container cargos. In total the two ports handed 125,9 million tons of non-containerized cargo, and 2,644 million TEUs of containerized cargo during 2008. In handling this tonnage, the two ports received 6130 vessel calls (48% of the country's total).

It is evident from the above statistics that the KwaZulu Natal ports play a vital role in the economy of the country.

In terms of infrastructure, the two ports have 59 operational cargo handling berths, amounting to over 15 kilometres of quay walls. See **Table 7.6.A** below.

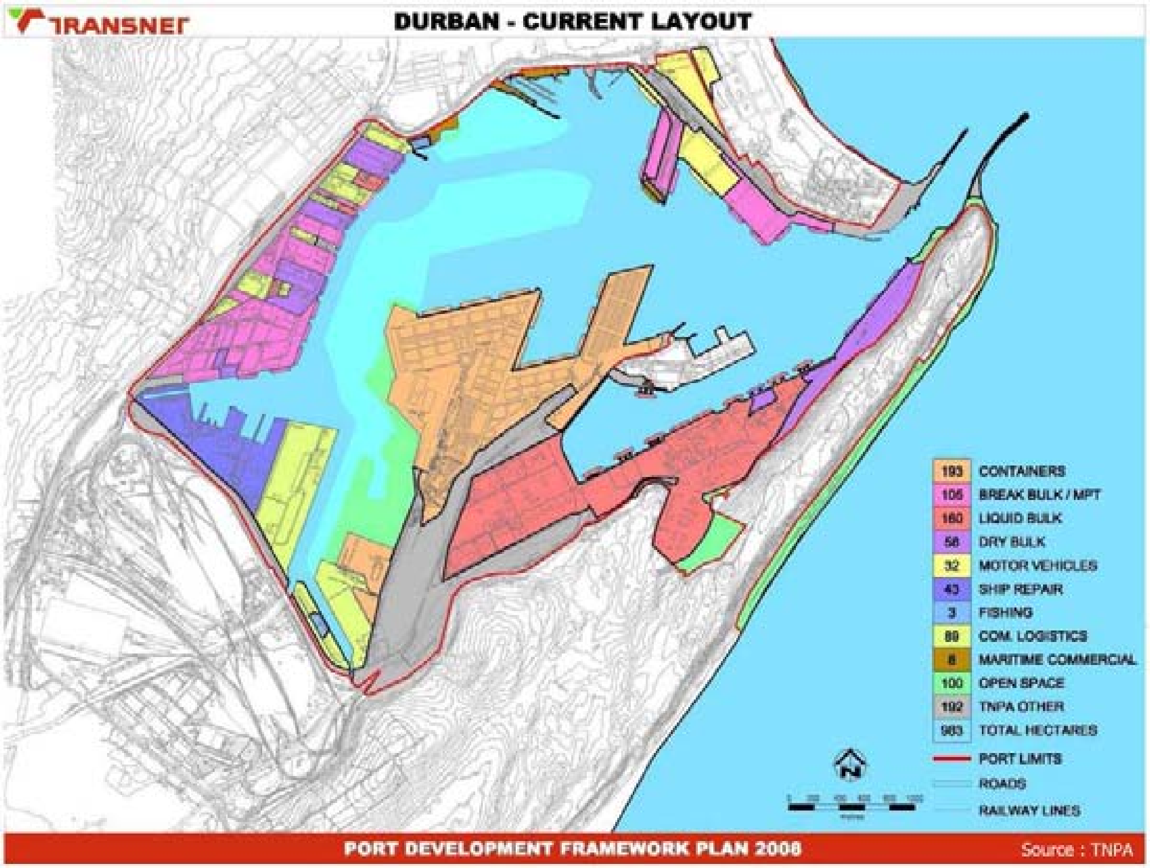
Table 7.6.A: South African Ports: Infrastructure and Capacity Assessment 2007

Port Infrastructure - Eastern Region							
Ports	**Cargo Type**	**Berths**	**Quay length (km)**	**Terminal Area**	**Capacity**	**Throughput 2008**	**Units**
Richards	Containers	9	2.80	167	2.40	2.54	mteu
Bay and	Break Bulk	23	5.20	141	16.82	7.02	mtpa
Durban	Dry Bulk	19	5.30	300	110.80	80.97	mtpa
	Liquid Bulk	7	1.50	167	18.00	10.57	mtpa
	Vehicles	1	0.40	31	550	392	tfbu

Source Transnet National Infrastructure Plan February 2008, updated 2009

Port of Durban

The Port of Durban is the busiest port in South Africa, handling a third of all vessel calls, and 22% of all non-containerized cargos. However, it is container handling that the Port of Durban excels, handing over two thirds of the country's total. The handling of both import and export vehicles has seen significant growth in the past decade, much of this growth being through Durban.

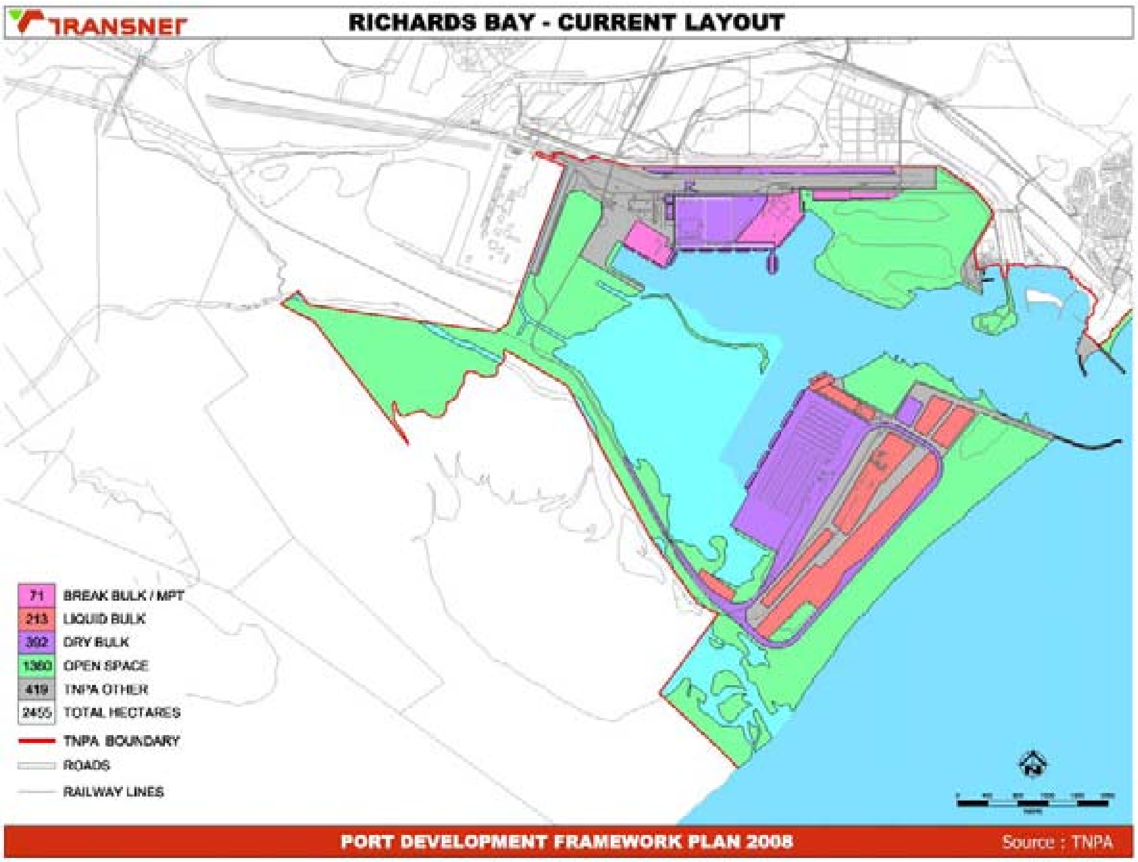


Source Transnet National Infrastructure Plan June 2009

Figure 7.6.A: Port of Durban: Current Layout 2008

Port of Richards Bay

The Port of Richards Bay is South Africa's leading port in terms of non-containerized cargo with over 90% of its traffic as dry bulk freight, mainly coal through the Richards Bay Coal Terminal which is one of the largest export coal terminals in the world. The port does not have dedicated facilities for handling containers or motor vehicles.



Source Transnet National Infrastructure Plan June 2009

Figure 7.6.B: Port of Richards Bay: Current Layout 2008

Port of Durban : Container Forecast

Port of Durban : Vehicle Forecast

7.6.2 Projections for Future Years

Tables 7.6.B and C gives the freight and container forecasts for the Durban port provided by Transnet.

Table .7.6.B: Port of Durban - Freight Cargo Forecast

Port of Durban : Freight Cargo Forecast

Expressed in tons per annum

TOTAL

Year	Break-bulk	Dry Bulk	Liquid Bulk	TOTAL
2005	8,945,196	5,651,718		
2010	6,194,636	8,074,020	38,024,515	52,293,171
2015	6,573,545	8,552,575	40,337,866	55,463,985
2020	7,122,531	9,535,310	45,165,894	61,823,735
2025	7,158,215	10,985,432	50,578,009	68,721,656
2030	7,194,078	12,210,026	55,947,783	75,351,887
2035	7,230,121	13,226,289	59,674,962	80,131,371
2040	7,266,343	13,805,789	62,375,892	83,448,024
2045	7,302,748	14,119,716	63,704,352	85,126,817
2050	**7,339,335**	**14,739,936**	**64,563,567**	**86,642,837**

Table .7.6.C: Port of Durban: Container Forecast and Vehicle Forecast

Expressed in TEUs	
Year	**Grand Total**
2005	1,899,065
2010	2,668,587
2015	2,856,023
2020	3,136,231
2025	3,635,751
2030	4,214,832
2035	5,127,988
2040	6,215,131
2045	7,456,649
2050	**9,005,007**

Expressed in FBUs	
Year	**Total FBUs**
2005	
2010	274,000
2015	306,918
2020	338,862
2025	374,131
2030	413,071
2035	456,064
2040	503,532
2045	555,939
2050	**613,802**

The assessed capacity of the Port of Durban, as evaluated in a detailed analysis undertaken on behalf of Transnet Projects as part of their Eastern Ports Rail Corridor Study by Prestedge Retief Dresner Wijnberg (Pty) Ltd, entitled “PORT OF DURBAN STATUS QUO REPORT, 467/01/009 REV 01, JUNE 2007”, revised in the light of capital development projects completed in the interim, or committed to in terms of the revised Transnet Capital Budget, is given in **Table 7.6.D**.

Of particular significance, in the abovementioned assessment, the consultants adopted a norm of handling 1215 TEUs per metre length of container terminal quay wall per annum. Provided there is sufficient back-up area behind such quays for the pre-assembly and reception of landed containers (usually about 400 metres of available stacking space) a terminal’s throughput can be ‘balanced’ by the appropriate installation of shore-side handling equipment.

The norm is based on current handling rates achieved by the Durban Container Terminal. This rate is considered in international shipping circles as being below par as compared to similar sized terminals elsewhere in the world. Whilst it is conceded that numerous factors influence the operational productivity of such terminals, which make direct comparisons inappropriate, it is not unreasonable to expect the South African port container terminals to improve on this norm. At the other end of the productivity scale, at the Kwai Tsing Container Terminal in Hong Kong, productivity rates of 1745 TEUs/metre/annum are the norm.

For the purposes of this analysis of the “do nothing scenario”, the consultant’s norm of 1215 TEUs/metre/annum are adopted as it would imply that nothing would be done to improve productivity over Table 7.6.D: Port of Durban: Container Forecast and Vehicle Forecast he quay wall.

Table .7.6.D: Port of Durban Capacity Assessment

Assessed Capacity 2005/06			
DURBAN			
	Assessed capacity 2005/06	Additional capacity installed/in progress	"Do nothing Scenario"
Containers		**TEUs/annum**	
Pier 1	600,000	120,000	720,000
DCT	2,400,000	1,000,000	3,400,000
Total	**3,000,000**	**1,120,000**	**4,120,000**
Dry Bulk		**Tons/annum**	
Rennies Bluff Mechanical (RBM/BMA)	4,800,000	0	4,800,000
MW Sugar Terminal	1,700,000	0	1,700,000
MW Rennies Bulk Terminal (RBT)	1,100,000	0	1,100,000
MW Agriport and Tate & Lyle	700,000	0	700,000
IV Durban Bulk Shipping (DBS)	2,100,000	0	2,100,000
Total	**10,400,000**	**0**	**10,400,000**
Break Bulk		**Tons/annum**	
S.A.Breweries (SAB)	85,000	-85,000	0
MW Cold Storage	32,000	0	32,000
MW SAPO	3,800,000	0	3,800,000
MW Brunnermond	280,000	0	280,000
MW (Bidfreight)	1,300,000	0	1,300,000
IV (Engen/Safrep/Total)	220,000	0	220,000
MPT (SAPO City)	4,250,000	-2,850,000	1,400,000
Fresh Produce Terminal (FPT City)	700,000	0	700,000
Total	**10,667,000**	**-2,935,000**	**7,732,000**
Bulk Liquids		**Tons/annum**	
Bunker Berth 1 30.7% unknown 40% 1,700,000	1,700,000	0	1,700,000
IV Vopak and IVS	5,100,000	0	5,100,000
IV (Engen/Safrep/Total)	12,000,000	0	12,000,000
MW Protank & GPU	900,000	0	900,000
Total	**19,700,000**	**0**	**19,700,000**
Motor Vehicles		**Fbu's/annum**	
	330,000	230000	560,000
Total	**330,000**	**230000**	**560,000**

Cargo Forecasts and Capacity

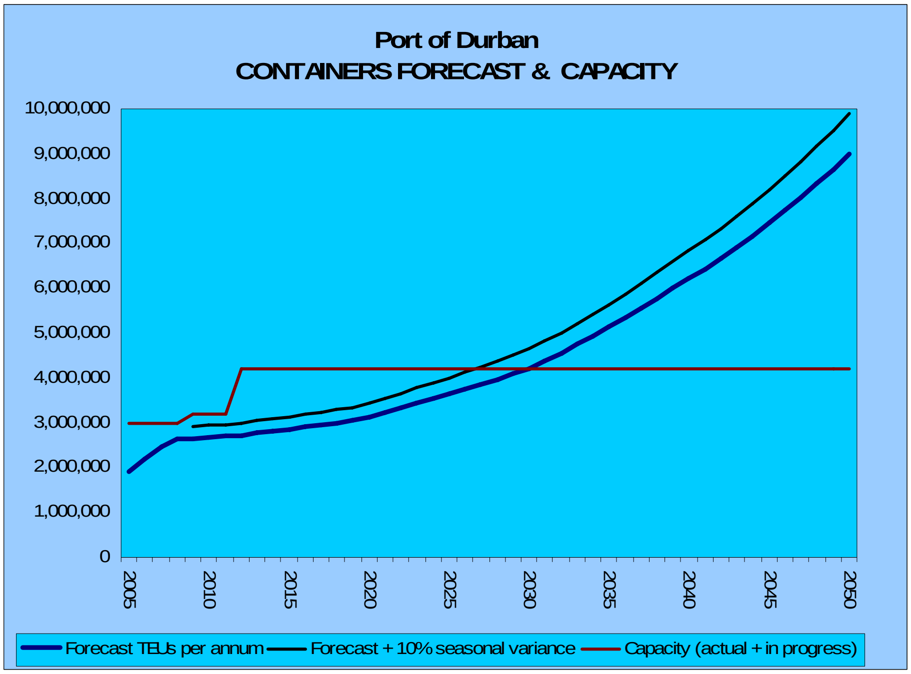


Figure 7.6.C: Port of Durban: Container Forecast

When all the projects planned, and committed for completion are brought into operation the capacity of the Port of Durban will be 4,4 million TEUs per annum, a figure not expected to reached until 2027 according to the forecast.

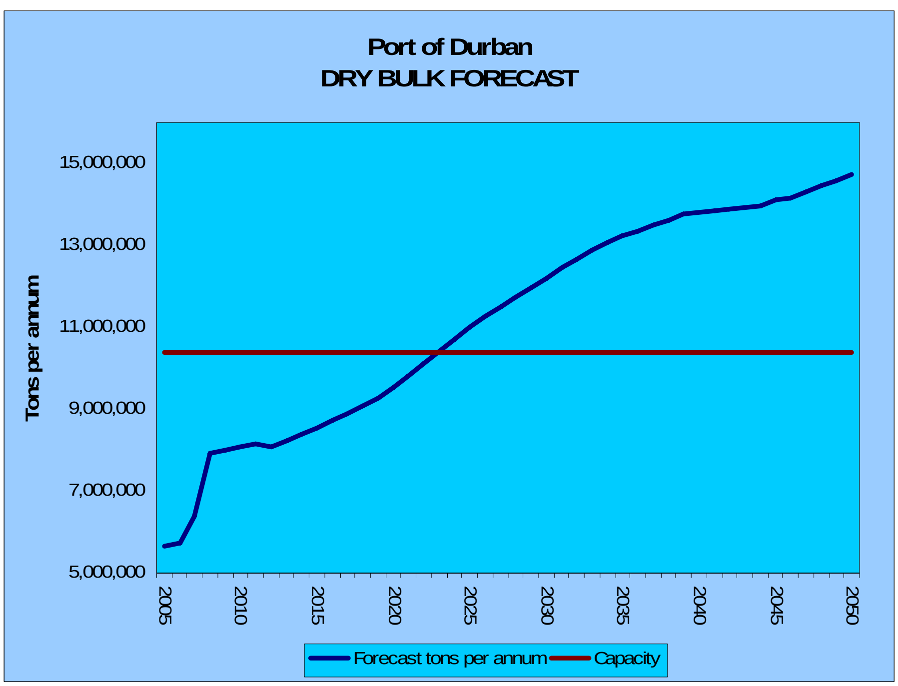


Figure 7.6.D: Port of Durban : Dry Bulk Forecast

The port currently has a capacity to handle 10,4million tons per annum of dry bulk cargo per annum, a tonnage not expected to be reached until 2023.

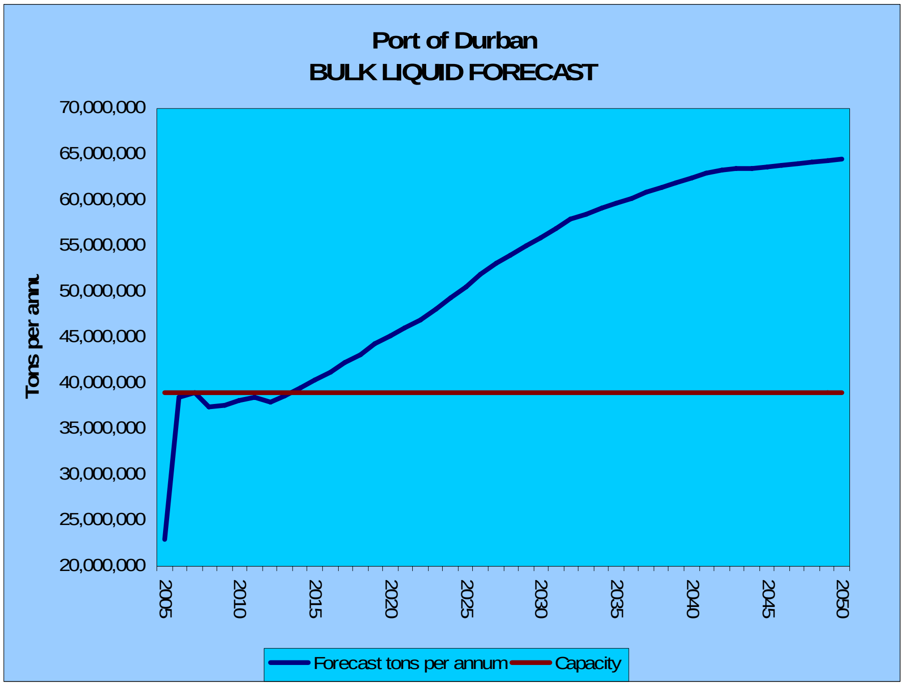


Figure 7.6.E: Port of Durban: Bulk Liquid Forecast

The port, including the Single Buoy Mooring, currently has a capacity to handle 38,9 million tons per annum of liquid bulk cargo per annum , a tonnage expected to be reached by 2013. Since the majority of the increase in bulk liquids will be crude oil or refined petroleum products in bulk, the Single Buoy Mooring facility will need to be replicated to satisfy the demand for crude oil/refined products imports. Alternatively, consideration will need to be given to the location of a refinery or bulk storage facilities elsewhere on the coastline. There is considerable merit in this strategy as an interruption of supply at the Durban SBM facility will not necessarily bring the import of petroleum products to the eastern seaboard of the country to a standstill.

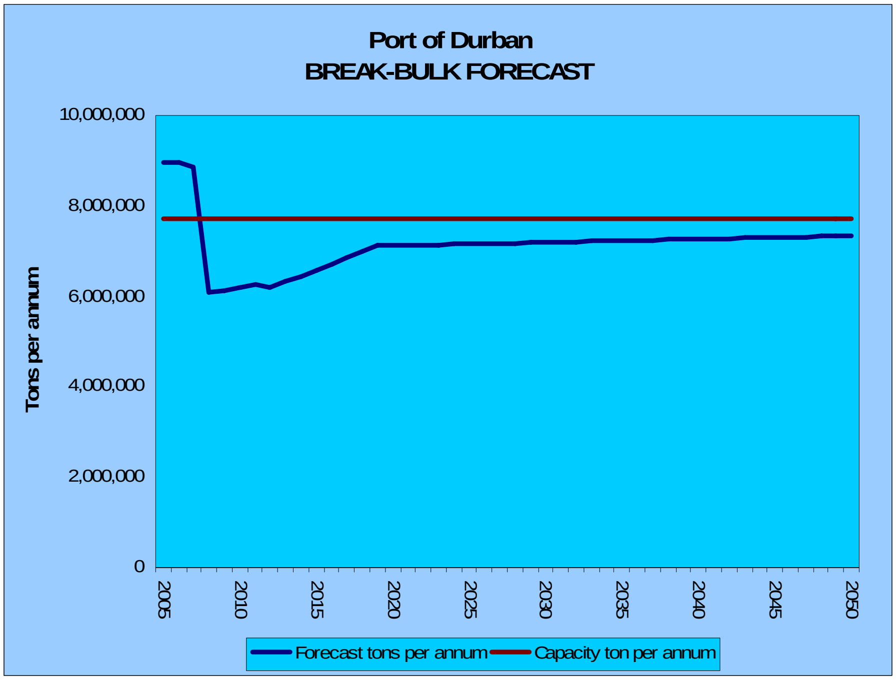


Figure 7.6.F: Port of Durban: Break-bulk Forecast (Excluding Containers)

The port currently has a capacity to handle 7.732million tons per annum of Break-bulk cargo per annum, a tonnage not expected to be exceed in the planning horizon.

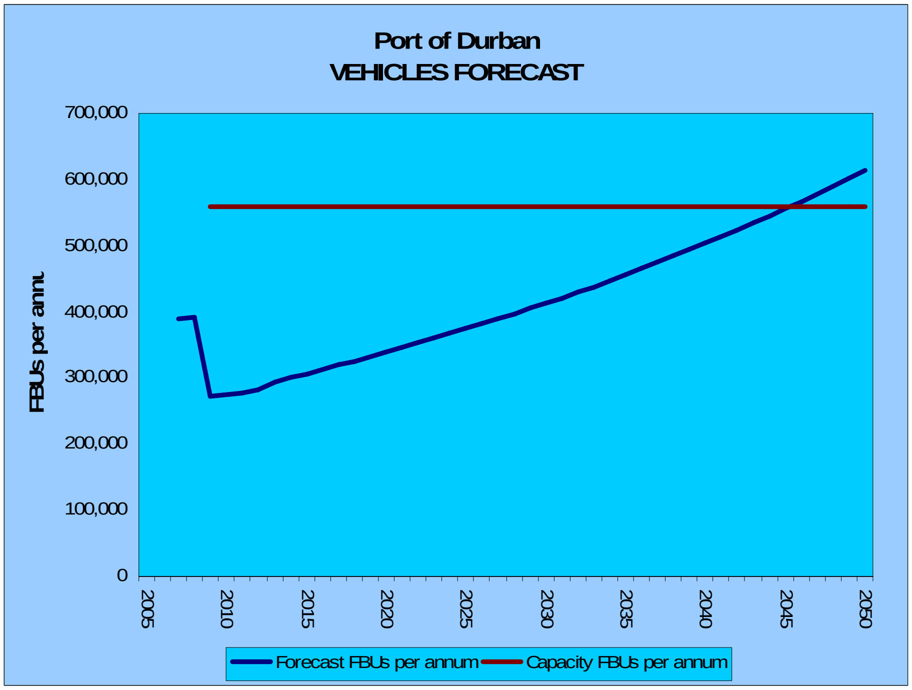


Figure 7.6.G: Port of Durban: Vehicles Forecast

The port currently has a capacity to handle 560 000 FBUs per annum, a number not expected to be reached until 2021.

Port of Richards Bay

Tables 7.6.E and F provides the Transnet freight and container forecasts for Richards Bay port, and **Table 7.6.G** provides the capacity assessment**.**

Table .7.6.E: Port of Richards Bay: Freight Cargo Forecast

Port Of Richards Bay : Freight Cargo Forecast

Expressed in tons per annum

TOTAL

Year	Break-bulk	Dry Bulk	Liquid Bulk	TOTAL	Non-coal Dry Bulk
2005	4,168,678				12,767,403
2010	4,315,832	81,145,554	1,453,000	86,914,387	18,000,000
2015	4,490,192	86,538,610	2,257,257	93,286,059	21,000,000
2020	5,006,138	96,482,340	2,418,905	103,907,383	21,000,000
2025	5,803,486	111,849,475	2,985,660	120,638,622	22,000,000
2030	6,727,831	129,664,197	3,685,208	140,077,235	22,000,000
2035	7,799,400	146,326,604	4,548,660	158,674,664	22,000,000
2040	9,041,642	159,310,479	5,614,422	173,966,543	24,000,000
2045	10,481,741	161,525,596	6,929,894	178,937,231	24,000,000
2050	12,151,211	164,093,523	8,553,584	184,798,318	24,000,000

Table 7.6.F: Port of Richards Bay: Container Forecast

Port Of Richards Bay : Container Cargo Forecast

Expressed in TEUs per annum

Year	Grand Total
2005	5,179
2010	9,444
2015	10,074
2020	10,908
2025	12,043
2030	13,428
2035	15,572
2040	18,233
2045	22,183
2050	26,989

Table .7.6.G: Port of Richards Bay: Capacity Assessment

Assessed Capacity 2005/06			
RICHARDS BAY			
	Assessed capacity 2005/06	Additional capacity installed/in progress	"Do nothing Scenario"
Dry Bulk - Coal Terminal	**Ton/annum**		
Berths 301 to 305	72,000,000	14,000,000	86,000,000
Total	**72,000,000**	**14,000,000**	**86,000,000**
Dry Bulk - General	**Tons/annum**		
General Cargo Imports	6,000,000	0	6,000,000
General Cargo Exports	4,000,000	0	4,000,000
Total	**10,000,000**	**0**	**10,000,000**
Dry Bulk - Woodchips	**Tons/annum**		
Exports	5,500,000	0	5,500,000
Total	**5,500,000**	**0**	**5,500,000**
Break Bulk	**Tons/annum**		
Imports and exports	6,650,000	0	6,650,000
Total	**6,650,000**	**0**	**6,650,000**
Bulk Liquids	**Tons/annum**		
	1,100,000	-1,800,000	-700,000
Total	**1,100,000**	**-1,800,000**	**-700,000**

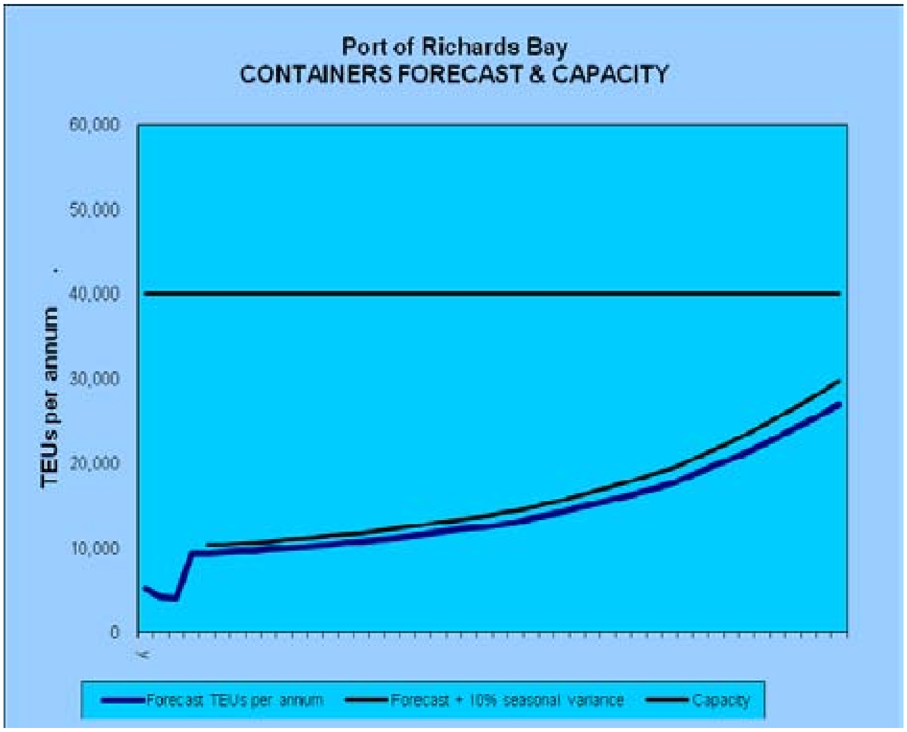


Figure 7.6.H: Port of Richards Bay: Dry Bulk Forecast

Construction of dedicated container handling facilities is not envisaged during the plan period given the low forecast predicted by the freight demand model.

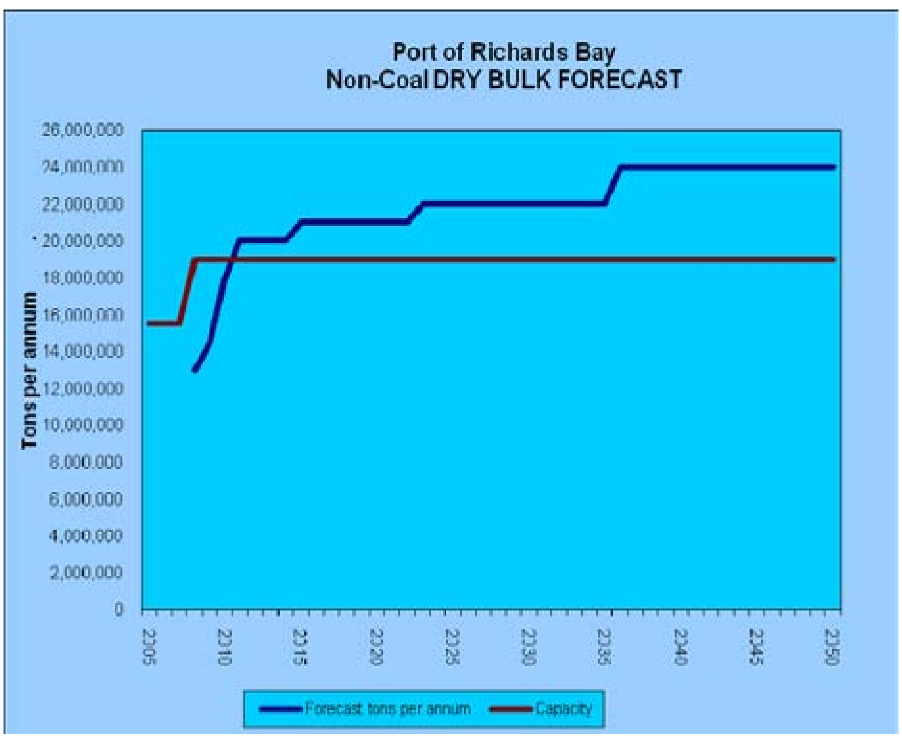


Figure 7.6.I: Port of Richards Bay: Non-Coal Dry Bulk Forecast

The existing non-coal dry bulk terminals include 3 import and 2 export berths for general cargo and 2 berths for the export of woodchips. During the plan base year (2005), these terminals had a capacity of 15.5mtpa but it has since increased to 19mtpa and that capacity will be reached by 2013.

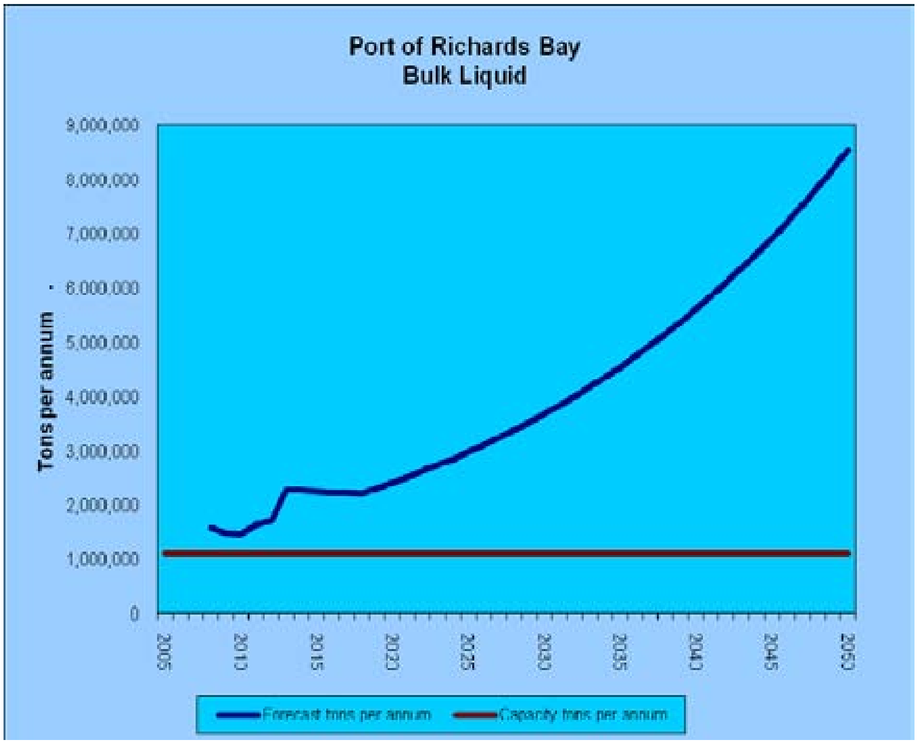


Figure 7.6.J: Port of Richards Bay: Bulk Liquid Forecast

The current terminal has one berth of 1,100,000 tons per annum capacity which is not meeting the demand.

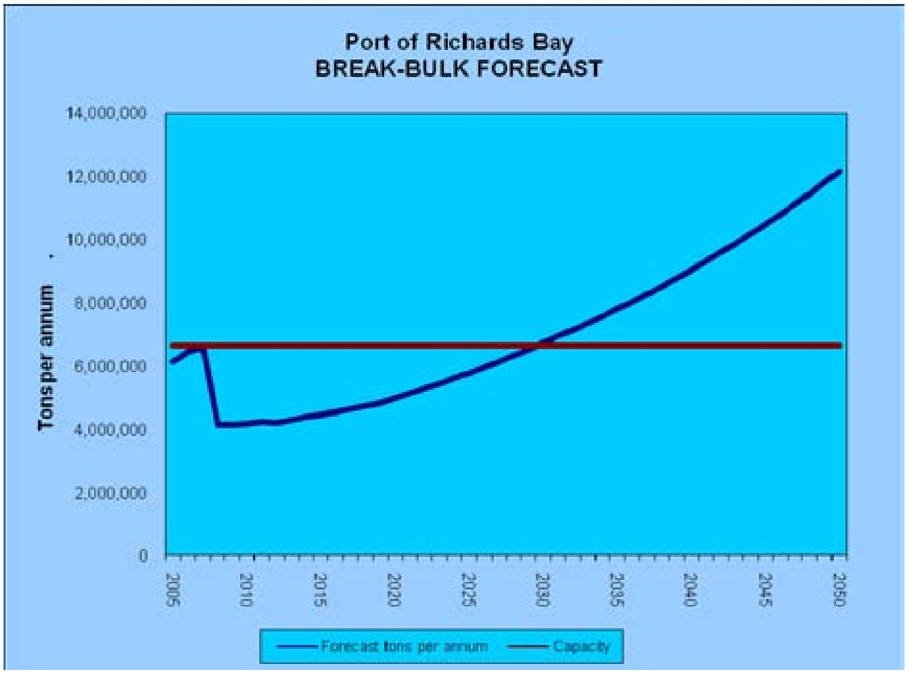


Figure 7.6.K: Port of Richards Bay: Break Bulk Forecast

The current capacity of 6,650,000 tons per annum will be reached by 2010.

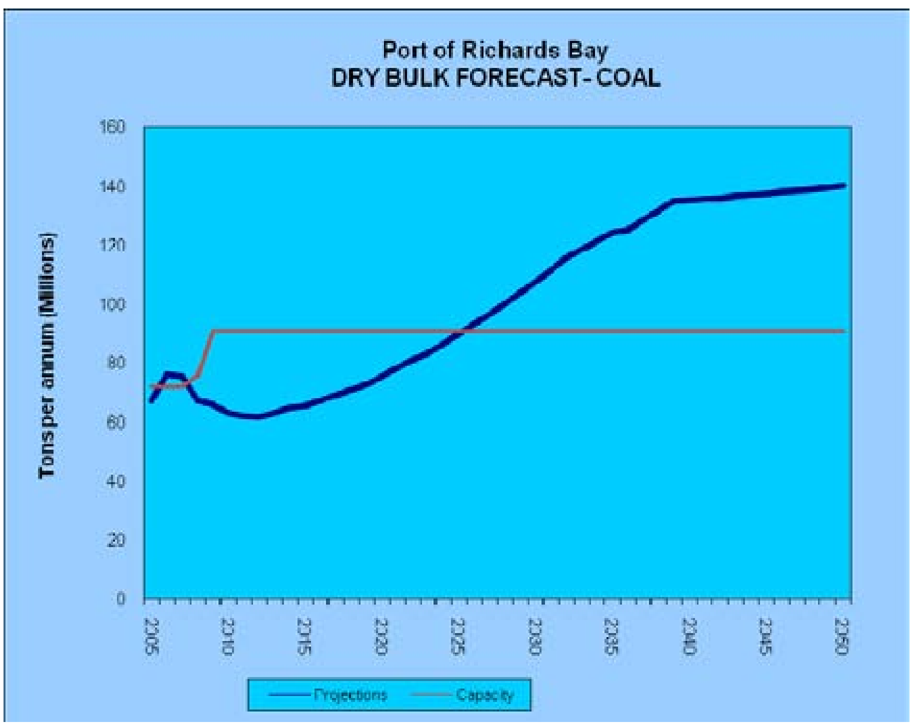


Figure 7.6.L: Port of Richards Bay: Coal Terminal Forecast

7.6.3 "Current Planning" – Evaluation of Strategy

7.6.3.1 Service Levels for Future Years

All of the country's ports are owned and managed by the parastatal, Transnet Ltd, via their National Ports Authority of South Africa division. This is In terms of the National Ports Act, 2005 (Act No.12 of 2005).

The primary functions of the Port Authority, as defined in the Act, are inter alia:
(a) plan, provide, maintain and improve port infrastructure;
(b) prepare and periodically update a port development framework plan for each port, which must reflect the Authority's policy for port development and land use within such port.

To this end Transnet annually prepares a National Infrastructure Plan (NIP) outlining the development plans for all of its divisions, including ports.

This Plan incorporates the forecasted cargo flows, and endeavours to identify the infrastructural responses to such scenarios. In this way Transnet endeavours to ensure that service levels of the country's ports satisfy the demands.

7.6.3.2 Transnet Planning for Future Years

Transnet have proposed in their National Infrastructure Plan, 2008, various development framework plans to meet the demands of their projections to the planning horizon of 2036, as well as plans of the future potential development of their ports beyond this horizon.

The Plans proposed by Transnet are analysed in terms of their ability to meet the demands assessed as part of this study (which may not, and in most instances do not, correspond with those made by Transnet and their consultants over a year ago before the effects of the world economic slump.

Port of Durban: Short to Medium Term Developments

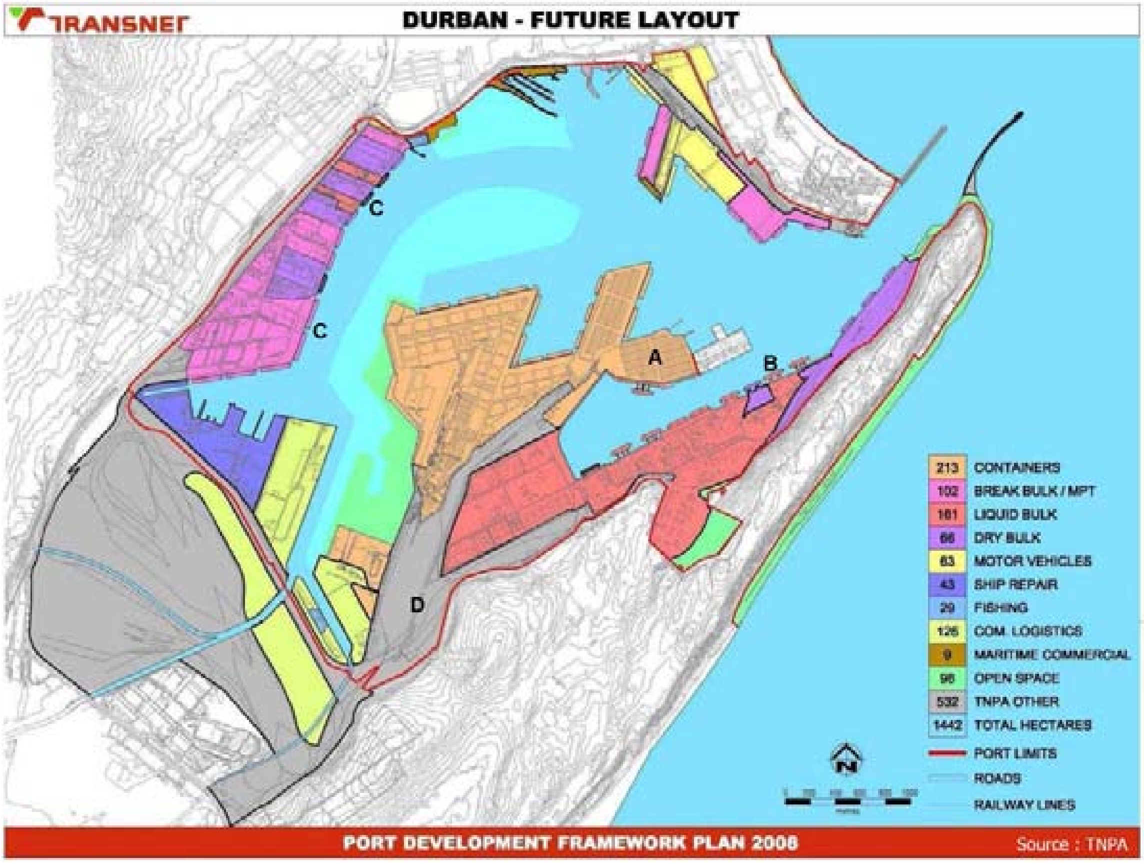


Figure 7.6.M: Port of Durban: Future Layout

Short Term Developments

Pier 1 Phase 2, (see A on **Figure 7.6.M** above) involves the expansion of the Pier 1 container stacking yard onto land still to be acquired from the Department of Defence. Transnet expects an increase in capacity for this development of 200 000 TEU's per annum. Since there is no additional berthage envisaged, this increase is questionable, unless the stack expansion will lead to substantial improvement in operational efficiency. This, the final upgrade in the Pier1/DCT complex will raise the throughput capacity of the Port to 4,4 million TEU's per annum.

The upgrading of the Island View Berth 2 Bulk Liquid Berth (marked B on **Figure 7.6.M** above) is unlikely to have a substantial impact on capacity, and is essentially a refurbishment of an existing asset.

The reconstruction of the Maydon Wharf berths (marked C on **Figure 7.6.M** above). Apart from replacing assets which have exceeded their useful economic life, this project has the potential to significantly increase the overall capacity of the Port. In total Maydon Wharf has in excess of 2800 metres of quay wall, presently divided into 15 berths. Whilst the area is currently used for breakbulk and bulk cargoes, there is the potential for a significant container terminal, and rationalisation of now largely outdated warehousing. Even accepting the limited throughput of 1215 TEUs/metre length of Quay/annum, a four berth container terminal, as depicted on the Layout drawing above, has the potential of a 1,7 million TEU/annum terminal. This would, however, require significant improvement to the road access serving the area, which has not been addressed in any way in the Transnet development framework plan.

Improvements to the Bayhead Road, (marked D on the **Figure 7.6.M** above) is to improve on road access to the Pier 1 Container Terminal, as well as the Island View complex, and would make no contribution to increasing port capacity per sae.

Comment on the Transnet rationale of developments

Pier 1 Phase 2, (see A) requires that Transnet acquires land presently occupied by the Department of Defence. This land is currently under-utilized by that Department, and should be re-allocated to commercial port activities.

However, the Plan does not provide for any additional berthage, relying on the existing Pier 1 Berths 101 to 103 to service this area. The resultant long haulage routes between the shipside and the stack area does not bode well for an efficiently operated terminal.

Although the back-up area achieved in this development is significant, and provides for efficient road and rail transfers, the average haul distance from centre of gravity of the berths to that of the stack area is in excess of 800 metres – considerably more than is practicably acceptable.

The provision of berthage fronting this stack area, to reduce haul distance, would be limited to a single berth, which too, is far from ideal as cranage provided on the berth would be limited to that berth.

Unless additional area, to provide for additional berths on the Department of Defence's Salisbury Island facility, the envisaged Pier 1 Phase 2 development will be an inefficient addition to the Pier 1 Container Terminal, and is unlikely to warrant the capital expenditure required.

Upgrading of the Island View Berth 2 Bulk Liquid Berth (see B) is regarded as essential refurbishment rather than a capacity increasing development. Although not listed by Transnet, similar refurbishment, and in some instances rebuilding of quay walls, is required at Island View Berths 1, 5, 7 and 8, Berth 6 having recently been rebuilt. Berth 5, in particular, having already suffered a partial collapse, is in urgent need of rebuilding.

The Island View berths serve a vital role in the South Africa bulk liquids exports and imports – especially lubricating oils and a myriad of chemicals vital to industry in the country. It is imperative that trade be allowed to operate without interruption.

The reconstruction of the Maydon Wharf berths, (see C) is not only an opportunity to increase capacity in the Port, but unless urgent steps are taken to re-build many of the berths, it is likely that several berths could fail structurally. Berths 1 to 4 were constructed using steel sheet piling in the early 1950's. Wastage of the steel due to the high corrosion experienced in Durban has severely compromised these berths, leading to load restrictions being imposed on the berths. A partial collapse of a similarly constructed berth, build at a similar time, at Island View mentioned above, is ample warning of the dire need to re-build these berths.

An additional impetus to re-build the Maydon Wharf berths is to create additional berth depth. Currently the Maydon Wharf berths are constructed to depths of between 6,1 and 10,4 metres Chart Datum. Given the location of dry bulk handling facilities on these berths (Sugar Terminal, Rennies Bulk Terminal, Agriport Grain Terminal, Woodchip Terminal and Brunnermond Soda Ash Terminal) the depth alongside is clearly insufficient for the efficient transportation of these products.

The reconstruction of the Maydon Wharf Berths is therefore not only desirable, but given the condition and limitations of the current berths is an urgently required project.

However, the Achilles heel of this area is the land side access, both roads an rail. Extensive attention will need to be given to this aspect, requiring innovative solutions and the cooperation of the Ethekwini Municipality and Transnet Rail Freight.

The recent construction of the Edwin Swales Link Road and the Khangela Bridge has provided vital relief to congestion on roads serving these port facilities in the short to medium term, but further improvements to the Bayhead Road (see D), is essential to address the limited road access to Pier 1 Container Terminal, as well as the Island View and Bluff Bulk handling facilities.

Port of Richards Bay: Short to Medium Term Developments

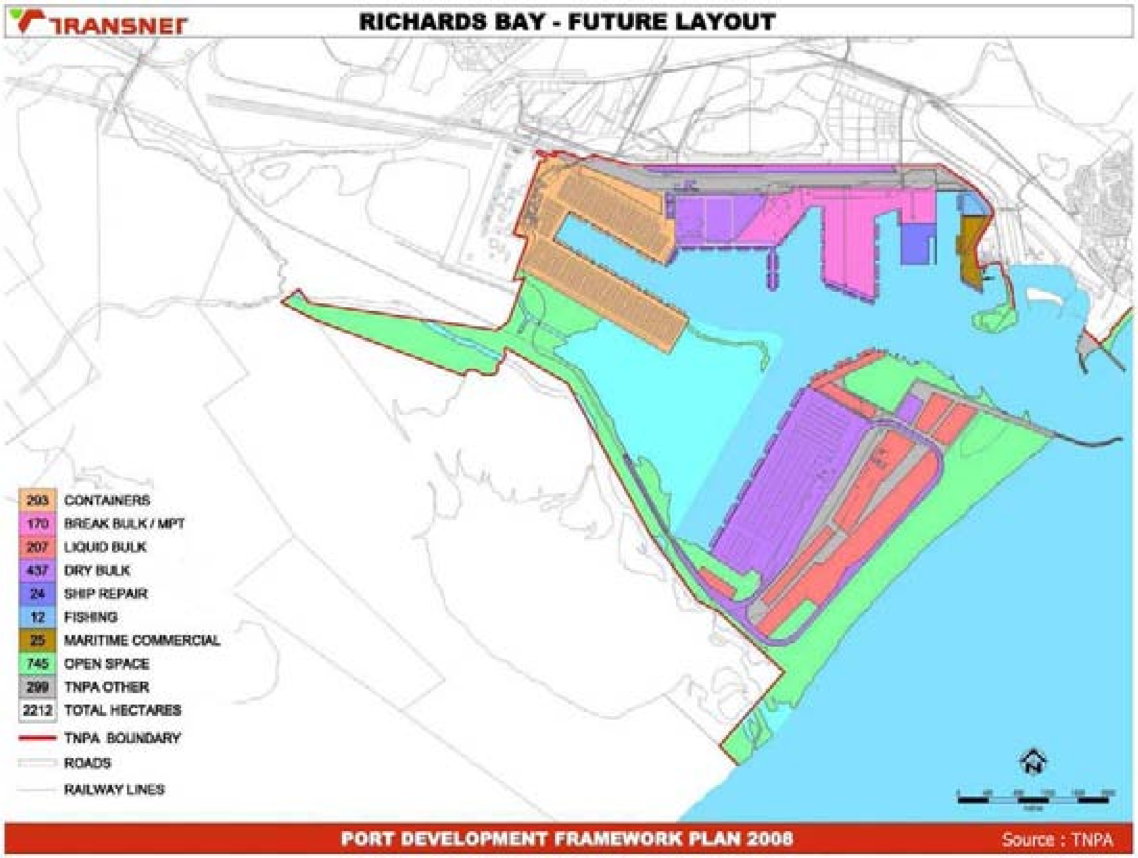


Figure 7.6.N: Port of Richards Bay: Future Layout

Impact on capacity

Richards Bay Coal Terminal: Berth 306 is now completed bringing the total number to six and current capacity to 86mtpa. Any further additional throughputs to 91mtpa will be achieved through ongoing operational efficiencies. Three additional berths will increase capacity to 136mtpa.

Non-coal dry bulk terminals: Two additional berths brings total throughput to 24mtpa.

Break bulk terminal: Five additional berths will increase capacity to 12mtpa.

Liquid bulk terminal: A new bulk liquid Berth 208 and additional storage area will be completed by April 2010 bring the capacity up to 2.4mtpa. The facility will have a capacity of 9mtpa with additional three berths.

Container handling terminal: Transnet proposes a 10 berth container terminal with a capacity of 4.25mteu per annum.

Ship building and repair facilities: Feasibility study has been completed.

Comment on the Transnet rationale of developments

Richards Bay Coal Terminal: Terminal throughput is expected to level off at 91mtpa once the additional one berth and associated stockyard facilities are fully operational. Any further expansion is dependent upon an economically sustainable business case.

Impact of alternative routes through Maputo and other sites in Mozambique for the export of coal should be investigated.

Non-coal dry bulk terminals: It is expected that the ongoing general refurbishment and/or replacement of the existing port equipment as well as upgrading of infrastructure and addressing issues of productivity will substantially increase their throughputs.

Additional improvements are expected following rationalization of the break bulk and dry bulk terminals on the north side of the port to the layout shown at Figure 12 above.

Extension and use of the dedicated woodchips export facility for handling other commodities including magnetite should be investigated.

Break bulk terminal: The ongoing rationalization and improvements to the break bulk and dry bulk facilities as stated above will require removal of the existing three MPT Berths 606-608 where container terminal will be sited.

Priority projects which will also compensate for the loss of capacity include extension of Berth 708 to allow operation of three vessels at any one time along the quay of Berths 705-708 and construction of Berths 709-711 and then 712-714.

Extension of break bulk terminal further east and beyond the extent shown in Figure 12 is constrained in order to retain Tuzi Gazi Waterfront and Naval Island areas including other non-freight activities in the area such as harbour services, waterfront development and ship building and repair.

The demand for break bulk facilities in the long term may diminish upon the ongoing shift of non-unitized commodities to containers.

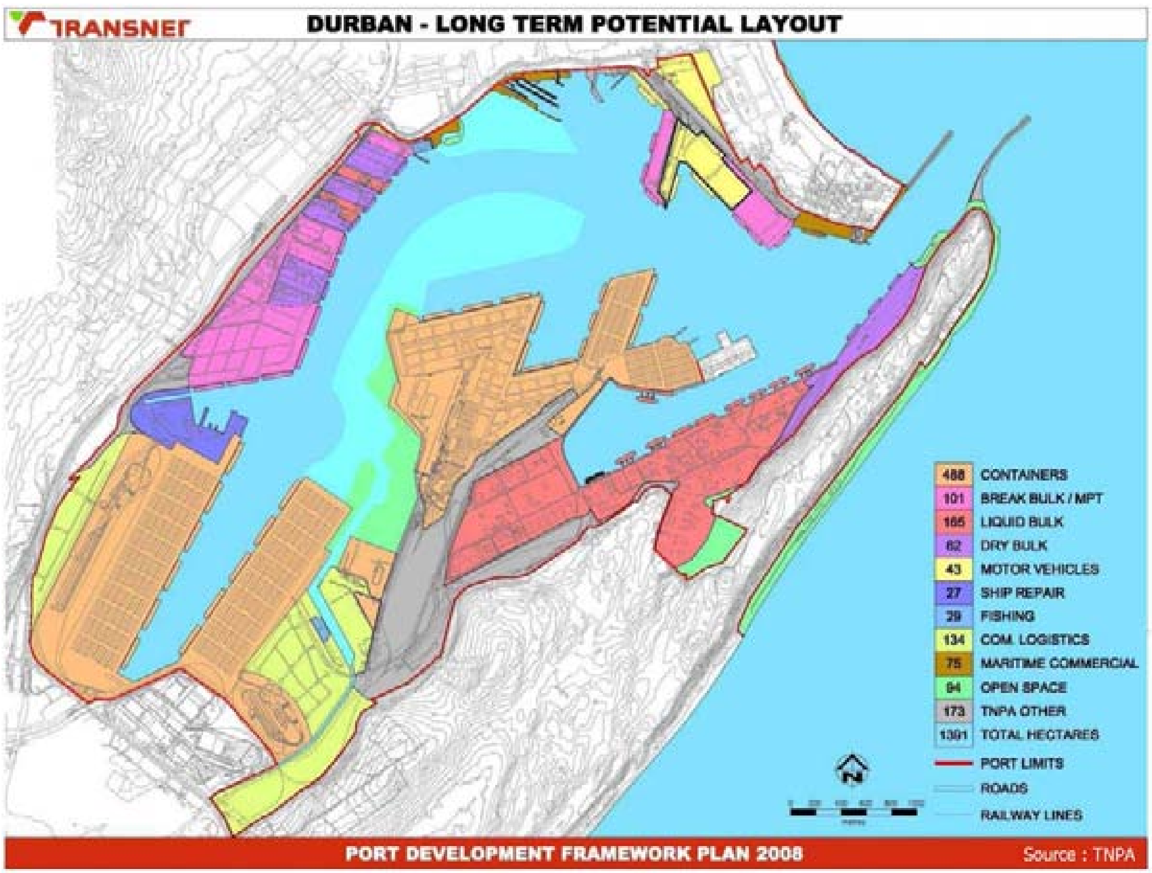
Liquid bulk terminal: The extent of long term requirements for liquid berths and associated tank farm will be informed by the Richards Bay IDZ projects and other industrial developments in the city and its catchment areas.

Container handling terminal: The forecasts in the National Infrastructure Plan has made no provision for a dedicated container terminal at Richards Bay on the assumption that expansion in Durban will be adequate to meet long term regional needs, and that the introduction of a hub strategy will mitigate against the development of significant new container handling capacity at Richards Bay.

The 10 berths, as shown in the Trasnet's future layout plan at Figure 12 should be considered as a fall back position if there are some obstacles in expanding container facilities at the Port of Durban and elsewhere in Durban.

Ship building and repair facilities: Transnet has proposed a facility with a dry-dock capability of handling very large crude carriers and other large vessels while the existing ship yard in Durban will be down-sized to make room for other developments. A site to the east of the break bulk terminal has been earmarked for that purpose.

Port of Durban: Long Term Developments



Source Transnet National Infrastructure Plan June 2009

Figure 7.6.O: Port of Durban: Long Term Potential

Impact on Capacity

The Transnet National Infrastructure Plan makes provision for the long term development of the Bayhead Container Terminal.

This ambitious plan envisages the expansion of the Port into the Bayhead area, currently occupied by the Transnet Rail Freight Durban Marshalling Yard, and various other Transnet facilities. At its fullest development, as shown on the **Figure 7.6.M,** allowing 10 new berths, a total 3500 metres of quay, and adopting the usual norm of 1215 TEU's/metre/annum, will result in a terminal capacity of 4 252 500 TEU's per annum. However, a modern, 5 berth contiguous berth terminal should be able to achieve at least 1500 TEU's/metre/annum, with the resultant capacity of 5 250 000 TEU's per annum. We will see, however, that the development of a terminal of this capacity is unlikely.

However, implementation of this development would require approval in terms of the Environment Conservation Act, 1989. In terms of the Record of Decision for a four phased development in the port issued by the Department of Environmental Affairs and Tourism in 1999, the dredging of the central banks was specifically prohibited.

In order to develop the Bayhead Container Terminal it is imperative to dredge a significant portion of the central banks in order to create a navigation channel to access the Terminal by vessels much larger than routinely traverse the Esplanade, Maydon and Maydon Wharf channels presently. The development would also impact significantly on the Bayhead Natural Heritage Site. It is therefore improbable that the Record of Decision will be reversed in favour of this proposal.

Comment on the Transnet rationale of developments

Bayhead Container Terminal

Other than the implications of the Record of Decision issued in terms of the Environment Conservation Act, 1989 mentioned above, of addition concern regarding the Transnet National Infrastructure Plan proposal for the Bayhead Container Terminal layout is the almost total disregard of the two rivers that discharge into the Bay at this point, and the potential consequences of not making provision to trap sediments brought down by these rivers before they enter the navigation channels and basins.

The two rivers, the Mhlatuzana and Umbilo Rivers, are canalized and combine some 800 metres before they enter the Bay waters, discharging into to artificially created Silt Channel. The purpose of the Silt Channel, as the name implies, is to trap the silt load washed down by the rivers before it enters the main navigation channels of the Port. During two flood events that occurred within months of one another in the late 1980s, the rivers deposited 800 000 cubic metres of silt into the Silt Channel, virtually filling it to its capacity, but fortunately not impacting on the main Maydon Wharf navigation channel. Fishing vessels berthed at the Fish Landing Wharf, and recreational vessels were trapped in the upper reaches of the Silt Channel for many frustrating months, before a shallow, narrow emergency channel was dredged to allow them to escape. The accumulated silt took the Port Authority ten years to remove.

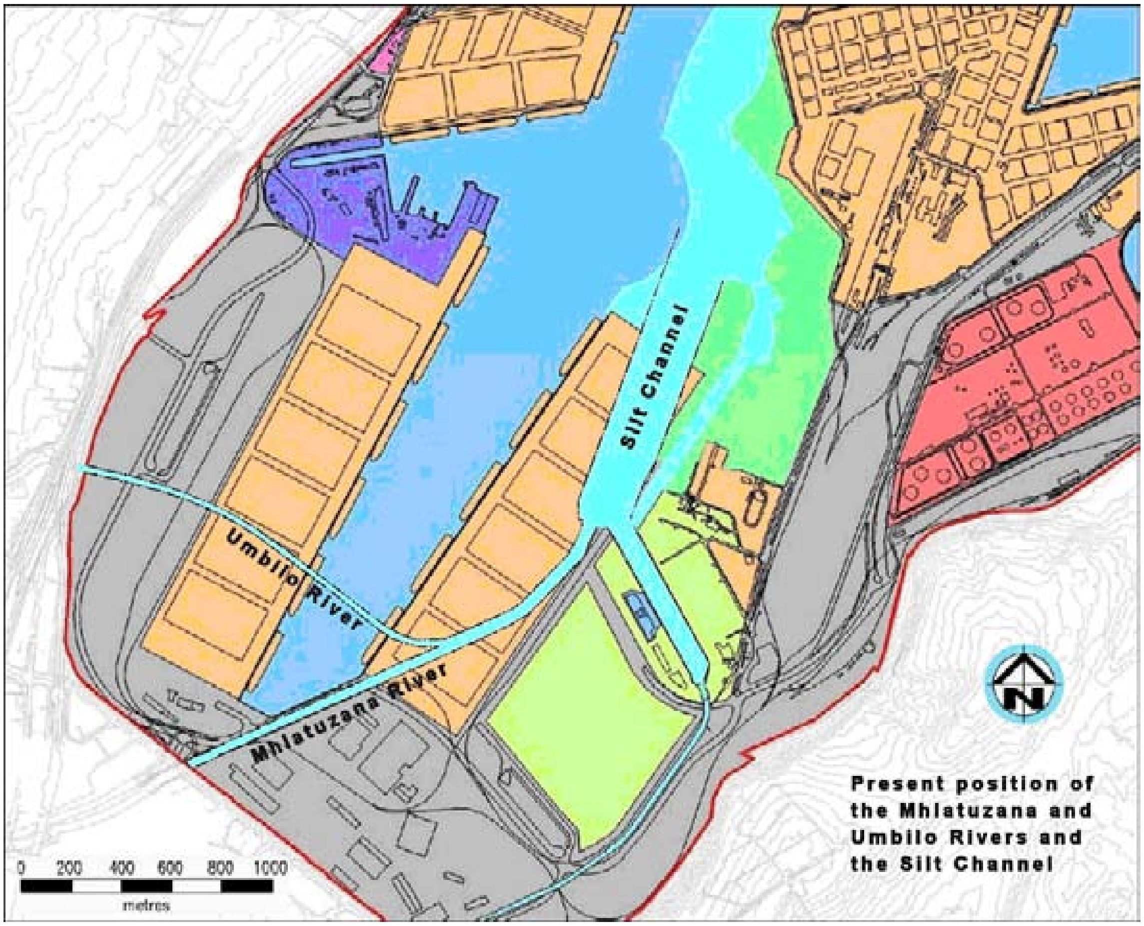


Figure 7.6.P: Port of Durban: Bayhead

As will be seen in **Figure 7.6.P**, where the positions of the two rivers and the Silt Channel have been superimposed on an extract of the Transnet National Infrastructure Plan Bayhead Container Terminal Layout, the presence of the canalized rivers have not been acknowledged. A splay at the southern end of the basin is aligned to the Mhlatuzana River canal; however, the canal would seem to pass under the South Eastern terminal stacks. From visual observations of the flood level experienced in the flood events mentioned above, decking over the canal would not be feasible without causing a throttle to the canal with disastrous consequences of flooding upstream.

Furthermore, the Layout, whilst acknowledging the need for a silt trap, has made woefully inadequate provision for the potential silt deposition of a significant flood event.

It is therefore the opinion that at most a 3 berth terminal could be achieved on the western side of the Basin, and to accommodate a comparable Silt Channel trap, a compromised 4 berth terminal could be achieved on the eastern side of the Basin.
The expected throughput of this terminal would be between 3 and 3,5 million TEU's per annum. This Layout is depicted in **Figure 7.6.Q**.

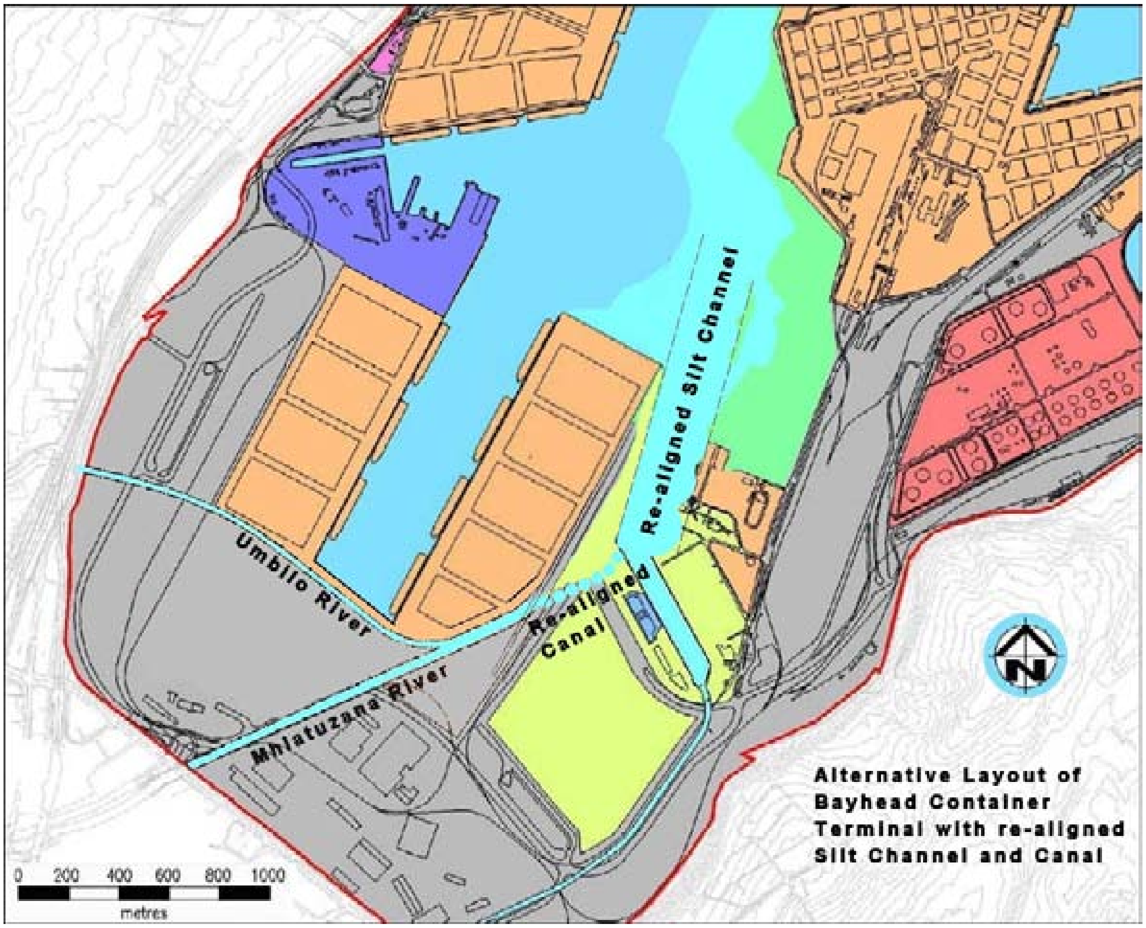


Figure 7.6.Q: Alternative Layout for the Bayhead Container Terminal

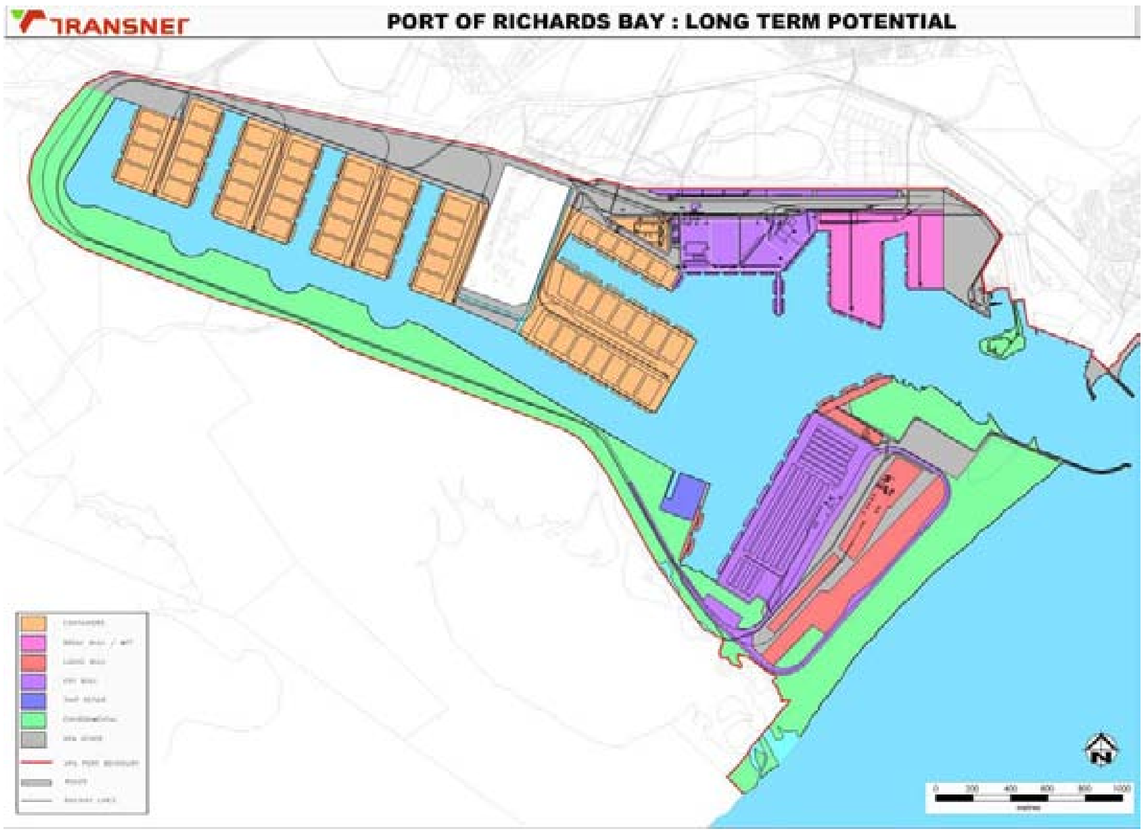
Of secondary concern is the lengthy navigation route from the Entrance Channel to the Bayhead Container Terminal, a distance of some 7 nautical miles. Assuming an optimistic average transit speed of 7 knots, the transit time in the largely uni-directional navigation channels will be one hour. Although simulation studies have not been undertaken to evaluate whether the channels could cope with the Bayhead Container Terminal and Maydon Wharf traffic, simple analysis would suggest that the 10 berth Container Terminal would burden the route unreasonably.

Thirdly, the Layout shows a significant reduction in the area allocated to ship repair and ship building in the Port of Durban. This industry provides an invaluable service to the vessels that trade in the Port, not to mention the foreign exchange earned by the Country in providing this service.

The proposed Bayhead Container Terminal requires far more technical evaluation than is visible on the Layout drawing. The impact of the proposal will be subject to the scrutiny of the Environmental process, and the requirement to widen and deepen the Esplanade, Maydon and Maydon Wharf Channels, thereby impacting on the Central Sandbanks, is likely to receive stiff opposition.

Project J, Expansion of the Point Car Terminal: The expansion of the Car Terminal will only be feasible if beak-bulk cargo volumes permit taking over an additional berth. The concurrence of the Ethekwini Municipality will be necessary for this expansion as it will entail additional vehicles transiting the already congested inner City road network.

Port of Richards Bay: Long Term Developments



Source Transnet National Infrastructure Plan February 2008

Figure 7.6.R: Port of Richards Bay: Long Term Potential

Impact on capacity:

Container Terminal: In the long term, the only major multi stage development envisaged is an additional 33 berths with a capacity of 14m teu.

Comment on the Transnet rationale of developments:

Long term container terminal will be located on the far north western side of the port which is presently underdeveloped and may be constructed around the Billiton Bayside smelter if it is not decommissioned beforehand. But in any case since the forecast did not allow for such expansion at Richards Bay, a study to determine preferred option between Durban (Bayhead area or Durban Airport dig-out site) and Richards Bay has to be carried out.

7.6.3.3 Additional Upgrade Requirements to 2050

Port of Durban

Container Handling Capacity

It has been assessed that the capacity of the Port of Durban when the DCT Upgrade has been completed in 2012, will be 4,4 million TEU's per annum, which throughput will not be reached until 2021. After that date, additional container handling facilities will be required, and included in the Transnet National Infrastructure Plan and are evaluated above, and under "Additional Ports" under. The infrastructural developments are illustrated graphically below, in two scenarios, although the sequence could be re-arranged. The potential capacity for the Port of Durban, including the proposed Durban South port, is 19,1 million TEU's per annum, which throughput is not forecast within the planning horizon.

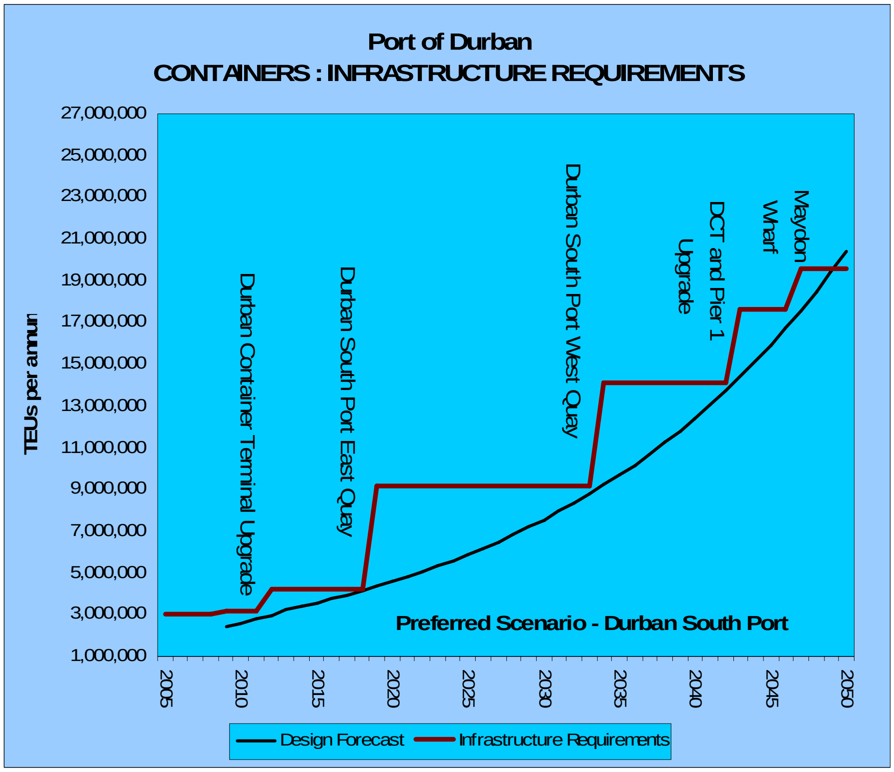


Figure 7.6.S: Port of Durban: Strategies to satisfy demand for Container Handling – Preferred Scenario – Durban South Port

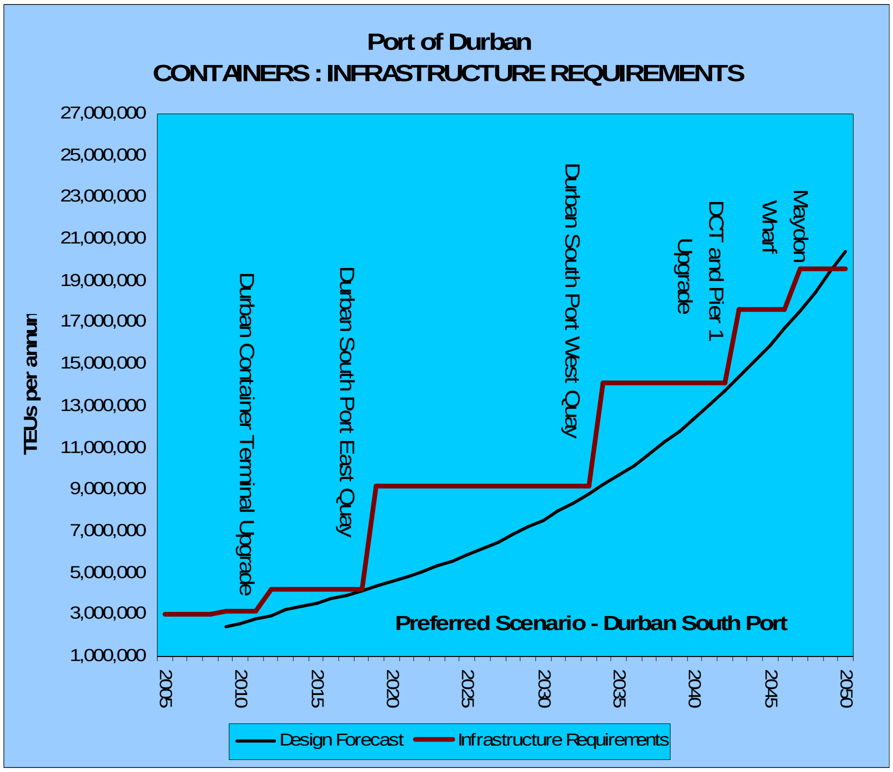


Figure 7.6.T: Port of Durban: Strategies to satisfy demand for Container Handling – Alternative Scenario – Bayhead Terminal

Dry Bulk Cargo

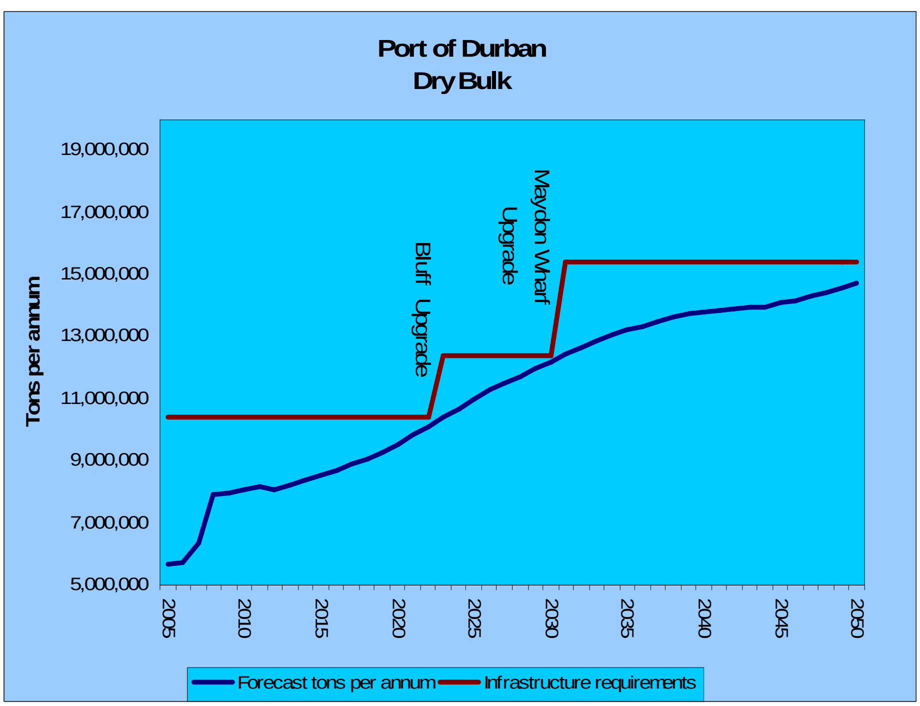


Figure 7.6.U: Port of Durban: Strategies to satisfy demand for Dry Bulk Cargo

Although the Port of Durban is not a primary dry bulk port, it nevertheless handles significant volumes of dry bulk, principally through facilities at the Bluff (Bulk Connections), Island View (Durban Bulk Shipping) and Maydon Wharf (Rennies Bulk Terminal, Agriport, Tate and Lyle, SA Sugar Terminal and Brunnermond).

Whilst indications are that current capacity will be exceeded in 2028, handling equipment upgrades, deeper draft vessel capability and general modernisation of the existing facilities should be quite capable of taking up the additional demand, without requiring additional berth space, for the duration of the forecast period.

However, it should be a principal to divert any major demands for dry bulk cargoes to the Port of Richards Bay, which is specifically focused on handling this class of cargo.

Bulk Liquid Cargo

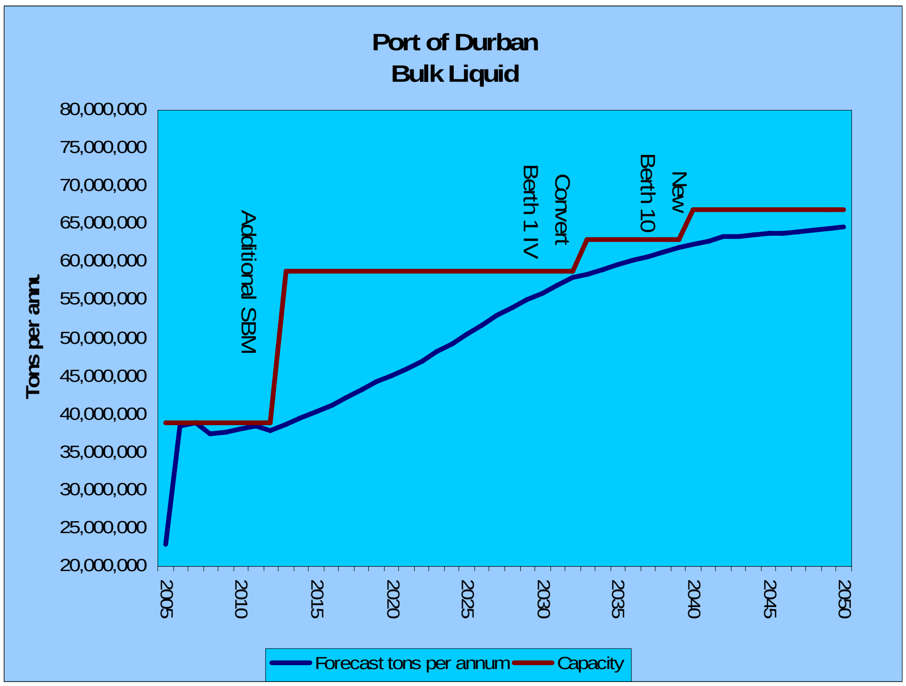


Figure 7.6.V: Port of Durban: Strategies to satisfy demand for Bulk Liquid Cargo

The forecast of bulk liquid cargo handling is significantly influenced by the petroleum industry, and strategies adopted by this industry, and indeed the continued reliance on this form of energy in the future. The various scenarios are not explored in this study, instead a scenario of the most likely maximum demand for bulk liquid cargo is adopted.

As mentioned in 7.6.2 above, the Port of Durban, including the Single Buoy Mooring, currently has a capacity to handle 38,9 million tons per annum of liquid bulk cargo per annum , a tonnage expected to be reached by 2013.

If the SBM is unable to cater for demands of crude oil imports (i.e. if additional refinery capacity is built in Durban) then either the Durban South Port will have been built, which makes provision for tankers currently serviced by the SBM to be brought into the port, or a second SBM could be installed offshore.

In either instance, there would be a need for additional shore-side tank storage, although this need not be in the immediate port precinct.

Additional capacity will ultimately be required in the Port to cater for the growth of bulk liquid chemicals, and refined petroleum product imports and exports. Conversion of the lay-by and bunker berth, Berth 1 Island View, and the creation of a new berth on the north western shore of the Island View basin, will satisfy this demand, however, a rationalisation of the tank storage facilities will be required to provide shore-side storage.

Break Bulk

Indications are that break bulk cargo will fall to a level of approximately 2 million tons per annum, whilst capacity of the port is 7.7 million tons. This spare capacity will be reallocated to other cargo types, principally for containers in the Maydon Wharf area.

No additional infrastructure is required, although upgrading/replacement or refurbishing of the existing dated infrastructure will be required.

Motor Vehicle Handling

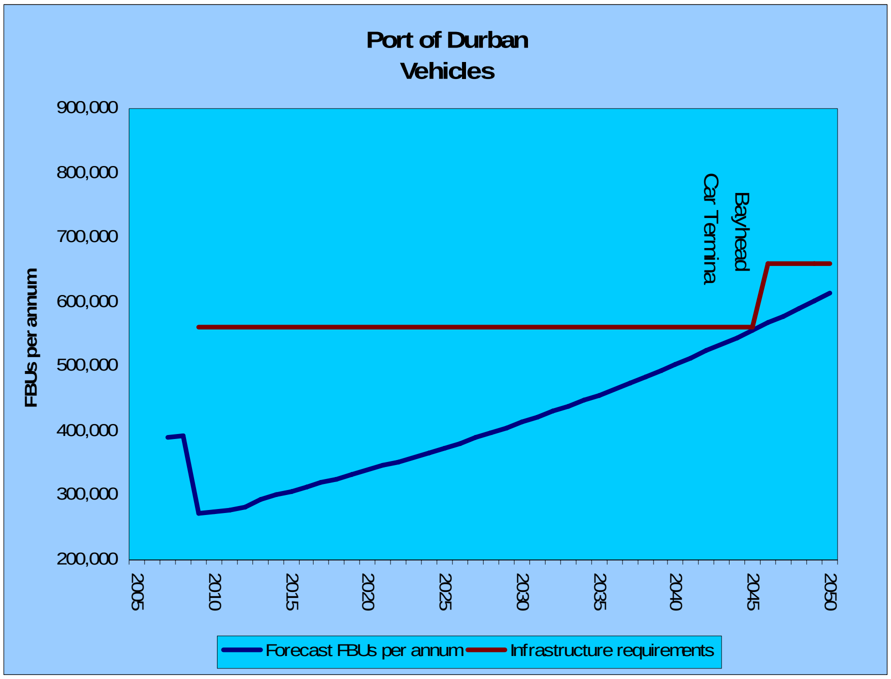


Figure 7.6.W: Port of Durban: Strategies to satisfy demand for Motor Vehicle Handling

The capacity of a port to handle built-up vehicles is largely dependent on the number of shore-side parking bays available, rather than berth space, as vessels are loaded and unloaded rapidly, provided there are sufficient drivers available. The 14 000 bays currently available in the Port of Durban are largely ground-level quayside parking, which is not space efficient. The capacity of the port and be increased by the erection of multi-storey parking garages over the current single level bays.

In the provision of additional container handling facilities, either at Bayhead or at Durban South port, facilities can be made to handle motor vehicles, more conveniently located nearer to the Toyota factory.

General comment on the future utilisation of the Port of Durban

It is common knowledge that Port of Durban has become strangled by the surrounding city in terms of its expansion and in its access routes. In particular The Point area relies on roads which traverse the inner core of the city, and a railway line which traverses a strategic corridor which effectively cuts the Bay off from the city, and is a serious impediment to the development of a highly desirable City/Bay waterfront. It is expected that the Ethekwini Municipality will increase lobbying for removal of freight operations from The Point, and the consequently the need for the Esplanade rail line.
Road access to the western area of the port is also a key requirement for the efficient operation of the Port of Durban. This will be achieved by a Link road from Bayhead Road or

the southern basin, linking to the N2 Highway, and onwards via an arterial road termed the Umhlathtuzana Arterial, as depicted in the figure below.

Although the recent construction of the Edwin Swales Link Road and the Khangela Bridge has provided vital relief to congestion on roads serving the port's container depot in the short to medium term, studies show that congestion will become problematic from 2015 onwards. This will become a bottleneck to the movement of containers through this area.

Traffic prediction models show that some intersections on both Bayhead Road and Edwin Swales will be operating at level of service F during the 2016 AM peak hour, even if 43% of the containers are on rail by that stage. The modelling results reveal that focusing access into the port via Edwin Swales and the Bayhead Road / Khangela Bridge system creates substantial congestion on the local road network around the port. There is therefore a need for an additional access route into the port, and it has been proposed that this should be a route exclusively for freight vehicles.

Expansion of the container facilities in the Durban port cannot be considered without addressing the road capacity limitations in the greater metropolitan area.

One proposal is for the construction of the Umhlatuzana Arterial between the southern entrance to the container terminal and Paradise Valley on the N3, as depicted in the figure below. However, the section from the N2 crossing through to Paradise Valley traverses rugged topography in environmentally sensitive areas and construction costs would be extremely high.

Figure 7.6.X: Future access road to the Port of Durban

Alternatives would be to Construct the portion of the Umhlatuzana arterial between the Durban container terminal and the N2 and then:

- Carry out major capacity improvements on the M7 up to the interchange at the N3.
- Upgrade the M35 and R603 between the Durban International Airport (DIA) site and the N3 at Umlaas Road.

The need and feasibility of providing such access roads is the subject of a joint commission by eThekwini Transport Authority and Transnet Ltd, undertaken by consulting engineers Arup Transport Planning.

A further issue of concern to the Ethekwini Municipality is the presence of hazardous bulk liquids stored in the Island View and Fynnland area of the port, adjacent to substantial urban housing. Several fires in the tank-farms recently have focused attention on this unsatisfactory situation, and in addition much of the region's fuel distribution road tankers emanate from this area and are obliged to traverse urban road infrastructure not designed to accommodate this traffic. Ideally, the bulk liquid cargo handling should be relocated out of the urban area to a site where adequate buffer separation between port and human settlement could be more clearly separated. The Durban South Port could serve such goals.

Port of Richards Bay

Coal Terminal

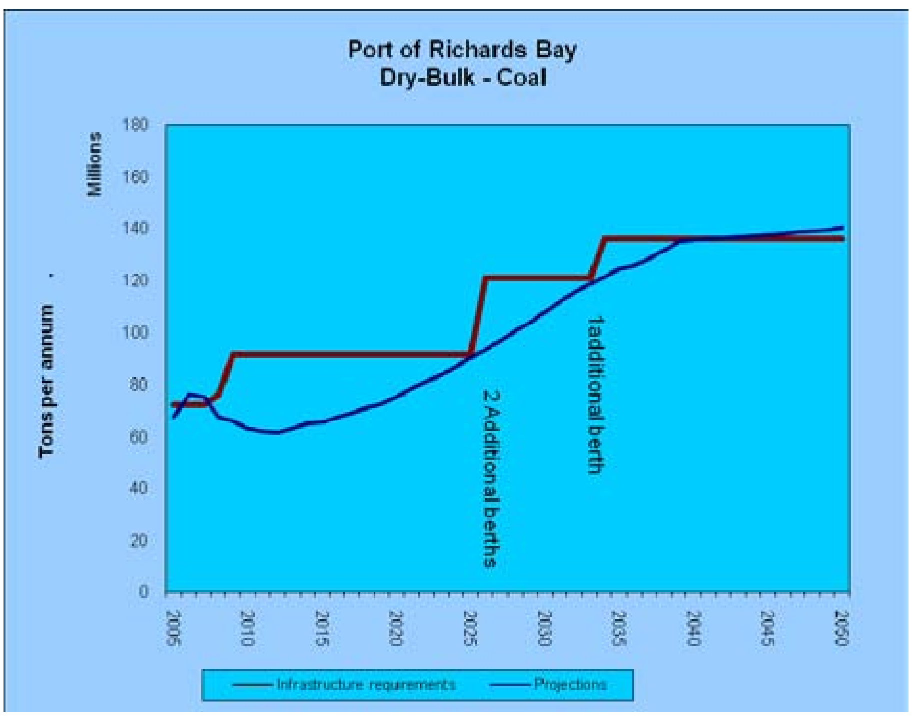


Figure 7.6.Y: Port of Richards Bay: Strategies to satisfy demand for Coal Dry Bulk Cargo

Non-Coal Dry Bulk Cargo

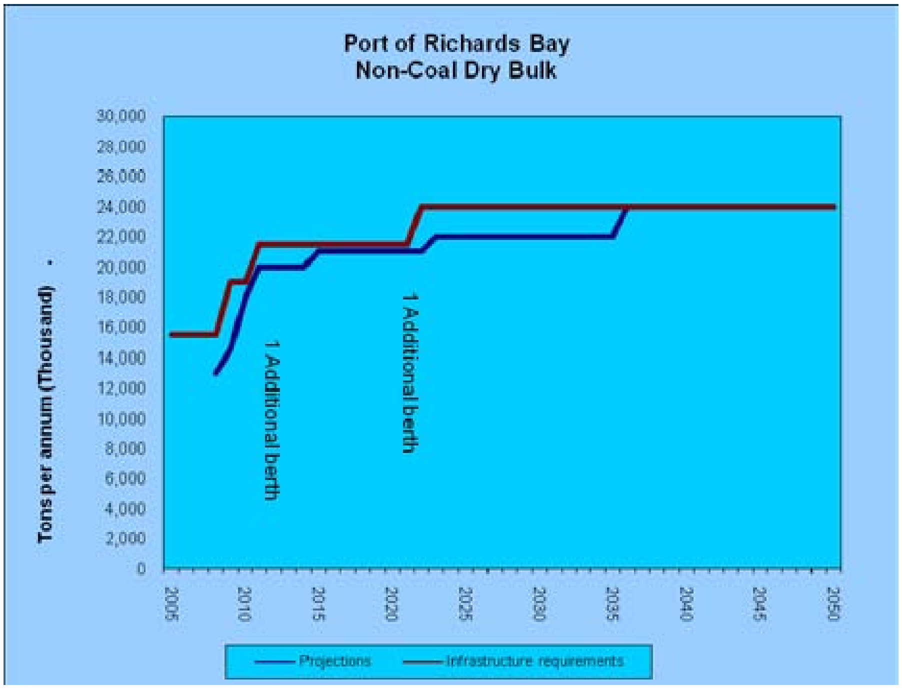


Figure 7.6.Z: Port of Richards Bay: Strategies to satisfy demand for Non-Coal Dry Bulk Cargo

Break-Bulk Cargo

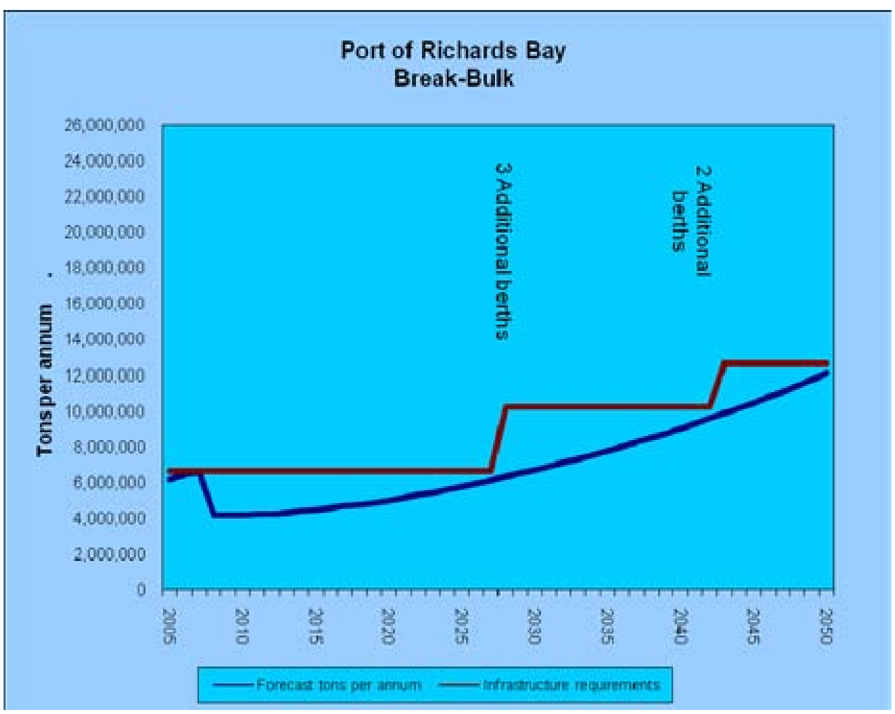


Figure 7.6.AA: Port of Richards Bay: Strategies to satisfy demand for Break Bulk Cargo

Bulk Liquid Cargo

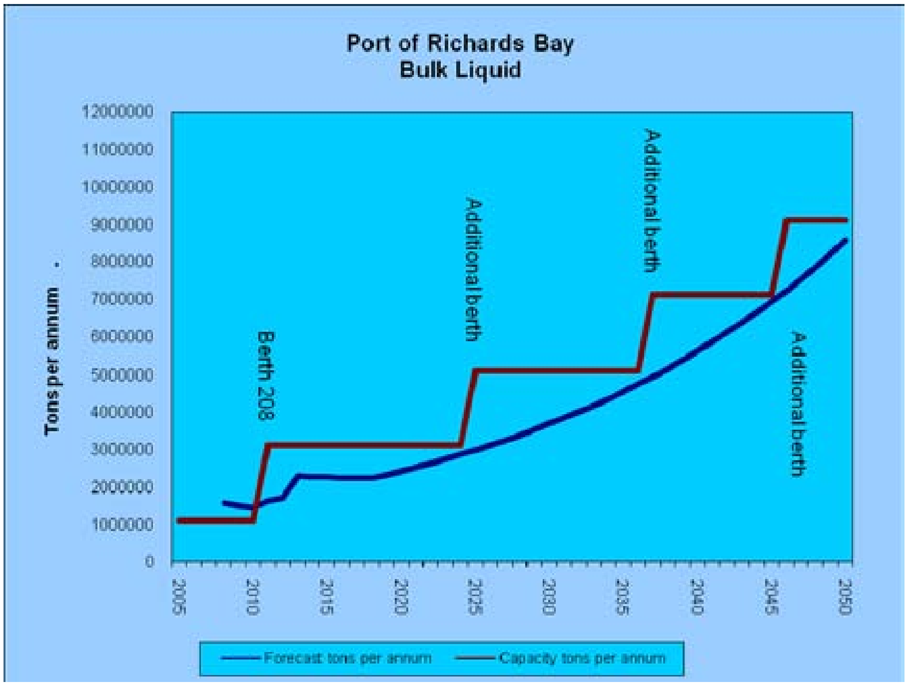


Figure 7.6.BB: Port of Richards Bay: Strategies to satisfy demand for Bulk Liquid Cargo

General comment on the future utilisation o Port of Richards Bay

In the short to medium term, the port will reach its fullest potential in terms of handling dry bulk and break bulk traffic and in the long term coal exports which accounts for 75% of all cargo through the port is likely to decline.

One major issue which will continue to be debated upon is the long term utilisation of the port with particular reference to the provision of dedicated container facilities having regard to policy and strategic issues articulated by Transnet and the government as well as projected industrial developments in and around Richards Bay including the Richards Bay IDZ initiative. Although the likely site for such facilities is the area to the west of the non-coal dry bulk terminals in the Bayside and Kabbeljou areas around the Bayside Smelter, container terminal could also be sited at the coal terminal area when coal exports decline but that is timing dependent.

Improved hinterland connectivity is required including a more direct high capacity road to Gauteng.

7.6.4 "Alternative Strategies" – Evaluation of Strategies

7.6.4.1 Addition of Ports

Durban South Port (site of the existing Durban International Airport, Reunion)

Transnet, in their National Infrastructure Plan (February 2008) have proposed the development of the Durban International Airport site at Reunion into a deepwater port, primarily for container handling. The site will become available in 2010 when Durban's airport is relocated to the King Shaka International Airport north of the city at La Mercy.

The site provides a unique opportunity to develop a port within the broad metropolitan city of Durban with its established maritime industry and services, and well established transport links with the interior.

It is understood that Transnet had withdrawn its offer to purchase the site from the Airports Company of South Africa. As this is a transaction between two state enterprises it is strongly recommended that reason should prevail in the greater interests of South Africa that this unique opportunity is not lost.

The development of the existing Port of Durban is extremely limited due to the throttling effect of the surrounding city, and the proposal made to expand into the Bayhead area is far from certain due to the limitations mentioned above, and the uncertainty of obtaining a favourable environmental assessment decision.

Source Transnet National Infrastructure Plan February 2008

Figure 7.6.CC: Port of Durban South: Long Term Potential

The proposed port layout, as depicted in the Transnet proposal above, could result in the provision of a sixteen-berth, state of the art, eight-berth contiguous, terminal. The capacity of this terminal should be able to match any similar terminal in the world, and handle up to 9,5 million TEU's per annum when fully developed.

In addition, should the vehicle market continue to expand, a four berth vehicle terminal could be established, in very close proximity to the Toyota factory in nearby Reunion. Due to this ease of access, export vehicles could be held on the factory site for direct delivery on a dedicated route to the quayside. Provided sufficient shore-side storage garages were provided, this terminal could handle between 750 000 and 1 million fbu's (fully built-up units) per year.

The port could also include for the provision of a three berth bulk liquid terminal to serve the adjacent Engen and SAPREF oil refineries. This will effectively replace the single buoy mooring (SBM) facility currently in use off shore, with greater operational security, and significant reduction in oil spill environmental risk. Potentially this terminal could handle in excess of 75 million tons of bulk liquids per annum.

This port is not without some challenges. Whilst rail connectivity to the Durban – Gauteng line is relatively straight forward, the addition road traffic that such a development would bring with it would severely strain the existing road network. Consideration would need to be given to an alternative route through the greater Ethekwini Metro area to the hinterland. This could be in the form of a dedicated road freight route, as is found in the City of Colombo in Sri Lanka, or a general purpose road.

Dry Port, Inland KwaZulu Natal

Due to the considerable congestion experienced of the roads presently in the greater city area, which will be compounded as traffic volumes increase, consideration should be afforded to the creation of a "Dry Port" in the interior of KwaZulu Natal, possibly at Cato Ridge.

The intention would be that all import containers not destined for delivery in the immediate locality of Durban, would be transferred directly from the quay side to a shuttle train for rapid transfer to the Dry Port, where they would be taken into stacks awaiting upliftment by road hauliers, or onward transport by rail. Similarly, although not as streamlined, export containers would be delivered to the Dry Port, and then be despatched by the shuttle train to the quay side stacks when they opened to receive containers.

It is recommended that this opportunity be fully investigated.

7.6.4.2 Maintenance of Port Infrastructure

The condition of port infrastructure was undertaken on behalf of Transnet Projects as part of their Eastern Ports Rail Corridor Study by Prestedge Retief Dresner Wijnberg (Pty) Ltd, entitled "PORT OF DURBAN STATUS QUO REPORT, 467/01/009 REV 01, JUNE 2007", and "PORT OF RICHARDS BAY, STATUS QUO REPORT, 467/02/002 REV 01, JUNE 2007"

Transnet will presumably plan to address those areas identified as requiring maintenance, and to make the necessary funding available to undertake that maintenance.

Port of Durban

As was mentioned above, several berths at Maydon Wharf and at Island View are severely compromised and require urgent replacement. Due to its poor condition, and in the light of a partial collapse of the berth in the 1990's, Island View Berth 5 has had to be closed to traffic, and requires urgent replacement.

By and large the port is in a reasonable state of repair, although recent cut-backs in the maintenance budget are impacting on the general condition of the infrastructure.

Port of Richards Bay

The port which is only 33 years old with low occupancy rate at many of its terminals requires only a few substantial repairs.

Major repairs identified include rebuilding of the pile-head caps beneath Berth 209 at the liquid bulk terminal and rebuilding of the berth mooring structures at the Reclaim Berth.

7.6.4.3 Summary and Recommended Strategies

Port Of Durban

a) In the light of the implication of Record of Decision for a four phased development in the port issued by the Department of Environmental Affairs and Tourism in 1999, a focused study needs to be undertaken to ascertain the options available for the expansion of container facilities in Durban. This must include full environmental impact assessments of both the Bayhead and Durban South Port options.
b) The proposed Bayhead Container Terminal should be re-planned taking into account the river courses and their potential impacts, the impact on the ship repair industry, and the consequential requirement of deepening and widening the access channels. This revised plan should be subject to an Environmental Impact Assessment scrutiny, and a Record of Decision obtained. The economic viability of some restricted development, should such be approved in the Record, will need to be evaluated.
c) The current Durban International Airport site at Reunion, on relocation of the operation to the International Airport at La Mercy, should be reserved for the construction of a new port in the south of Durban.
d) The needs and desirability of a Dry Port, constructed at some location inland of Durban, should be investigated, and if found to be beneficial, a mechanism be established to implement its development.
e) An alternative road access route into the southern basin of Durban should to investigated, and, in the light of predicted road freight traffic, an assessment made of its desirability.

Port of Richards Bay

a) It is considered that in future most of land area requirements at the Port of Richards Bay will be for container facilities (quays, stacking areas, rail and road access) as well as for new access channel and turning basins although the freight demand forecasts appear to assume that most of the existing land and sea transport corridors, and their relative weight, will prevail over the plan period and beyond.
b) The ongoing unitization of break bulk cargo into containers and introduction of dedicated container terminal during the plan period will substantially reduce demand for break bulk berths.
c) Provision of ship building and repair facilities may assume some urgency if the existing services at the Port of Durban are scaled down or terminated.

d) As study reports have pointed out, project planning process should take into account that*.... Large scale changes to Richards Bay will need to be subjected to an extensive environmental approval process. Long term programmes will need to be initiated at an early stage in order to obtain necessary approvals.....*

7.6.5 Identification of Critical Projects

7.6.5.1 List of Critical Projects

Port Of Durban

a) Environmental Impact Assessment of the options for container terminal expansion in Durban.
b) Securing of the current Durban International Airport site as a future seaport.
c) Environmental Impact Assessment for the development of a port on the site of the current Durban International Airport site at Reunion.
d) Redesign of the Bayhead Container Terminal and environmental and economic evaluation thereof.
e) Investigation of, and evaluation of an inland Dry Port to handle container traffic.
f) Investigation of, and evaluation of an alternative road route into the southern basin of Durban.
g) Replacement of certain compromised berths in the Port of Durban

Port of Richards Bay

a) Further consolidation and rationalization of the dry bulk and break-bulk terminals on the northern side of the port.
b) Planning and construction of one additional berth at non-coal dry bulk terminal and at least three break bulk berths.
c) A detailed study of requirements for dedicated container handling facilities.
d) Land acquisition to safeguard long term developments, especially if major extensions at the Port of Durban do not go ahead.

7.6.5.2 Port Related Costs – Typical Unit Rates

It is not feasible to establish unit rates for port development projects due to the many and varied natures of their requirements. Each development needs to be assessed on its needs, the environmental constraints that would apply and a thorough assessment of the likely developments in shipping and land haulage.

7.6.5.3 Project Capital Costs

Port Of Durban

The estimated costs to provide the infrastructure mentioned in the plan above are based on estimates prepared on behalf of Transnet Ltd by their consultant, Prestedge Retief Dresner

Wijnberg (Pty) Ltd, prepared in June 2007, and modified where the extent of the schemes recommended by them have been amended in this report. The costs are present-day day costs at that time, and have not been escalated. The estimates are based on the best information available at the time, but will depend on further extensive geotechnical, hydrographic and shipping trend investigations, culminating in detailed designs and costing.

Table .7.6.H: Port of Durban: Capital Costs

Project Description	Capacity Increase	Project Cost (R millions) June 2007
Property acquisition		
Acquire Durban Airport Site from ACSA		
Containers		
Durban South Port Phase 1 and 2	2,170,000 TEUs	R 23,328
Durban South Port Phase 3	1,280,000 TEUs	R 6,679
Durban South Port – Phase 1	1,280,000 TEUs	R 5,231
Durban South Port -Phase 2	1,280,000 TEUs	R 5,231
Durban South Port -Phase 3	850,000 TEUs	R 3,103
Bayhead – Phase 1	2,170,000 TEUs	R 20,655
Bayhead – Phase 2	1,060,000 TEUs	R 5,105
Vehicles		
Durban South Port: Car Terminal Phase 1	980,000 FBUs	R 4,316
Durban South Port: Car Terminal Phase 2	650,000 FBUs	R 1,983
Durban South Port: Car Terminal Phase 3 & 4	660,000 FBUs	R 1,983
Bulk Liquid		
Upgrade Island View Berths	6,000,000 tons	R 550
Durban South Port: Liquid-bulk – Phase 1	10,000,000 tons	R 138
Durban South Port: Liquid-bulk – Phase 2	10,000,000 tons	R 138
Basic Infrastructure		
Maydon Wharf Berth Deepening	-	R 1,650
Road and Rail Upgrades	**-**	**R 2,623**

Port of Richards Bay

Table .7.6.I: Port of Richards Bay: Capital costs

Project Description	Capacity	Project Cost, (R millions) June 2007
Non-Coal Dry Bulk Terminal		
Extension of Finger Jetty - Phase 1a	2 mt	R1,750
Finger Jetty - Commission 2nd Berth	2 mt	R647
Break Bulk Terminal		
Phase 1	3.8	R1,686
Extension of Berth 708 by 105m		R154
Phase 2	1.9	R843
Phase 3	2.9	R1,264
Phase 4	3.8	R1,686
Bulk Liquid Terminal		
3 Berths	6 mt	R414
Basic Infrastructure: Road and Rail Upgrades	-	R1,376
Container Terminal (See Note)		
10 Berths, Phase Construction	4.25 mTEU	R24,916
Basic Infrastructure: Road and Rail Upgrades	-	R2,293

Note:

1) Break bulk terminal: Ongoing improvements in efficiency may require less investment at each phase.
2) Bulk liquid terminal: Berth 208 to be commissioned in April 2010 is not included.
3) Container terminal: Development of new dedicated container facilities in Richards Bay and further major extension of the ones in Durban are mutually exclusive since the freight demand model did not forecast such facilities at both ports. The above is an estimated cost of 10 berths in case some of the proposed developments in Durban do not go ahead.

7.7 PIPELINES

7.7.1 Summary of Pipelines

Transnet Pipelines (TPL) currently operates all of the pipelines which begin or terminate in KwaZulu Natal. These comprise 3 commodity-specific pipelines as follows:

- The Durban – Sasolburg crude oil pipeline. Length 580 km, design capacity 6.8 bn litres/annum, current capacity 5,2 bn litres/annum
- The Durban – Ladysmith – Kroonstad – Sasolburg multiple products (petrol, diesel and AvTur) pipeline and the inland network. Length 725 km, current capacity 4,3 bn litres/annum

- The Secunda – Volksrust – Empangeni – Durban methane-rich gas pipeline. Length 570 km, current capacity 17 m giga joules/annum

TPL is currently implementing the first phase of the New Multi-Product Pipeline (NMPP) which will provide significant additional refined fuel capacity between Durban and Gauteng:

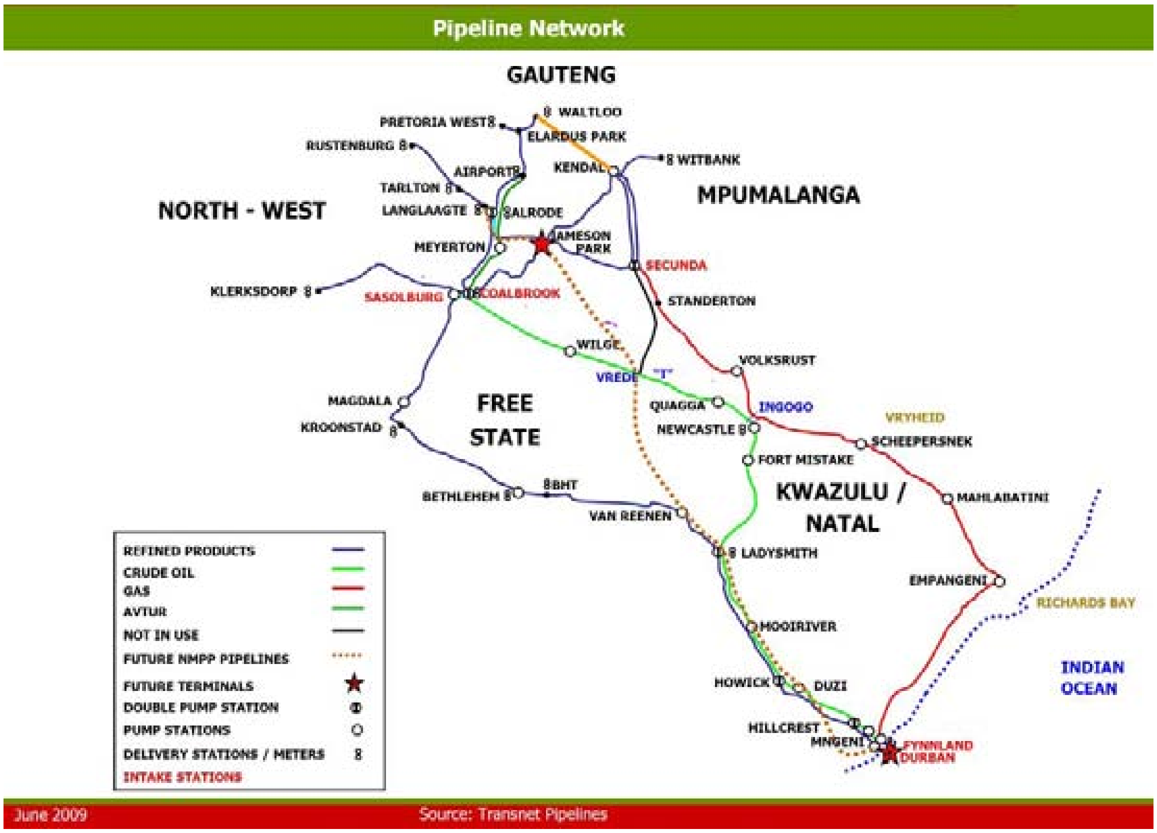


Figure 7.7.A: Transnet Pipelines in KwaZulu Natal

7.7.2 "Current Planning" – Evaluation of Strategy

7.7.2.1 Planning for Future Years

Although demand at the Sasolburg refinery is expected to increase between 2012 and 2014 as a spin-off of upgrades to meet new "clean fuel" specifications the addressable demand will continue to be constrained by refinery rather than pipeline capacity. The refinery is expected to "saturate", i.e.. attain its capacity limit of about 5,6 billion litres pa, in about 2013/14. There are thus at this time no plans to increase the capacity of the crude-oil pipeline as its current capacity of 6,8 billion litres pa is more than sufficient to meet demand.

Inland Crude Oil Demand

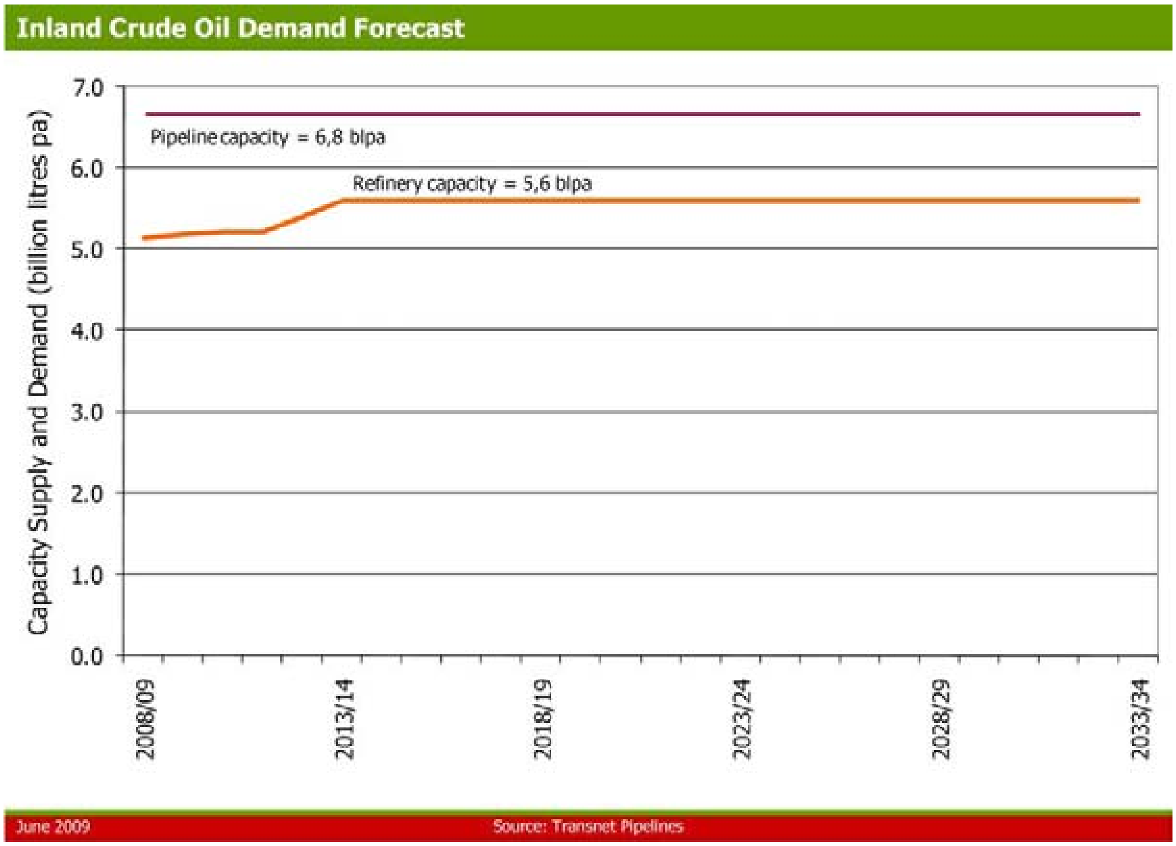


Figure 7.7.B: Inland Crude Oil Demand

Inland Refined Products Demand

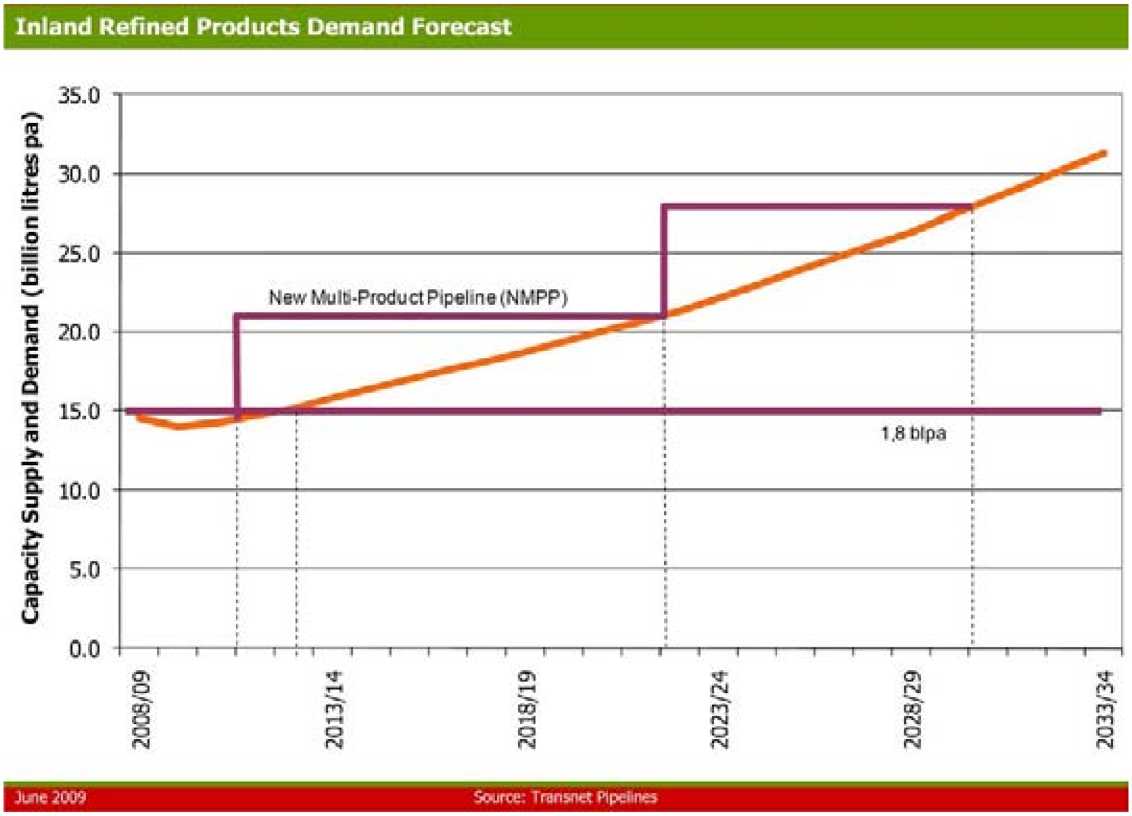


Figure 7.7.C: Inland Refined Products Demand

The demand for refined products to be transferred inland from the refineries in Durban, and discharge of refined products through the Port of Durban has exceeded the pipeline capacity, forced increasing volumes of, especially refined fuels, to be carried by road and rail.

The refined product inland demand doubles in approximately 20 years. Some of this growth will be serviced by expansion and upgrades to the two inland refineries at Natref and Secunda. However, the major portion of this demand will have to be serviced by the New Multi-Product Pipeline (NMPP). The NMPP, with additional phased investments, is capable of addressing the growth in forecast demand for the next 20 years. Future investments in the NMPP will be influenced by economic growth, additional inland refining capacity (another coal-to-liquids plant) and other pipeline (PetroLine) supply to this area.

Gas Pipeline

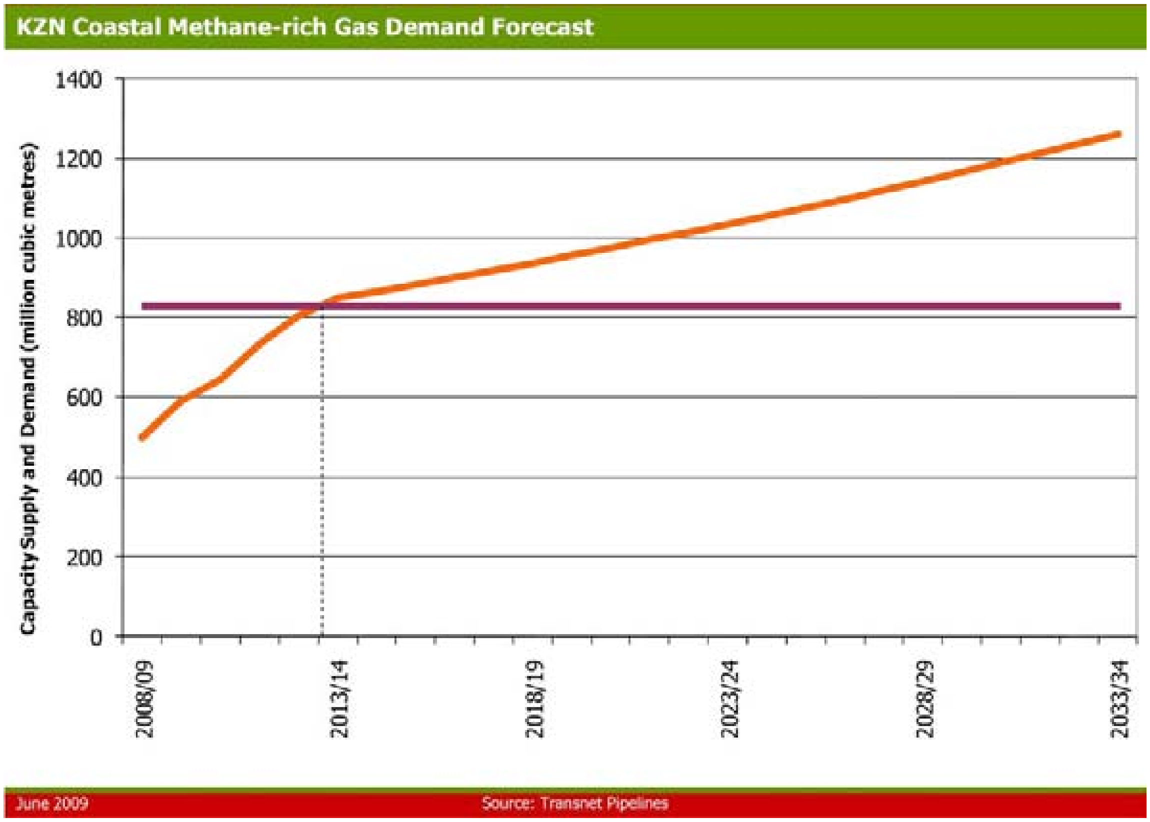


Figure 7.7.D: Methane-rich Gas Pipeline Demand

Currently approximately 74% (17m Giga Joules (GJ)/annum) of the gas pipeline capacity (23m GJ/annum) is utilised. In order to meet the forecast demand the capacity of this pipeline will have to be enhanced at around 2013. Phased expansion of the current pipeline is technically feasible, but capacity-enhancement will inevitably have to be driven by economic feasibility.

THE New Multi-Product Pipeline and the Bridging Plan

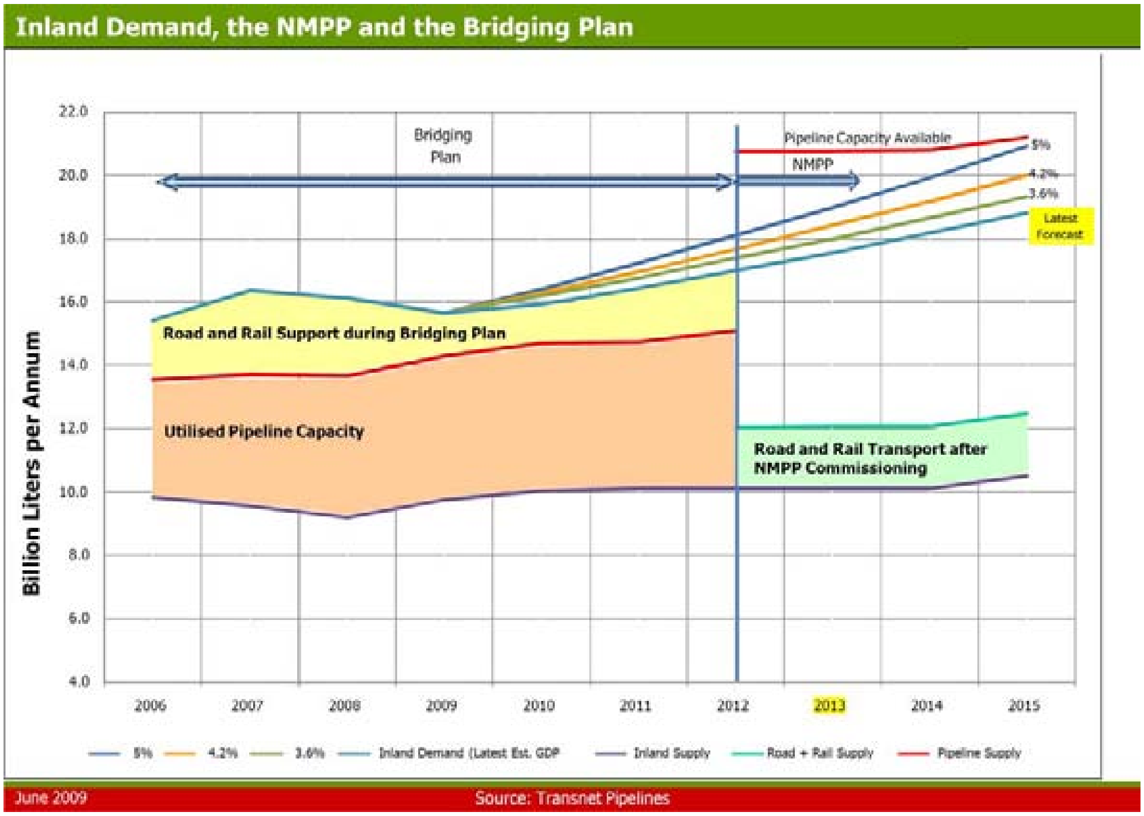


Figure 7.7.E: The NMPP and Bridging Plan

The NMPP will provide an opportunity to recapture at least some of these so-called "slippage" volumes, whilst additionally providing considerable spare capacity to cater for future increases in inland demand. The first phase of the NMPP was intended to be commissioned in 3rd-quarter 2010, but the drop in inland demand, as a consequence of the economic decline of late-2008, has enabled its implementation to be delayed to mid-2012 whilst still catering for the (albeit slower) inland demand growth.

The NMPP has been designed with in-built spare pipeline capacity which will be brought on-stream over time by improving flow rates by additional investments in pumps and pump-stations. Prior to the commissioning of the NMPP, a Bridging Plan has been implemented which will enable Transnet to cater to the interim needs of the inland market.

The Bridging Plan has also enabled fuel transportation to be rationalised between Transnet Freight Rail and Transnet Pipelines, to the benefit of both. For example, the stringent quality specifications of aviation turbine fuel (also known as AvTur or JET) causes the loss of pipeline capacity. Supplying ORTIA by rail rather than via the refined products pipeline, as had been the practice, has enabled additional volumes of other refined fuels to be carried in the pipeline, thereby increasing its carrying capacity without risk to the sustainability of aviation fuel supplies to ORTIA.

Future Pipeline Network

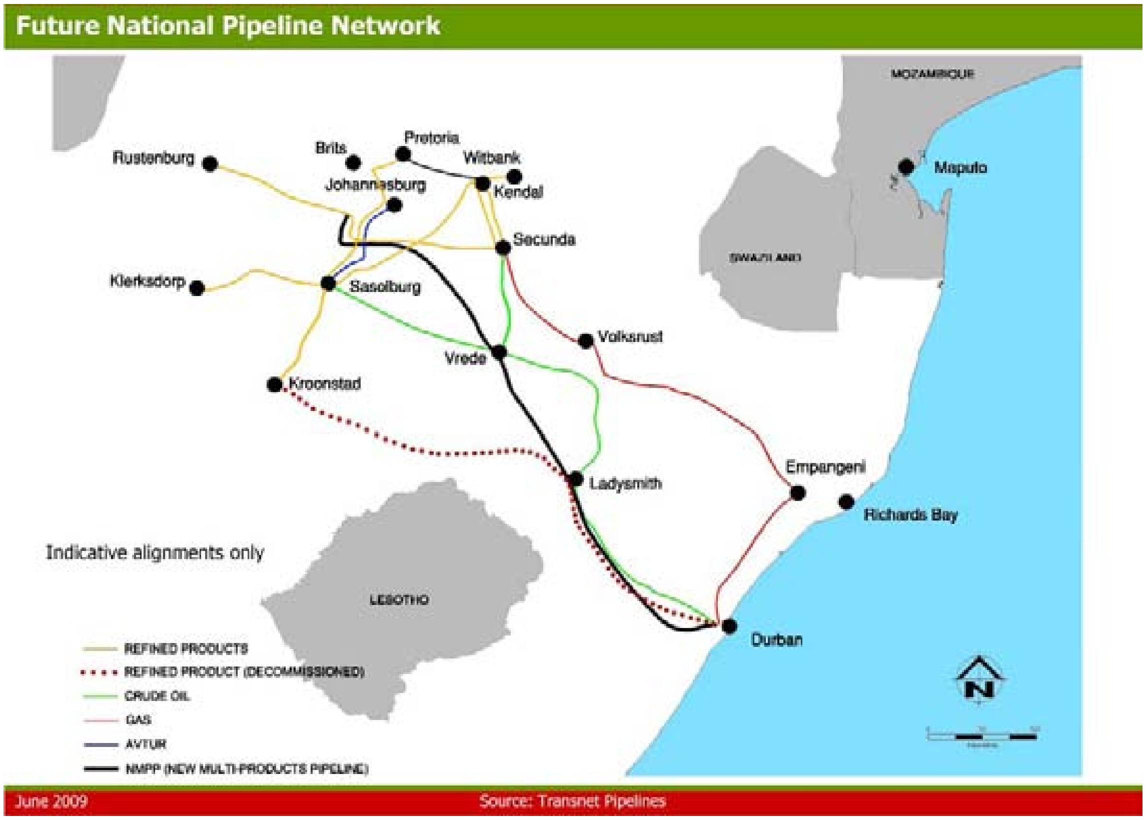


Figure 7.7.F: Future Transnet Pipeline Network

- The black line represents the first phase of the Durban – Ladysmith – Vrede - Johannesburg NMPP. NERSA has awarded Transnet a licence for the construction of the NMPP.

  Construction is well underway and availability of sections will be phased from end 2009. Once the NMPP is commissioned and sustainable, the DJP (Durban Johannesburg Pipeline) will be decommissioned.

  The first phase of the NMPP will increase inland pipeline capacity to 8,5 bn litres/per annum.

Long-term Pipeline Network

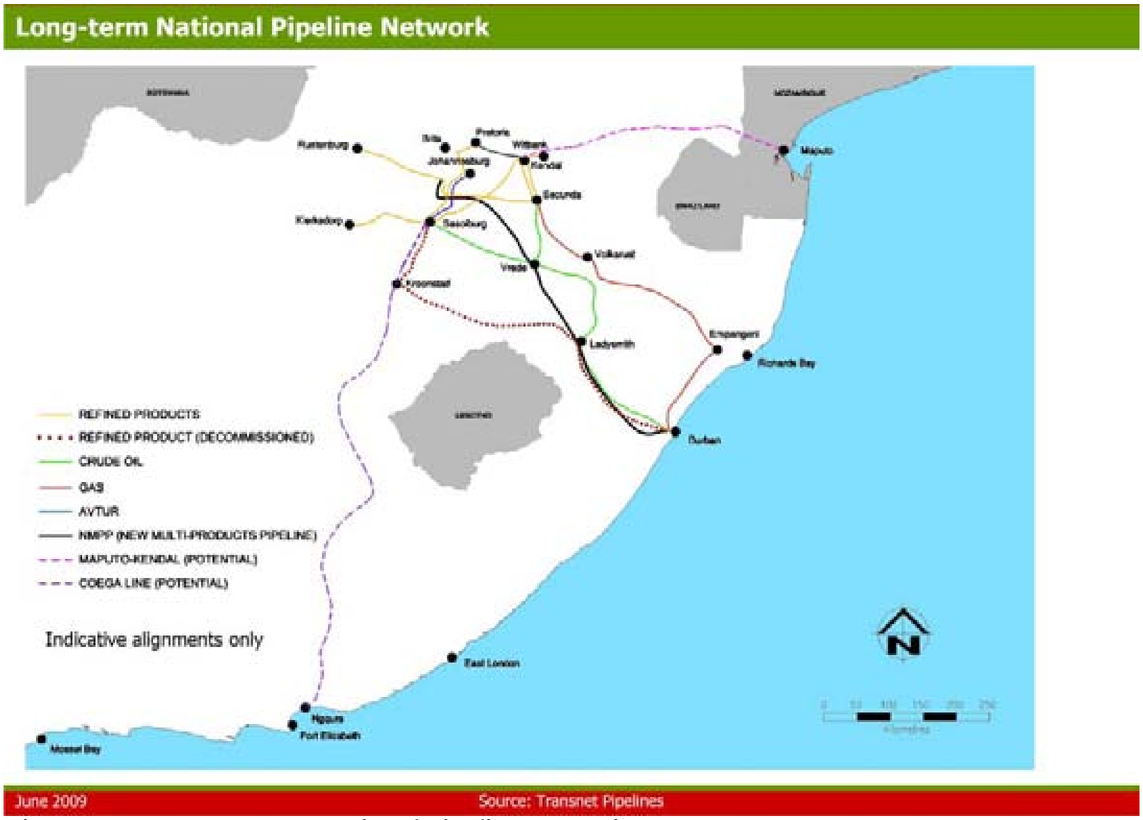


Figure 7.7. G: Long-term national pipeline network

Other potential pipelines are depicted above are as follows:

- The dashed purple line represents the proposed PetroLine pipeline. NERSA has awarded PetroSA a licence to construct a pipeline from Maputo to Kendal. This pipeline was forecast to be commissioned by early 2010. To date there are no construction activities on this pipeline. Its potential capacity is 3,5 bn litres/annum.

- The dashed blue line represents the proposed PetroSA Ngqura – Kroonstad - Sasolburg refined products pipeline, currently under investigation.

  This pipeline will compete for volumes with the NMPP. Transnet has proposed an alternate option which entails shipping product from the refinery to Durban for injection into the NMPP in order to optimise national pipeline investment and also to ensure orderly development of pipelines as prescribed in the Petroleum Pipelines Act.

7.7.2.2 Evaluation of Current Plans

The planned implementation of the Transnet Pipelines NMPP project will satisfy demand for refined oil product transfer from the coast at Durban to the Gauteng Province until approximately 2022. Thereafter capacity can be enhanced by improving flow rates by additional investments in pumps and pump-stations.

However, demand for liquid fuels is integrally bound with the dwindling world supply of oil, and the technological quest to find an alternative energy source.

The same question will heavily influence whether additional refinery capacity is to be built in South Africa. Whilst the intention of PetroSA to build a new refinery at Coega is noted, economic reality and sustainability of such a plant may yet influence the final decision. The siting of a new refinery, if such is indeed justified, should be subject to a comprehensive economic analysis, including the transportation costs to convey the refined products to the end user over the full lifespan of the refinery.

The present-day cost to provide the NMPP between Durban and Gauteng is estimated to be R12.66 billion. The route of a pipeline between the Coega and Gauteng is conservatively one and a half times the length of the NMPP, so construction costs to build such a pipeline would be in the order of R20 billion. This may be compared with the cost to build the Port of Ngqura as it currently stands of R4.5 billion.

Economic reality would seem to indicate that the construction of a new refinery, if such is indeed justified, should be located in Durban, where the spare capacity of the NMPP could be taken up.

7.7.3 Identification of Critical Projects

There are no critical pipeline projects, provided the NMPP is completed as scheduled.

7.8 INTER-MODAL FACILITIES

7.8.1 Summary of Existing Inter-Modal Facilities of National Importance

7.8.1.1 Freight Inter-Modal Facilities

The Intermodal system in KZN is confined to the transport of maritime ISO containers between ports and inland terminals. The rail transport is offered by the monopoly rail operator and the inland terminals and the ports are all managed by Transnet.

There are no inter-modal transfer facilities outside of the ports of Durban and Richards Bay. In terms of air freight, the Dube Trade Port close to the new International Airport at La Mercy is a new facility that is just being commissioned. It will serve the air freight market.

7.8.1.2 Public Transport Inter-Modal Facilities

Public transport inter-modal facilities of national significance, serving inter-regional land transport, are located at the eThekwini CBD train station, and in major towns such as Pietermaritzburg, Margate and Richards Bay.

Land-air intermodal facilities are located at Durban International Airport, the new airport at La Mercy, and the other airports of national significance, such as Pietermaritzburg Airport, Richards Bay Airport and Margate Airport.

7.8.1.3 Freight Inter-Modal Facilities

The fact that the terminal operation is dominated by Transnet means that future planning tends to focus on rail only, and the alleviation of congestion around both ports and the inland terminals, in the road network, is external to the planning process of the terminal operations and is currently in a state of disarray.

The fact that all rail transport is provided by one monopoly operator means that there is no private sector investment in Intermodal transport. In order to create an environment that will encourage the development of intermodal transport, it is necessary to revise the institutional structures and to devise means of making private sector investment and involvement attractive and competitive.

The future constraints on inter-modal transport in South Africa are considered to be a function of the institutional framework. The development of truly intermodal competitive cargo services depends on the ability to negotiate open competitive procedures and the introduction of modern equipment.

It is expected that private sector operators will be unlikely to invest in intermodal services as long as they are faced by a monopoly partner with the current powers accorded to the national transport operator. This limitation on private investment in inter-modal transport means that the road and rail sectors will continue to operate in isolation, in competition, without any attempts at developing what could be effective intermodal services.

There is need for an urgent review as this is a priority, in relation to the total future logistics systems development in South Africa.

<u>Dry Ports and Freight Hubs</u>

Due to the considerable congestion experienced of the roads presently in the greater city area, which will be compounded as traffic volumes increase, consideration should be afforded to the creation of a “Dry Port” in the interior of KwaZulu Natal, possibly at Cato Ridge.

The intention would be that all import containers not destined for delivery in the immediate locality of Durban, would be transferred directly from the quay side to a shuttle train for rapid transfer to the Dry Port, where they would be taken into stacks awaiting upliftment by road hauliers, or onward transport by rail. Similarly, although not as streamlined, export containers would be delivered to the Dry Port, and then be despatched by the shuttle train to the quay side stacks when they opened to receive containers.

Transnet is planning to further develop Freight Hubs and Terminals for Intermodal and Breakbulk freight at Durban MPT, Pietermaritzburg, Richards Bay and New Castle. Car terminals would also be further developed at Isipingo and Point.

The development of the inland terminals in Gauteng, Freestate, Mpumalanga and Limpopo is part of the strategy to attract more freight to rail. Theses developments are incorporated in the Transnet model.

The pressure on the road corridor between Durban and Gauteng would be relieved with the development and promotion of these terminals.

7.8.1.4 Public Transport Inter-Modal Facilities

The proposed SPTN provides for planned primary and secondary modal transfer facilities.

Primary facilities are located at:

- Durban CBD train station, where inter-city coach terminal is also located;
- Durban International Airport and Airport at La Mercy and
- Richards Bay CBD train station

Secondary facilities are located at:

- Pietermaritzburg;
- Howick;
- Kokstad;
- Ladysmith;
- Dundee;
- Vryheid;
- Blythedeale and
- Mtonjaneni

Minimum standards will have to be developed for primary and secondary facilities. Typically, primary facilities need to be of a high standard similar to airports, where provision is made for easy transfers between modes, public amenities, ticketing offices and passenger information, shops and restaurants, and car rental. Park and Ride facilities also need to be provided. Security must be of a high standard.

Secondary facilities will be of a more basic nature, but they need to provide for ease of transfer, public amenities and high security, clean and well maintained.

7.8.1.5 Current Planning – Evaluation of Strategy

There is no planning for the development of intermodal capability for land transport, apart from the provision of some railway rolling stock and the continued expansion of the road freight fleet capacity.

There are as far as is currently known, no significant integrated plans to develop capacity at the ports or the inland terminals to make any significant changes to intermodal capability, apart from planning by Transnet (Transnet Freight Rail and Transnet National Port Authority) to provide for greatly enlarged container terminals.

7.8.2 Identification of Critical Projects

7.8.2.1 List of Critical Projects

The critical projects are listed above.

7.8.2.2 Typical Unit Rates

Unit rates will depend on the type, lay-out and size of the facility, and also the range of public amenities that would be provided for. For the purposes of the prioritisation of projects in Phase 4, it is proposed that lump sums are assumed.

8. CONSOLIDATION OF STRATEGIES

8.1 INTEGRATED INFRASTRUCTURE FRAMEWORK

The central theme of the Terms of Reference (ToR) of NATMAP is integrated planning and the development of an Integrated Master Plan. The ToR identified the lack of integration across various planning dimensions as a major problem.

Each planning authority is tasked with the planning and development of its own infrastructure to meet forecasted growth in demand, but coordination between authorities is not effective. Integrated planning is further aggravated by the fragmentation of roles and responsibilities of different planning authorities across the different spheres of government.

Various dimensions of integration of planning were defined:

- Institutional coordination horizontally and vertically is the most important factor in integrated planning, as well as enabling legislation.
- Land use, economic development and transport must be integrated.
- Transport services, must be integrated with transport infrastructure on which they operate.
- Finance and implementation of different infrastructure components need to be coordinated in order to have a well-functioning system
- Sustainable transport in terms of energy efficiency and environmental impacts must be a central theme in all planing.
- Coordinated data of high quality is crucial for integrated planning

In NATMAP the different dimensions of integrated planning and principles defined above are being addressed in this Forward Planning Phase. Typical examples of the integration of the different components of the total NTMP have been described, such as:

Land use: The National Land Spatial Development Framework and Spatial Development frameworks of provinces have been used to derive the demand for transport. Land use strategies have been developed in support of the infrastructure development, and to exploit the transport development to achieve land use goals.

Role of transport in the economy: The NTMP was drafted to respond to the economic needs and planning of the country via the economic scenarios and projections conducted for NATMAP. In turn, the proposed strategies and plans proposed for transport services and infrastructure investment will have a major impact on the economic development of the country.

Freight and passenger transport operations: The main goal was to optimise the transport services by means of the different modes and the ways in which these services are provided.

Transport Infrastructure: Integration have been achieved by trading-off the roles of different modes and types of infrastructure and not by just increasing capacity of one type of infrastructure in isolation to the rest. Different infrastructure components which are supportive of each other have been integrated.

The implementation and funding program: In Phase 4 the plans and projects for each five-year interval will be done in such a way that supporting projects which will jointly have the largest benefit, are packaged together.

Demographic, economic and transport demand models have been developed and applied in an integrated way and the formulation of all the plans have been informed by the same set of models from a national perspective, consistent across all provinces.

The different freight models of the DoT (NATMAP) and Transnet needs to be urgently and seriously addressed at the highest level for the purposes of future planning alignment between the DoT and Transnet.

In conclusion, the various plans proposed in this first draft of the provincial reports provide only a first step towards full integration. The Consolidated Working Group should facilitate further integration in their documentation of the national Phase 3 report, and discussions at the Phase 3 Round Table (RT3) should lead to further integration.

A summary of the main conclusions from each Chapter of the report is given in the following sections.

8.2 DEMOGRAPHIC FORECASTS

From the demographic forecasts described in the Phase 2 report for the Low, Middle and High growth scenarios, it is evident that the existing settlement pattern will to a large extent remain in future.

From an urban perspective it is proposed that densification and infill development should take place along public transport corridors, in order for people to reduce their driving time to work. The provision of community facilities should become a priority in these corridors and nodes.

One stop community centres are also proposed in the rural areas. These centres should serve the people in the surrounding communities with services such as internet connections (very important to facilitate further education and information), medical facilities, pension pay points, shops etc. It is of utmost importance that a good public transport link be established from the urban areas to these rural services centres.

8.3 LAND USE DEVELOPMENT

8.3.1 National policy directives, development objectives, and evaluation of scenarios

National policy directives were used to formulate development objectives, which in turn were used to evaluate the various scenarios of the transportation model in the Forward Plan. The high, medium and low scenarios were evaluated in terms of the defined directives and objectives.

It was concluded that the middle scenario best fulfils the development directives and objectives set for the national transportation network. It best achieves land use and transportation integration due to the fact that the middle scenario strikes a balance between urban and rural development. However, the existing national and provincial transportation network does have certain limitations in implementing the middle scenario.

8.3.2 Implications of demand projections

It would appear that in contrast to the level of connectivity between well-established urban areas, the linkages between areas of exclusion and areas of economic opportunity could be improved from a passenger transportation perspective. Vast numbers of settlements of exclusion occur within the Zululand, Umkhanyakude, Umzinyathi and Ugu district municipalities. Notably, these municipalities have been earmarked as Rural Development Nodes by the Government's ISRDS programme.

The transportation infrastructure constituting the existing corridors can be upgraded and extended to better develop key rural areas and to further exploit comparative and competitive advantages of regions from a freight perspective. For example, stronger direct linkages can be established between the harbours of Ethekwini, Richards Bay, Maputo and Nqura (Couga), as well as linking these gateways to key rural and agricultural areas.

8.3.3 Strategies to Align Land Use and Transportation

A number of strategies based on the principles associated with the middle scenario can be developed to ensure better land use and transportation integration, and help to exploit the competitive advantages of regions. Extensive feasibility studies would be required prior to implementation of actions proposed for each strategy considering aspects such as inaccessible terrain and availability of a lower-level transportation infrastructure network.

- Strategy 1: Integrate the space-economy of the Province and exploit the competitive advantages of regions in a sustainable manner;
- Strategy 2: Establish a clear hierarchy of settlements to guide infrastructure provision in an effective and sustainable manner;
- Strategy 3: Link areas of exclusion to areas with economic potential by ensuring good access and
- Strategy 4: Accelerate economic growth by stimulating sector development and the development of the Province's existing and proposed Gateways.

8.4 PASSENGER TRANSPORT

The projections of the NATMAP model were used to determine the future public transport demand potential. A Strategic Public Transport Network was developed based on the demand potential, distinguishing a primary and secondary route network. Primary and secondary modal transfer facilities have been identified where the SPTN can be accessed. The public transport demand potential was subsequently used to define appropriate modes, depending on demand and distance intervals.

The key stakeholders that should be responsible for the planning, design and implementation of the SPTN have identified, as well as key operational aspects that must be addressed. The NLTA makes adequately provision for the legal requirements for the implementation of the SPTN.

The SPTN should be seen as a strategic framework for further refinement and development into a full Operational Plan during 2010, which should be implemented in 2011.

Important building blocks of the SPTN are PRASA's Passenger Rail Master Plan and current implementation of various components, projects initiated by the DoT on the management and monitoring of the taxi recapitalisation program, and on public transport grants and subsidies.

Critical gaps in information were identified relating to operating costs of inter-regional public transport and relative cost-efficiencies of different modes across different demand and operating profiles. Urgent research is needed on these aspects.

8.5 FREIGHT TRANSPORT

8.5.1 Evaluation of Alternative Operational Strategies

<u>Rail</u>
In the consideration of various possible strategies to revitalise the railway system of South Africa in order to expand its role from bulk minerals transport with minimal general cargo traffic, there is need for extensive institutional reform, organisational change, skills development, competition and systems and equipment modernisation.

All of the options need extensive analysis and evaluation, in order to decide on the future direction of the rail sector in South Africa, but it is important that these decisions are seen to be urgent, in order to halt the current decline in the efficiency of the railway system and the continued switch from railway to road haulage, for cargo that really should be retained on rail, in the national interest.

Various strategies were suggested, including the following:

- Restructuring and reorganisation of the national parastatal rail transport company (Transnet Freight Rail) should be considered;
- The disaggregation of the railway sector in South Africa with possible partial removal of specific aspects from the control of Transnet and
- Revitalisation of the railway sector to effect the disaggregation described in the previous strategy option, with the difference that the various entities would be established, as separate competitive commercial entities operating within a controlled network and a regulatory structure that provided for competition between railway operating companies under the control of the economic regulator and the safety regulator.

Roads

In view of the constraints preventing achievement of improved road freight operations in the future, would require the following strategic actions:

- **Improve operator competence:** Create a registry of competent, licensed road freight operators with known identities and characteristics that can be controlled by the authorities;
- **Improve road freight quality:** Full introduction of Road Transport Quality System (RTQS) of road freight transport, including vehicle inspections, control of overloading, driver quality control, driver licensing and subsidiary legislation regarding road traffic operations, transport of dangerous goods, transport of abnormal loads, and compliance with the National Road Traffic Act;
- **Investigate road user cost recovery:** Conduct professional investigation into all the costs, both direct and indirect arising from the road freight sector should be conducted as well as the best method(s) of road user cost recovery;
- **Reduce road freight energy consumption:** Ensure security of supply of diesel fuel and reduce total diesel usage through improved fuel efficiency and use of bio-fuel alternatives and
- **Improve institutional capacity to enforce road freight quality:** Extensive institutional reorganisation and equipment of the authorities at various levels are required to develop the effective control of quality in road freight transport that is frequently proposed.

Ports

- Disaggregation of the National Ports Authority: There is considerable potential for improving the coordinative functions of the port authorities, if these are disaggregated.
- Disaggregation port terminal operations: The strategic disaggregation of port terminal operations into commercialised entities with a mandate to compete and make profit will revitalise many of the functions in the ports and will encourage private sector investment in modernisation programmes and the introduction of best practises.

Pipelines

It is essential that the pipeline sector is deregulated within the planning period defined for this project, if significant distortion of modal usage for liquid fuel transport is to be avoided.

Inter-modal Facilities

In order to create an environment that will encourage the development of intermodal transport, it is necessary to revise the institutional structures and to devise means of making private sector investment and involvement attractive and competitive.

Air Freight

There are limited strategic options for changing the air cargo environment in South Africa, as most international air cargo is moved to and from O.R. Tambo International Airport in Johannesburg and the economics of low volume air cargo movement from other centres to O.R. Tambo International Airport does not offer potential for development by any air carrier.

8.5.2 National freight transport strategic imperatives

National Freight Transport Policy

- Create a National Transport Commission with executive level and academic expertise in freight transport to advise the Minister and broaden the decision making and policy formulation process for freight transport to include the logistics providers and industrial users;
- Reassign the responsibility for freight transport policy in all modes to the Department of Transport;
- Redefine the role of government in the provision of freight transport and
- Research and redefine structures, capabilities and responsibilities of authorities to manage freight transport at various levels of government.

Rail Freight

- Develop a national training and research capacity for development of operational, technical and managerial skills in rail freight sector;
- Commission technical and economic evaluation of the role of electrified railways in relation to possible future restrictions on hydro carbon liquid fuels and
- Commission urgent investigation of strategies to maximise the potential for use of branch lines in rural areas.

Road Freight

- Commission research to establish the necessary conditions for creating a sustainable road freight infrastructure funding system;
- Create structures and institutional changes to achieve effective operator regulation;
- Commission research into the creation of competence and development of skills in the road freight sector;
- Develop effective policies for road user cost recovery, including re-evaluation of toll roads strategies;

Ports

- Re-evaluate role of Ports Authorities and define appropriate institutional structure and
- Commission research into optimising the logistics framework at each major port.
-

Pipelines

- Evaluate potential for attracting international investment and
- Commission an integrated study of pipeline and storage facilities including all stakeholders.

8.6 INFRASTRUCTURE DEVELOPMENT PLANS

8.6.1 Road Network

Summary of Road Network

The KZN road network included in the First Order Network Assessment (FONA, HCM 2000 Methodology) amounts to 4 583 km of roads The following road classes were incorporated in the KZN FONA analysis network:

- 1,105 km of National Roads, including sections of National Routes N2, N3 and N11;
- 1,872 km of Provincial (R2) Roads, including sections of the R33, R34, R56, R66, R68 and R74;.
- 1,579 km of Provincial (R3) Roads, including sections of the R102,R602, R612, R618 and R620; and
- 29 km of Metropolitan Roads. were considered important enough to be considered as freeway segments

Projections for Future Years

Based on the average growth rates applied, to the KZN base year traffic volumes, it is evident that the KZN traffic volumes will increase by 18 percent from 2005 to 2050, between 2005 and 2020 by 15 percent and between 2005 and 2030 by 24 percent.

Do-nothing scenario

Based on the Level Of Service (LOS) analysis the following observations can be made:

- The percentage of roads operating at LOS A reduces from 72% in the base year (2005) to 21% in 2030 and to 16% in 2050.
- The percentage of roads operating at LOS B increases from 27% in the base year (2005) to 35% in 2030 and decrease again to 34% in 2050.
- The percentage of roads operating at LOS C stays the same in 2030 as in 2005, namely 19% and then increase to 22% in 2050.
- The percentage of roads operating at LOS D increases from 4% in the base year (2005) to 13% in 2030 and then reduces to 11% in 2050
- The percentage of roads operating at LOS E increases from 3% in the base year (2005) to 10% in 2030 and then to 13% in 2050
- KwaZulu Natal will have 2% of its roads operating at LOS F by 2030 and 4% by 2050.

The percentage of roads operating at LOS A, decreases over time whereas all the other increase which indicates that the roads across the board will deteriorate over time.

Upgrading Required for Future Years

Based on the Target LOS analysis and the additional lane requirement calculations the following observations can be made:

- The majority (71%) of the KZN roads only reach or exceed the Target LOS “D” beyond the horizon year of 2050. The Target LOS “D” is reached according to the following date groupings:
    - 5.6% of the KZN road network reached or exceeded LOS “D” in 2005 and would require 1 lane (per direction) to be added to them
    - The remaining 23.4% of the road network reaches or exceeds LOS “D” between 2006 and 2050
- Lane additions are warranted once LOS “D” is exceeded.
- The KZN road network never warrants the addition of more than one lane

Evaluation of Alternative Strategies

The following alternative strategies were tested with regards to their impact on network operational efficiency (estimated by means of LOS) and the sensitivity with regards to the reduction in additional lane requirements in future years:

- Reduce Freight Volumes on Road Network
- Reduce Private Vehicle Volumes on Road Network
- Combination of Private Vehicle and Freight Reduction on Road Network

Management of Road Infrastructure

Three aspects of road infrastructure management were discussed:

i) Overload control

There are thirteen operational weighbridges in KZN. Six of them are on the N2, three are on the N3, two are on the N11, and one each on the R33 on the R69.

There has been a continued significant decrease in the extent of overloading on the N3 corridor from approximately 16% to approximately 11%. When compared with 25% estimated for the rest of the country it is an excellent achievement.

Applying the proposed weighbridge spacing to the KZN road network the following weighbridge locations are recommended:

- N2: Park Rynie, Groutville, and Mkhuse;
- N3: Westmead and Midway;:
- N11: Newcastle and
- R33: Vryheid.
-

ii) Road Safety

In order to fully understand the extent of the Road Safety problem within South Africa, it is important to have an appreciation for the road environment, driver population, driver behaviour, accident record etc. which are all contributing factors to South Africa's road safety problems.

South Africa has one of the worst road safety records in the world, recording road accident related deaths of approximately 120,000 people per annum and injuries in excess of a million people per annum. This annual road carnage costs the South African economy in the order of R43 billion (2005).

Existing Road Safety Strategies are:

- Arrive Alive campaign of the DoT;
- Business Plan of DoT, followed from the Road to Safety Strategy;
- Road Traffic Management Corporation and its actions and plans;
- The Administrative Adjudication of Road Traffic Offenses (AARTO) Act and
- National Overload Control Strategy

- Roads development plan

New road safety strategies were discussed in terms of Education, Enforcement and Engineering.

The following strategies were also discussed:

- Data Management Systems
- The Accra Declaration of SADC
- Incident Management Systems
- Land use planning

iii) Travel Demand Management (TDM)

TDM is defined as any action or set of actions aimed at reducing the demand for private vehicle travel in a specific area during a specific time period, i.e. influencing people's travel behaviour and encouraging a shift to other modes of transport. These techniques, strategies and programmes lead to a reduction in the need for road-based travel and are generally implemented to counter the following:

- Congestion of roads (demand for travel exceeding capacity).
- Under-utilisation of existing transport infrastructure and services.
- Over-use or dependency of one particular mode of road based transport.
- Inappropriate expenditure on infrastructure not conducive to meeting the objectives of TDM.
- Lack of new and innovative infrastructure and traffic control elements required for a forward compatible and progressive transport solution.
- Vehicles travelling on inappropriate roads to avoid congestion or delays (rat-running).
- Environmental quality reduction based on vehicle emissions associated with congestion and longer travel times.
- The absence of an understanding of what measures will have the most cost effective and efficient impact on the transport network.

Road congestion can typically be addressed by two strategies, namely:

- Infrastructure management (supply side management):
- Demand side management:

TDM requires time for implementation. Ideally, TDM measures will be planned so that it can be implemented at the time when it is required and when it will have the desired impact. In the long run any specific TDM measure is unlikely that result in an indefinite improvement in the performance of the transportation system on its own. The performance of the system will deteriorate with time as the demand for travel increases at which point additional TDM measures need to be implemented to achieve the desired improvement in the network operational performance.

8.6.2 Rail Network

Existing network

Transnet divided their rail network into a Core Network and Branch Lines. The suburban network belongs to PRASA (Passenger Rail Agency of South Africa) and is operated by their division Metrorail. The freight network belongs to Transnet and is managed by the division TFR (Transnet Freight Rail). There are also various private sidings in the province that belongs to municipalities and other businesses.

The following rail sections link the province with other provinces and countries:

- Durban – Gauteng Main Line: Limpopo, Freestate and Gauteng;
- Richards Bay – Ermelo Coal Line: Mpumalanga and
- Richards Bay – Golela:: Swaziland and Mpumalanga

Existing capacity utilisation

The rail network in the Kwazulu-Natal had significant spare capacity during 2007. The practical capacity of the Umbogintwini – Umkomaas and Mount Edgecombe – Booth sections that were shared with the suburban services were fully utilised. The utilization of the section of the coal line between Paulpietersburg and Vryheid indicated that capacity constraints could develop in the near future.

Transnet is busy to develop a strategy to concession the branch lines to private operators through a public bidding process.

Future Rail Technologies

NATMAP undertook the following two studies to obtain an indication of the strategies that should be followed in future for the technological development of the rail business in South Africa:

i) Rail Gauge Study: The purpose of the study was to analyse the consequences and implications of the 1067 mm gauge of the South African rail network and to recommend future strategies.

The main findings of the report include amongst others the following:

- Standard gauge generally holds the trump in terms of better, faster, more economic, economy of scale, quality of R&D etc. Only the cost of the track infrastructure for narrow gauge has an advantage (about 5 to 7%);
- Conversion of the existing Transnet core network to standard gauge is discussed in some detail with the conclusion that it is not economically justifiable and
- South Africa should gradually move towards standard gauge via a new standard gauge network, based on a master plan from a separate study.

The report recommends that:

- Existing network should not be converted to standard gauge as this cannot be justified economically. Investment should continue in the existing network whilst keeping the to-be-developed master plan in mind and
- South Africa to fit in reactively (rather than pro-actively) with whatever happens across our borders in terms of the AU guidelines.

ii) Passenger Rail Technology Study: The Passenger Rail Technology Study was undertaken on behalf of PRASA to give guidance on the most appropriate technologies for future development of the rolling stock and infrastructure.

The study came to the following conclusions:

- The global railway renaissance generated a range of attractive, competitive mass mobility solutions with potential to restore contribution of passenger rail to SA;
- Portions of the legacy may be recyclable: Leveraging them will maximize the return on new investment and
- However, many constraints impede their adoption, and that overcoming them will pose high challenges, but is achievable if the task is reduced to manageable portions.

Key recommendations of the study include the following:

- Examine minimum interoperability requirements carefully, to create space within which migration to contemporary passenger rail solutions can take place;
- Recognize that rail solutions in general require close matching of infrastructure and train characteristics, to maximize capacity and minimize journey time;
- Consider alternatives to existing steel-wheel-on-steel-rail passenger rail technology, such as rubber-tyre solutions, that allow passenger rail to compete effectively against road competitors over a wide range of capacities;
- Physically separate metro and freight operations, to develop fully the potential of urban rail, without interference from incompatible trains;
- Consider technologies such as automatic train protection and automatic train operation, to mitigate passenger exposure to undue risk, and to utilize infrastructure and rolling stock more intensely and
- Revisit local content and the state of the supply industry, which aspects will need to support effective implementation of contemporary rail solutions in South Africa.

Future capacity utilisation

Transnet in their National Infrastructure Plan (NIP) indicates the utilization of the theoretical capacity of all rail sections. Transnet has developed a complex demand model based on commodities, demand and supply at magisterial/station level as well as taking into account the operational characteristics and the network capacity characteristics. The strategy of Transnet is to plan capacity improvements (operational and/or infrastructural) when the utilization of a section of the network would exceed 60% and to implement improvements before the utilization of a section exceeds 80%.

Comparison between the estimated utilization of the 2005 line capacity by the demand estimated by Transnet and the NATMAP freight model respectively for the years 2030 and 2050, indicates that the estimated utilization of the line capacity as determined by the NATMAP model will on all the core line rail sections in Kwazulu-Natal be lower than the utilization as determined by the Transnet model. The difference could mainly be contributed to the strategies of Transnet to increase their market share in the commodities that are more rail-friendly while the NATMAP model is based on the current modal split between road and rail for these commodities.

The capacity of the rail network in Kwazulu-Natal is, apart from a few pressure sections, adequate for the demand until 2015. The current 5 year program of Transnet does not make provision for any projects to increase the capacity of any corridor in Kwazulu-Natal.

Additional Upgrade Requirements to 2050

The additional projects identified by Transnet to increase the capacity of the freight network in KZN to provide for their estimated traffic growth for the following 20 years are the following:

i) Durban – Gauteng main line

- The sections between Ennerdale – Pietermaritzburg, Cato Ridge – Booth and Booth – Bayhead would require that the capacity be increased by 2030;
- The Transnet model indicates that the capacity of the almost the entire corridor would need to be increased from 2025 onwards;
- A higher growth rate than reflected in the Middle scenario could create the opportunity to provide a new standard gauge rail system in this corridor that would accommodate the higher speed freight train and high speed passenger trains between Durban and Gauteng by 2035;

ii) Richards Bay – Ermelo coal line

The moderate capacity improvements of the projects would provide sufficient capacity to 2050. Transnet estimated that the growth rate in export coal volumes from Mpumalanga would decrease;

iii) Richards Bay – Durban North Coast line

The projects could provide sufficient capacity for the freight service as well as for the suburban service up to 2050 should the third rail be provided in the metropolitan areas;

iv) Durban – Port Shepstone South Cost line

PRASA would need to increase the capacity of the single line sections for their suburban services and

vi) Richards Bay – Swaziland

The projects would provide sufficient capacity for the estimated demand to 2050.

Evaluation of alternative strategies

- **Addition of rail links:** An additional link could be required between Durban and Gauteng during the 1940's should the demand for rail freight grow in accordance with the Transnet model;
- **Improved maintenance of rail infrastructure:** Speed is critical for passenger trains. Pressure should be applied on Transnet by PRASA to reduce speed restrictions and to improve the rail alignment for passenger travelling comfort;
- **Open the rail infrastructure** to other operators and rolling stock owners in order to increase the role of rail in the transport market and to provide competition within the rail transport business;

- **Develop freight hubs and terminals:** Transnet is planning to further develop Freight Hubs and Terminals for Intermodal and Breakbulk freight at Durban MPT, Pietermaritzburg, Richards Bay and New Castle. Car terminals would also be further developed at Isipingo and Point. The pressure on the road corridor between Durban and Gauteng could also be relieved with the development and promotion of these terminals;
- **Consider impact of new coal gasification technology**: There is a strong possibility that the technologies to convert primary energy into gas at the coal mines could become viable and economical. This could reduce the transportation of inland coal significantly. The influence on the infrastructure in KwaZulu-Natal should however be limited and
- **Provide clean energy:** The promotion of electrical energy will contribute significantly to the reduction of pollution in built up areas.

8.6.3 Airports

There are four airports of national importance within KwaZulu Natal:

- International Airport at La Mercy to be commissioned in 2010;
- Existing Durban airport to be de-commissioned in 2010;
- Pietermaritzburg Airport;
- Richards Bay Airport and
- Margate Airport.

The proposed new International Airport at La Mercy near the Dube Tradeport is planned to be commissioned in 2010. When the International Airport at La Mercy is commissioned, Durban International Airport will be decommissioned.

The future role of the existing Durban Airport still needs to be decided. Various aviation and non-aviation possibilities exist, and whilst NATMAP provides some guidance in this regard, it is recommended that a comprehensive feasibility study be conducted by the DoT in order to determine the best role of the site in serving the national interest.

Durban, Pietermaritzburg and Richards Bay have been identified as the main growth points within KwaZulu Natal. No other areas have been identified that will require an airport of national importance (scheduled flights or a freight hub) over the planning period (2005-2050) of this project.

The New International Airport at La Mercy could reach capacity by 2050, by when a new international airport will be required. Assuming that the planning and construction of a new airport will take about 20 years, the site for the new airport should be identified by 2030.

The available land at the International Airport at La Mercy is sufficient to expand the airport to 2 independent and parallel runways. There is sufficient space for landside access to be upgraded to meet the demand.

8.6.4 Sea Ports

KwaZulu Natal's two complimentary ports of Durban and Richards Bay play a vital role in the economy of the country. Transnet have proposed in their National Infrastructure Plan, 2008, various development framework plans to meet the demands of their projections to the planning horizon of 2036, as well as plans of the future potential development of their ports beyond this horizon. The Plans proposed by Transnet were analysed in terms of their ability to meet the demands assessed as part of this study, which in most instances do not correspond with those made by Transnet over a year ago before the effects of the world economic slump.

Recommended Strategies

Port of Durban

- A study needs to be undertaken to ascertain the options available for the expansion of container facilities in Durban. This must include full environmental impact assessments of both the Bayhead and Durban South Port options;
- The proposed Bayhead Container Terminal should be re-planned taking into account the river courses and their potential impacts, the impact on the ship repair industry, and the consequential requirement of deepening and widening the access channels. This revised plan should be subject to an Environmental Impact Assessment scrutiny, and a Record of Decision obtained. The economic viability of some restricted development, should such be approved in the Record, will need to be evaluated;
- The current Durban International Airport site at Reunion, on relocation of the operation to the International Airport at La Mercy, should be reserved for the construction of a new port in the south of Durban;
- The needs and desirability of a Dry Port, constructed at some location inland of Durban, should be investigated, and if found to be beneficial, a mechanism be established to implement its development and
- An alternative road access route into the southern basin of Durban should to investigated, and, in the light of predicted road freight traffic, an assessment made of its desirability.

Port of Richards Bay

- In future most of land area requirements at the Port of Richards Bay will be for container facilities as well as for new access channel and turning basins, although the freight demand forecasts appear to assume that most of the existing land and sea transport corridors, and their relative weight, will prevail over the plan period and beyond;
- The ongoing unitization of break bulk cargo into containers and introduction of dedicated container terminal during the plan period will substantially reduce demand for break bulk berths;
- Provision of ship building and repair facilities may assume some urgency if the existing services at the Port of Durban are scaled down or terminated and
- As study reports have indicated, project planning process should take into account that: Large scale changes to Richards Bay will need to be subjected to an extensive environmental approval process. Long term programmes will need to be initiated at an early stage in order to obtain necessary approvals.

8.6.5 Pipelines

Transnet Pipelines (TPL) currently operates all of the pipelines which begin or terminate in KwaZulu Natal. These comprise 3 commodity-specific pipelines as follows:

- The Durban – Sasolburg crude oil pipeline;
- The Durban – Ladysmith – Kroonstad – Sasolburg multiple products (petrol, diesel and AvTur) pipeline and the inland network and
- The Secunda – Volksrust – Empangeni – Durban methane-rich gas pipeline.

TPL is currently implementing the first phase of the New Multi-Product Pipeline (NMPP) which will provide significant additional refined fuel capacity between Durban and Gauteng:

The planned implementation of the Transnet Pipelines NMPP project will satisfy demand for refined oil product transfer from the coast at Durban to the Gauteng Province until approximately 2022. Thereafter capacity can be enhanced by improving flow rates by additional investments in pumps and pump-stations.

However, demand for liquid fuels is integrally bound with the dwindling world supply of oil, and the technological quest to find an alternative energy source. The same question will heavily influence whether additional refinery capacity is to be built in South Africa. Whilst the intention of PetroSA to build a new refinery at Coega is noted, economic reality and sustainability of such a plant may yet influence the final decision. The location of a new refinery, if such is indeed justified, should be subject to a comprehensive economic analysis, including the transportation costs to convey the refined products to the end user over the full lifespan of the refinery.

9. IMPLICATIONS FOR PHASE 4

9.1 DELIVERABLES AND OBJECTIVES OF PHASE 4

The ToR states the following deliverable for Phase 4:

- *To develop detailed Agenda for Action and five years periods interactive programmes for all land use/transportation sectors for the first twenty years, and for the next thirty years thereafter*

The following objectives are stated:

- *To review all existing transportation policies, rules and regulations, policy pronouncements and stipulate new and responsive policies formulation, amendments, and/or promulgation during short term, medium term, and long term of the proposed Plan and*
- *To develop a National/Provincial goals achievement matrix prioritising and itemizing policies, institutional, infrastructure facilities, rolling stock and equipment components of the master plan to be implemented and procured on a phased and incremental basis starting with the zero option.*

9.2 METHODOLOGY AND SCOPE OF WORK

The following qualifications need to be stated regarding the scope of Phase 4:

- Similar to PLTF's and ITP's, NATMAP will have to be updated on an annual basis, providing a rolling 5-year programme for implementation, and updates of the medium and long-terms plans up to 2030 and 2050;
- The definition of the projects will be rather strategic in nature, and cost estimates will only be done at an "order of magnitude" level and
- The project details will become progressively less for the medium and longer term horizons. The most critical projects are those defined for next 5 to 10 years, as projects thereafter will be planned in more detail during following updates of NATMAP.

The following methodology will be followed:

i) Define list of projects

The strategies and plans described in the Phase 3 Forward Plans will be broken down into projects. Preliminary project lists have been identified in this Phase 3 report for infrastructure plans, which will be refined.

Projects will be defined for various future target years according to when they would be required based on the considerations of the Forward Plans and the demand projections.

ii) Estimate project costs

Only a very high level cost estimate for each project will be done to suit the level of detail of the Goals Achievement Matrix. Unit cost rates reported in this Phase 3 report will be used, supplemented by any additional unit rates that may be required.

iii) Develop Goals Achievement Matrix

The national FILM report proposed a concept Goal Achievement Matrix (GAM), based on multi-criteria evaluation techniques typically used by the World Bank and the European Investment Bank for the evaluation of strategic investment projects. The concept GAM will be refined to suit the purpose of NATMAP, the type of strategic projects that need to be prioritised, and the availability of information for rating the projects against various criteria.

iv) Prioritise projects in terms of Goals Achievement Matrix

Subsequently, the projects will be prioritised by means of a Goal Achievement Matrix, as specified in the ToR. Projects will be allocated into five-year intervals, according to the total estimated budget for each five year period.

The national FILM report for Phase 3 indicates available national and provincial transport budgets, which will be used.

v) Formulate Action Agenda

Finally, the prioritised program of projects to be implemented will be supplemented with an Action Agenda, specifying the major actions required to facilitate implementation, responsible authorities, target dates, and key constraints to be resolved.

vi) Refine project priorities and Action Agenda at Round Table 4

Finally, the project priorities and Action Agenda will be refined and confirmed at the Phase 4 Round Table Conference.

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