6.1 Introduction

This chapter provides an overview of the current state of transport infrastructure – the hard engineered, designed and constructed infrastructure that refers to the physical networks required for the functioning of today’s modern economy, as well as the related analysis and forecasting. It includes interventions required to align the road, rail, air, maritime, and pipeline transport modes with the NATMAP 2050 Spatial Vision. It also shows alignment to spatial development by demonstrating how and where strategic integrated projects (SIPs) are located in support of economic and population growth.

6.2 Significant Plans, Concepts and Context

Several critical strategies, projects and concepts have been established since the development of the NATMAP 2050, providing guidance on the future development of transport infrastructure and the achievement of goals pertaining to national economic development and future economic growth in South Africa. These include but are not limited to the following:

- National Development Plan 2030 (NDP 2030)
- Strategic integrated projects (SIPs)
- Regional integration and connectivity
- Road-to-Rail Strategy
- Road Freight Strategy (RFS 2011)
- CBRTA initiatives such as the Operator Compliance Accreditation Scheme (OCSA) and market access regulations
- Rail expansion network and the African Union’s position on Rail Gauge, Africa Agenda 2063 (2014)
- Single-transport economic regulator (STER) – currently being developed
- Private Sector Participation (PSP) Framework Plan and Implementation Plan – currently being developed
- Green Paper on National Rail Policy – currently being developed
- Green Paper on National Maritime Transport Policy – currently being developed
- Transnet Long Term Planning Framework 2014
- National Airports Development Plan
- Airspace Master Plan
- Aerotropolis
- Ocean economy: Operation Phakisa Programme.

The DoT’s PSP framework and implementation plan are intended to give input into the broader National Treasury process that intends to provide a standardised mechanism for private sector participation throughout the government.

The impact of each of these is detailed per infrastructure type in the remainder of this chapter.
6.3 Road Infrastructure

6.3.1 Overview of road infrastructure

The NATMAP 2050 road infrastructure focus is on roads of national and provincial importance. Currently, there is no consolidated road information system. The information on roads that is kept at municipal level and, in some instances, at provincial level through means of programmes such as the Road Asset Management Plans (RAMP), containing networking condition data per province, is often outdated or incomplete, hence necessitating a consolidated road information system. Figure 6-1 reflects the South African National Roads Agency SOC Limited (SANRAL) road network, which, according to SANRAL’s 2014 annual report, totals 19704 km. SANRAL has an extensive road management system (RMS) that contains key information on the road network – such as road condition and traffic volumes.

Road rehabilitation on the N4 near Ressano Garcia (the border between South Africa and Mozambique) and heavy vehicles carrying minerals that should be transported by rail.

FIGURE 6-1: OVERVIEW OF THE MAJOR ROAD NETWORK
SANRAL, an independent statutory commercial company, was established in April 1998 by an Act of Parliament. The Agency develops and maintains South Africa's national road network.

SANRAL has two primary sources of income: toll roads and non-toll roads. Non-toll roads (84% of the total national road network) are funded from allocations made by the National Treasury. Toll roads (16 percent of the total national road network) are funded either through public-private partnerships or through capital markets borrowings.

The average daily truck traffic counts on national roads, as collected by SANRAL's counting stations in 2013, are shown in Figure 6-2. These figures clearly confirm major movement at and between activity centres along existing and emerging transport corridors defined in the NATMAP 2050 (also see Chapter 5).
HEAVY VEHICLES OVERLOADING

About 60% of the damage to roads is caused by overloaded heavy vehicles (CSIR 1997 Annual Report). The highest traffic volumes occur in Gauteng, the Western Cape, and KwaZulu-Natal. The figures below show a graphic overview of the major road network and the traffic volumes on national and provincial roads.

SANRAL owns 13 traffic control centres (TCCs) and operates them on a 24-hour basis. In summary, a total of 1 616 825 heavy vehicles were weighed at the TCCs during 2013, of which 30 873 were charged for overloading, adding up to a total value of R36 997 310.

CONDITION OF THE NATIONAL ROAD NETWORK

The condition of provincial roads has deteriorated since the 1990s. Significant maintenance and rehabilitation are required – particularly in the Eastern Cape, the Free State, Gauteng, KwaZulu-Natal, and Mpumalanga. In 2007, the general condition of the national road network ranged from 58% (fair) to 28% (poor or very poor). Since then, SANRAL has invested significantly in the rehabilitation and maintenance of roads – one example is the Gauteng Freeway Improvement Project (GFIP).

Figure 6-3 shows a comparison of South Africa’s road network condition in 2009 and in 2013. It shows that the condition of the national road network (SANRAL) improved somewhat while the road conditions in Gauteng and the North West remained constant. KwaZulu-Natal and Mpumalanga have shown improvements in overall road conditions while the Eastern Cape, the Northern Cape, the Western Cape, Limpopo and the Free State have all shown deterioration in overall road conditions.

CONDITION OF THE PROVINCIAL ROAD NETWORK

To obtain a sense of what the current condition of the provincial road network is, available information reflected in the Road Asset Management Plans (RAMP) for each province was examined. The purpose of the RAMP is to give information on the condition of the existing provincial transport road infrastructure and to highlight deficiencies that have been identified through the various systems within provincial road departments. These plans indicate how provincial road departments intend to address the deficiencies identified along the road network over the next 5-year planning period (2013–2018). The objective of these plans is to ensure that, within the provincial budgetary constraints, the systems provide and maintain the existing transport infrastructure to an acceptable level of service that promotes public transport and meets the strategic goals of the specific provincial road department.

These plans provide an indication of how the provincial road maintenance grant, the provincial earmarked allocation and the discretionary allocation for provincial roads funding will be used and integrated into the provincial departments’ infrastructure renewal and development activities.

The central challenge the provincial road departments face is to establish an integrated sustainable transport system that will contribute to the provision of safe, reliable, effective, efficient and fully integrated transport operations and infrastructure that will best meet the needs of freight and passenger customers at improved levels of service and at reasonable costs in a manner that supports government strategies for economic and social development whilst being environmentally and economically sustainable.

Figure 6-4 shows a summary of the visual condition index (VCI) per province derived from the latest RAMPs submitted per province. The provinces that reported an increase in the total length of road that is classified as “poor” and “very poor” are, Limpopo, the Free State and the North West. The rest of the provinces reported a decrease in length of road that is classified poor” and “very poor”, indicating an improvement in overall road conditions in these provinces.
FIGURE 6-3: ROAD NETWORK CONDITION COMPARISON 2009 AND 2013 (Source: South African National Roads Agency (SANRAL), as quoted by the 10th Annual State of Logistics Survey for South Africa 2013)

FIGURE 6-4: VCI PER PROVINCE BASED ON LATEST RAMPS (Source: Provincial RAMPs)
ROAD SAFETY

According to the Department of Transport – National Land Transport Strategic Framework 2015–2020 Draft 1 March 2015, South Africa has one of the world’s worst road safety records at ±26 fatalities/100 000 people while comparable developed countries have an accident rate of as low as 3.2 fatalities/100 000 people.

Figure 6-5 below illustrates that South Africa’s road fatality statistics have worsened between 2001 and 2011 and that South Africa is not achieving its road safety objectives. The poor road safety record has detrimental impacts on South Africa’s economic productivity.

Over the 12-month period from 1 July 2006 to 30 June 2007, the total number of fatal collisions per 10 000 registered motorised vehicles in South Africa was 16, with the total number of fatalities per 100 000 human population calculated at 31.6 (Road Traffic Management Corporation (RTMC) Annual Report). The latest report from the RTMC for the period 1 April 2010 to 31 March 2011 shows a slight improvement on these figures, namely 12 fatal collisions per 10 000 registered motorised vehicles and 27.5 fatalities per 100 000 human population.

TRAFFIC CONGESTION

Traffic congestion is a condition on road networks that occurs as use increases and is characterised by slower speeds, longer trip times, and increased vehicular queuing. Recurring traffic congestion relates to insufficient capacity, unrestrained demand, and the ineffective management of capacity. It is, however, not desirable or affordable to build our way out of the problem by providing sufficient peak hour capacity. Supporting planning measures, such as public transport services to help manage traffic congestion, are required.

REGIONAL CORRIDOR INTEGRATION DEVELOPMENT

Regional integration is defined within the context of the Tripartite Regions: Southern African Development Community (SADC), East African Community (EAC) and Common Market for Eastern and Southern Africa (COMESA). The Tripartite Region is characterised by both landlocked (semi-landlocked) and coastal/maritime countries.

Reducing transport costs and cross-border challenges, improving corridor efficiencies and, therefore, addressing general efficiencies and logistics are central pillars to regional integration. From a regional integration perspective, transport provides three very important things: accessibility and mobility as well as an inducer for development.

Agreement and cooperation between regions in the form of corridor entities and Memorandum of Understanding (MOU) are critical to the success of regional integration and trade facilitation. South Africa has these relationships on at least the following corridors:

- Maputo Corridor via the Maputo Corridor Logistics Initiative (MCLI)
- Trans-Kalahari via the Walvis Bay Corridor Group (WBCG)
- North–South corridor through SADC participation.

The roll-out of one-stop border posts is a reality that still has to be met in South Africa.

6.3.2 Outcome of road transport infrastructure analysis and forecasting

Capacity constraints and bottlenecks were identified through a first-order network assessment (FONA) analysis of all national and some provincial roads (roads of national importance in 2005). Figure 6-6 indicates the level of service (LOS) across the provinces.

The peak hour bottlenecks identified in urban metropolitan areas were primarily attributed to the lack of high-quality, reliable public transport services as an alternative to private car use. It is expected that the GFIP will alleviate the situation in Gauteng.

Capacity was also assessed in areas with high volumes of heavy vehicle traffic and in rural areas where few access linkages exist between rural, district, and provincial roads.

Budget limitations and uncertainties as to who is responsible for what generally contributes to the lack of appropriate provision of traffic capacity to meet growing demand. Attention must be given to the 11% of the road network that already operates at an LOS of D and worse (at 2005).
The future demand on the national and the provincial road networks was projected at 67% and 150% by 2030 and 2050, respectively. The projections indicated in Figure 6-7 were based on traffic growth forecasts obtained from the transport demand model developed as part of the NATMAP 2050 process.

Major concerns relating to South Africa’s road transport network include capacity constraints in metropolitan areas and the poor condition of the road network – particularly the provincial road network.

Various factors that contribute to the rapid deterioration of the roads include the:

- Intense movement of freight by road
- Lack of investment in road maintenance
- Overloading of vehicles.

6.3.3 Critical interventions and strategies identified for road network infrastructure

The NATMAP transport vision identified the existing and emerging corridors that will establish the NATMAP 2050 transport system. Based on the situational analysis, the following critical road-related strategies and interventions required to realise the NATMAP vision were determined.

**STRATEGIES PROPOSED FOR ROAD NETWORK INFRASTRUCTURE**

- **Demand:**
  - Address capacity constraints on critical sections of the network by investigating additional road capacity provision
  - Develop a national transport demand management plan for each road of national importance in the provinces
  - Address traffic demand measures to reduce freight volumes on the road network (e.g. bulk minerals and agriculture products) (refer to the road-to-rail strategy in the rail freight section of Chapter 7)
  - Support RAMP and the application of it from national to municipal and not just provincial level
  - Address traffic demand measures to reduce passenger volumes on the road network
  - Develop freeway by-pass strategies to alleviate congestion in urban areas.

- **Overloading:**
  - Increase the coverage of overload control
  - Support the RTMS initiative
  - Revisit and enforce the RTQS initiative
  - Improve efficiency at overloading control centres
  - Investigate the introduction of a heavy vehicle fee to cover external costs.

- **Preventative road maintenance:**
  - Improve the maintenance of the lifecycle of roads at optimum levels, which will minimise costs

- **Border posts:**
  - Support the OCAS regional scheme of CBRTA in the development of regional integration
  - Support the market access regulation initiative of CBRTA to improve regional integration and corridor development.

Figure 6-8 illustrates the integration between the NATMAP 2050 existing and emerging corridors and the road infrastructure projects identified to ensure that these corridors and others feeding into the system operate effectively and efficiently.

![Figure 6-7: FORECASTS IN AVERAGE DAILY TRAFFIC (ADT) PER PROVINCE](image)

Note: This figure shows the ADT on the average road link (national and provincial roads) per province. The average road link represents the average of all national and provincial road links (roads of national importance) that formed part of the network selected for the FONA analysis.
FIGURE 6-8: NATMAP SHORT-TERM ROAD INFRASTRUCTURE INTERVENTIONS
PROPOSED INTERVENTIONS FOR ROAD NETWORK INFRASTRUCTURE

- Preventative road maintenance:
  - Improve the maintenance of the lifecycle of roads at optimum levels, which will minimise costs.

- Moloto Road:
  - Upgrade the Moloto Road to improve safety and mobility.

- N1–N2 Winelands Toll Highway:
  - Upgrade and rehabilitate the many road sections of the N1 and N2 that are approaching the end of their design life.

- N3 Durban–Pietermaritzburg capacity improvements:
  - The upgrade will include a proposed Pietermaritzburg ring road and the re-routing of the N3 near Hammarsdale.
  - Capacity improvements on the N3 are intended to enhance the network’s functionality and safety by providing an alternative route and splitting light and heavy traffic to ensure that both routes operate at optimal levels without bypassing opportunities (e.g., Harrismith).
  - A complementary solution is being developed in support of the Harrismith Freight Logistics Hub, the Tsiame Gateway and the N3 De Beer’s Pass.

- Pongola and eDumbe Road upgrade:
  - The project will entail the upgrading of the D-1867 road off the N2 between Pongola and Piet Retief from gravel to tar.

- N3TC:
  - The work entails the rehabilitation of specific sections of road, including sections between Harrismith and Warden and between Cedara and Tweedie near Howick.

- N2 Wild Coast Highway construction and upgrading:
  - The work entails the construction of new highway sections (a 17-km section between Ndwalane to Ntafufu River and a section between Lusikisiki and the Mtamvuna River, including 6 large bridges across the following rivers: Msikaba, Mtentu Mnyameni, Kulumbe, Mpahlane and Mzamba).
  - It also involves the upgrading of the existing R61 between the Ntafufu River and Lusikisiki, a distance of about 17 km, including a new interchange at Lusikisiki.

The following proposed interventions are provincially specific and, where relevant to an SIP development, are indicated as such:

- **Gauteng:**
  - Construction of PWV9
  - Construction and implementation of Class 2 routes in all municipalities
  - Various road upgradings (K29–Malibongwe Road/ Johannesburg–Brits interprovincial road, roads providing connectivity to OR Tambo International Airport – PWV15, K86 link, K88 link)

- **KwaZulu-Natal:**
  - Provision of a new heavy haul route from the N2 to Cato Ridge (SIP 2)
  - Provision of a heavy haul route between Richards Bay and Melmoth (SIP 2)
  - Weighbridge operations and links to one national system

- **Western Cape:**
  - New weighbridges
  - Capacity improvements on various roads (M7, R302, R310, R300)
  - Doubling of the Huguenot Tunnel
  - Bypass around Knysna

- **Free State:**
  - Strategic gravel road upgrades in all district municipalities
  - Weighbridge operations and links to one national system

- **Mpumalanga:**
  - Upgrading of the coal haulage roads in the province (SIP 1)
  - Weighbridge operations and links to one national system

- **Limpopo:**
  - Upgrading of coal haulage roads in the province (SIP 1)
  - Weighbridge operations and links to one national system

- **Northern Cape:**
  - Road upgrades and capacity improvement (N12 between Warrenton and Klerksdorp)
  - Weighbridge operations and links to one national system

- **North West:**
  - Road upgrades and capacity improvement (N18 between Setlagole and Vryburg)
  - Weighbridge operations and links to one national system

- **All provinces:**
  - Elimination of backlog in maintenance of road network of national importance
  - Periodic and routine maintenance of road network of national importance
6.4 Rail Infrastructure

The African Union’s Africa Agenda 2063’s second aspiration for an integrated continent is for a pan-African high-speed railway network that connects all the major cities/capitals of the continent.

6.4.1 Overview of rail infrastructure

OWNERSHIP AND OPERATIONS

Rail is seen as an essential long-term component of the networks for both freight and passenger transport. The national freight rail network is owned by Transnet and is managed, maintained, and operated by its Transnet Freight Rail (TFR) division. In the metropolitan areas of the Western Cape, Gauteng, and KwaZulu-Natal, the national passenger rail network is owned by the Passenger Rail Agency of South Africa (Pty) Ltd (PRASA), while their management and operation are the responsibility of Metrorail, a division of PRASA.

Numerous sidings (branch lines) connect industrial, commercial, and mining facilities to the national network, some of which are operated by private entities that are owned by Transnet. TFR operates freight trains on certain PRASA lines. Metrorail and Shosholoza Meyl operate suburban and intercity trains on certain Transnet lines. These operations are regulated in terms of a mutual usage agreement between Transnet and PRASA.

IMPORTANT RAIL NETWORKS

Table 6-4 summarises important rail networks in South Africa and Figure 6-9 the Transnet freight rail network.

<table>
<thead>
<tr>
<th>IMPORTANT RAIL NETWORKS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suburban Network (PRASA)</td>
<td>The suburban rail networks in the metropolitan areas of the Western Cape, Gauteng, and KwaZulu-Natal are well developed and are maintained by the regional Metrorail offices. Of the 468 passenger rail service stations (across 3 180 kilometres of rail lines), 374 are on property owned by PRASA. The suburban rail infrastructure that belongs to PRASA includes 175 route kilometres in the Western Cape, 385 route kilometres in Gauteng, and 138 route kilometres in KwaZulu-Natal. Metrorail also uses Transnet lines for the suburban rail services. The route kilometres span 235 in the Western Cape, 119 in Gauteng, 136 in KwaZulu-Natal, 43 between the Port Elizabeth Station and Uitenhage in Nelson Mandela Bay, and 41 between East London Station and Berlin Buffalo City. The Metrorail operations between Kraaifontein and Malmesbury in the Western Cape and the services in the Eastern Cape include train authorisation by centralised traffic control (CTC) and colour light signalling. PRASA is currently planning a 4-kilometre line to Cape Town International Airport. A new line from Duffs Road has been completed and is already operational.</td>
</tr>
<tr>
<td>Gautrain</td>
<td>The Gautrain infrastructure belongs to the Gauteng provincial administration. The rail connection comprises two links: one between Tshwane and Johannesburg and another between OR Tambo International Airport and Sandton. Apart from the three terminal stations on these two links, seven other stations are linked by approximately 80 kilometres of rail along the route. The standard gauge lines allow for a maximum speed of 160 kilometres per hour. The following extensions are currently being considered under the Gautrain Phase 2 development: Extension 1 – new line from Mamelodi in Tshwane to Naledi in the south of Johannesburg; Extension 2 – extensions from OR Tambo International Airport to Boksburg; Extension 3 – new connection between Randburg and Sandton.</td>
</tr>
<tr>
<td>Kei Rail</td>
<td>The Eastern Cape provincial administration leases the 281-kilometre Kei Rail line between Amabele and Mthatha from Transnet. The province upgraded the line and introduced a limited passenger service – strategic planning includes the offering of freight services that will support development in the northern areas of the province.</td>
</tr>
<tr>
<td>Transnet Freight Network (TFR)</td>
<td>Transnet’s TFR is well developed and connects to the strategic rail lines of landlocked neighbouring countries. The rail gauge (Cape) allows interconnectivity and the mutual use of rolling stock and traction between neighbouring countries without any infrastructure complications. A record high of 857 000 twenty-foot equivalent units (TEUs) for freight transported on rail was achieved in 2013. In 2013/14, this network transported 83.1 mt coal, 18.5 mt mining minerals and chrome, 62.9 mt iron ore and manganese, 21.4 mt cement and steel, 11.1 mt agricultural products and bulk liquids, along with 13.4 mt for the automotive and container industries. The Transnet freight network consists of 31 000 track kilometres and 22 500 route kilometres. The main objectives are to: (1) provide capacity ahead of demand, (2) ensure the sustainability of development plans, (3) integrate port, rail and pipeline planning, (4) align the network with national road and electricity supply planning, (5) provide capacity through operational efficiencies before infrastructure provision and (6) ensure proper environmental and social integration.</td>
</tr>
</tbody>
</table>

TABLE 6-4: IMPORTANT RAIL NETWORKS IN SOUTH AFRICA
RAIL NETWORK CONDITION

The National Infrastructure Plan (NIP) states that the average condition of the core rail network is fair of which the coal and ore lines are classified as good and that the branch line network was classified as poor to very poor.
RAIL GAUGE

Rail gauge is defined as the distance between the inner sides of the two parallel rails. This distance then determines the wheel spacing on the rolling stock that can be safely operated on the line and has a major impact on vehicle dynamics, permissible axle load and vehicle size. In South Africa, there are basically three gauges, namely:

- **Cape gauge** at 1 067mm – the core network plus the majority of the branch line network (92.7 %)
- **Narrow gauge** at 610mm – some isolated lines on the branch line network (7 %)
- **Standard gauge** at 1 435mm – only the Gautrain passenger network (0.3 %).

The following factors are important when considering an appropriate rail gauge:

- **Regional and cross-border network connectivity with neighbouring countries** – Such network connectivity is an important consideration for regional inter-operability, especially for Transnet/PRASA shared infrastructure and branch line private operators, and economic development. In this sense, practically all main rail infrastructure in Southern Africa is Cape gauge.

- **Procurement** – It is sometimes faster and more cost-effective to procure systems and rolling stock from providers with an established gauge specification, leading to savings on development and design costs. However, each corridor and region is unique and will require specific development testing and specialised components that will increase costs over the stock items. However, billions have been spent recently on the recapitalisation of rolling stock for TFR and PRASA on the Cape gauge specification.

- **Installed legacy systems** – To change the gauge for a whole network will be extremely expensive and may not be practical or economically viable. With the majority of South African railways are built according to Cape gauge standards and the current rolling stock renewal plans of Transnet and PRASA are based on this gauge, the high costs associated with rebuilding the networks to a standard gauge design may prove detrimental to the economic competitiveness of rail transport. The counter argument is that, to remain competitive in terms of global best practice for heavy haul and passenger lines, the implementation of a standard gauge should be considered on merit.

- **Stand-alone lines** – The specifications for each line should be carefully considered and studied, based on forecasted traffic volumes, user requirements and, therefore, the purpose of the specific line. These specifications must support rail’s inherent strengths over road traffic, such as long-distance heavy haul and high-density high-speed passenger rail benefits.

- **Application** – Certain applications, such as high-speed passenger services, double-stacking and axle weight, can benefit from wider gauges.

Given the dominating factors of interoperability on the current network, the high investment needs to change infrastructure and the recent rolling stock investments by TFR and PRASA, it can be concluded that a wholesale change of the main railway network from Cape gauge to standard gauge is not financially viable. Strategic investment should be framed within the objective of increasing the effectiveness of the freight supply chain and the rapidness of the public transport system and enhancing modal optimisation. The mechanism to host this exists in the Private Sector Participation (PSP) Framework currently being developed.

For new or ‘green field’ lines, feasibility studies and business case scrutiny are required to consider the appropriate gauge on a case-by-case basis, giving due regards to the integration of the system while considering factors listed above (in the short term with a review considered over the long term). This issue should also be aligned with the Green Paper on National Rail Policy currently being developed by the DoT.
6.4.2 Outcome of rail transport infrastructure analysis and forecasting

CAPACITY CONSTRAINTS

The freight rail system is constrained by the following issues summarised in Table 6-5.

Figure 6-10 indicates utilisation of the 2007 rail network capacity by 2050 (middle scenario).

### Table 6-5: Freight Rail System Constraints

<table>
<thead>
<tr>
<th>Freight Rail Issue</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance and running costs</td>
<td>World-wide, general rail freight is considered competitive with road over distances of more than 600 kilometres and where the saving in running costs becomes more than the end-point handling cost. A great number of the potential consumers in South Africa fall outside these conditions.</td>
</tr>
<tr>
<td>Lack of general freight products and services</td>
<td>There is a lack of general freight products and services. It is expected that the utilisation of rail freight services can be improved with the existence of reliable and consistent delivery time schedules and delivery services that are priced competitively. These issues are to be considered in the Green Paper on National Rail Policy currently being developed by the DoT.</td>
</tr>
<tr>
<td>Heavy haul commodity prices and demand</td>
<td>The expansion of the heavy haul lines is being hampered by non-viable expansion financial business cases, based on current low commodity prices and demand.</td>
</tr>
<tr>
<td>Intramodal competition</td>
<td>A lack of intra-modal competition results in sub-optimal levels of innovation and customer satisfaction. The Road-to-Rail Strategy developed by Transnet will propose steps to correct intra-modal competition between road and rail. It should, however, be noted that intra-modal competition is only applicable to branch lines and not to the core network, which is and will continue to be owned and operated by Transnet. The mechanism to host the intra-modal competition on branch lines exists in the PSP framework and Green Paper on National Rail Policy currently being developed by the DoT.</td>
</tr>
<tr>
<td>Rolling stock shortage and conditions</td>
<td>The current operations are partly constrained by a shortage of new rolling stock for expansion purposes and the use of older rolling stock with its associated lower reliability and higher maintenance costs. Expansion plans, therefore, require the procurement of new rolling stock, along with the refurbishment or replacement of the current fleet, to meet the required reliabilities. This will contribute to rail corridors meeting their intended rail capacity.</td>
</tr>
<tr>
<td>Axle loading limitations</td>
<td>The limitation of axle load design on the lower specification general network feeding the heavy haul lines does not allow for the optimum use of higher heavy haul axle loading.</td>
</tr>
<tr>
<td>Rail condition</td>
<td>Imposed speed restrictions due to poor in situ formation conditions, maintenance shortcomings, localised weather conditions and old, less reliable rail infrastructure curtail the efficiencies of current corridors and lines.</td>
</tr>
<tr>
<td>Rail gauge</td>
<td>The 1 067 mm gauge (Cape) of the freight network limits the travelling time of passenger trains due to speed limitations, along with the lower payload tonnages per wagon associated with axle loading limits. Double-stacking is also not possible on this gauge, which imposes a constraint on general freight delivery and commodity export services.</td>
</tr>
<tr>
<td>Corridors</td>
<td>The corridors that currently experience capacity constraints from the freight customers’ point of view are the:</td>
</tr>
<tr>
<td>Operational inefficiencies</td>
<td>Improvements in operational efficiencies can be gained through the latest operational management tools, rolling stock technologies, condition-monitoring equipment, signalling systems and sufficiently skilled maintenance and operational staff.</td>
</tr>
<tr>
<td>Misalignment between capacity and demand</td>
<td>The improvement of rail freight capacity is not aligned with the needs of emerging users versus established clients, which forces traffic onto the default mode of transport, namely roads. The inability of emerging users to gain access to reserve capacity (unallocated capacity for established clients) creates the perception of a lack of capacity on the network.</td>
</tr>
</tbody>
</table>
FIGURE 6-10: UTILISATION OF THE 2007 RAIL NETWORK CAPACITY BY 2050 (MIDDLE SCENARIO)
PROJECTIONS FOR FUTURE YEARS

Transnet developed a comprehensive market demand strategy (MDS) to analyse the movement of freight. The model takes into account the potential growth of the different commodities, the minimum transport distance over which rail can be competitive, and the potential market share of each commodity.

Based on the modelling and analysis referred to above, Table 6-6 summarises the railway lines likely to experience capacity constraints in the future.

6.4.3 Critical strategies and interventions proposed for rail infrastructure

The following subsections summarise the critical strategies and proposed interventions to address the prioritised needs of rail infrastructure in South Africa to realise the NATMAP 2050 transport vision.

Figure 6-11 illustrates the integration between the NATMAP 2050 existing and emerging corridors and the rail infrastructure proposed interventions to ensure that these corridors and other feeders into the system operate effectively and efficiently.

STRATEGIES PROPOSED FOR RAIL NETWORK INFRASTRUCTURE

- Rail gauge

  The NATMAP 2050 includes a detailed study on rail gauge. It found that, while standard gauge (1 435 mm) has some benefits, mainly in terms of speed and capacity (double-stacking), other issues, such as interoperability, capital investment to change to Cape gauge (1 067 mm) and massive current investment in Cape gauge-compatible rolling stock, are prohibitive factors to change. The study concludes that the conversion of the existing network to standard gauge is not economically viable.

  Based on the various findings of this study, which highlight implications related to cost and interconnectivity, it is not recommended to convert existing Cape gauge lines to standard gauge lines. However, in the case of green field or new line expansion proposals, a case-by-case approach should be adopted, informed by appropriate feasibility work and business case analysis. Such line extensions should not be merged with existing Cape gauge infrastructure. However, interchange facilities (associated with passenger rail) at intersecting nodes and different gauge networks must be implemented to support customer journey reliability.

  Other factors to be considered:

  - Green Paper on National Rail Policy (currently being developed)
    All decisions regarding railway infrastructure should be aligned with this policy.

  - Rail gauge – African Union
    In 2007, the African Union, in conjunction with the Union of African Railways, resolved that standard gauge should be adopted for all new railways lines. This resolution must be read in conjunction with the aforementioned sub-section on rail.

  - Rail gauge – Transnet and PRASA
    After the directives by the AU, the need was expressed in South Africa to slowly transform to a standard gauge network using a step-by-step process to introduce new standard gauge lines on a master plan basis and not by a general conversion of the existing network. It was also stated that conversion to standard gauge on a large scale is not economically viable and should, therefore, not be attempted (National Transport Master Plan 2005–2050). Continuous investment and maintenance should be undertaken on the existing network, together with a constant lookout for opportunities to migrate portions to standard gauge network, where sensible. TFR estimated the costs of conversion to standard gauge in the order of US$30 billion (2006), excluding costs associated with terminals, handling facilities, sidings and operational constraints during such a conversion.

  Transnet and PRASA currently have large expansion plans in the form of expanded rail infrastructure and the procurement of new rolling stock appropriate to Cape gauge infrastructure. Transnet is currently studying capacity expansions of the three heavy haul and existing Waterberg Cape gauge lines.

  In addition to the infrastructure plans, Transnet has placed orders for various new Cape gauge locomotives,

<table>
<thead>
<tr>
<th>RAILWAY LINE</th>
<th>CAPACITY CONSTRAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sishen–Saldanha Ore Line Base Year</td>
<td>The ore line started experienced capacity constraints during base year 2010 and are still undergoing studies to improve capacity.</td>
</tr>
<tr>
<td>Lines Requiring Improvement by 2030</td>
<td>In 2030 the Sishen-Saldanha ore line will require significant infrastructure improvements including the line between Rustenburg-Pretoria-Emalahleni. The line between Kimberley and Lime Acres will require new infrastructure, as will the line between Ermelo and Piet Retief.</td>
</tr>
<tr>
<td>Lines Requiring Improvement by 2050</td>
<td>In 2050 the Saldanha-Sishen line will continue to require significant infrastructure improvements, as will the line between Durban and Ladysmith, Richards Bay and Komatiepoort, and the line between Lephalale and Emalahleni. The Hotazel-Port Elizabeth line will also experience capacity constraints and will require new infrastructure.</td>
</tr>
</tbody>
</table>

TABLE 6-6: FUTURE RAILWAY LINE CAPACITY CONSTRAINTS
which will operate on a variety of existing Cape gauge lines. This level of investment essentially locks out the implementation of standard gauge across the network. Over and above the infrastructure expansion plans in the metros of Johannesburg, Cape Town and Durban, PRASA is in the processes of procuring new Cape gauge rolling stock to overhaul its current aging fleet. Should green field or new line expansion proposals be considered, a case-by-case approach should be adopted, informed by appropriate feasibility work and business case analysis in alignment with the Green Paper on National Rail Policy currently being developed.

### Accessibility to the network

Accessibility to the national rail network for operators other than TFR and PRASA could increase the usage of the available capacity. Future emphasis on cleaner energy would also place more emphasis on rail transport. It should be noted that accessibility to the primary network of Transnet is not supported at national level – Transnet is of the opinion that operations must remain with TFR but supports competition on branch lines and the mechanism to support this exists in the PSP framework currently being developed.

### Development plans to improve the capacity of the current network

Interventions are proposed to improve the capacity of bottleneck sections ahead of demand. Transnet modelling indicates, in most cases, that additional capacity will be required before the periods indicated by the NATMAP 2050. The following proposed lines will be needed to expand the capacity of the TFR network:

- **Lephalale – Mahalapye**: A new line to link the Waterberg coal fields with the proposed Trans-Kalahari corridor.
- **Hamelfontein to Botswana coal fields**: A new Cape gauge heavy haul line between Ermelo and Botswana, via Lephalale.

The following passenger rail transport line interventions are proposed:

- **Johannesburg–Durban high-speed line**: The project will provide a high-speed passenger service between Johannesburg and Durban – with services to major nodes along the route. A service for time-sensitive freight will also be provided, and a long-term need for a third line in the existing corridor has been identified.
- **Johannesburg–Musina high-speed line**: The project will provide a high-speed passenger service between Johannesburg, Polokwane, and Musina, with services to major nodes along the route.
- **eMalahleni and Steve Tshwete link with Moloto rail corridor and Gautrain**: An interregional commuter rail network must be developed to link the Highveld high-density urban areas of eMalahleni and Steve Tshwete with Pretoria, also linking with the Moloto rail corridor (see below) and the Gautrain system between Pretoria and Johannesburg.

### Maintenance of rail infrastructure

The maintenance standards required for freight trains are different from those required for ride comfort and speed for passenger trains. The recovery of the maintenance and capital cost between Transnet and PRASA should be addressed as well as any future operators in infrastructure.

### Branch lines

Transnet is preparing to concede more branch lines to private business to boost its road-to-rail tonnage by 18.9 million tonnes this year and made its first call for proposals for one of its branch lines linking Kimberley and De Aar in the Northern Cape in April 2015. The DoT supports the revitalisation of branch lines.

### Balancing the different needs of rail freight and passenger demand

In the implementation of new railway lines, it should be considered whether it is possible to serve both freight and passenger demand. The balancing act of the needs of freight and passengers must be carried out with due consideration to financial implications. Business cases must be developed to ensure value for money. Any railway line that will allow mixed traffic should be designed and proven economically feasible before any final decisions on implementation are made. The different needs between rail freight and rail passenger infrastructure are reflected in the following standards that are proposed for future rail infrastructure developments. It is proposed that the standards be considered on a case-by-case basis – little will be gained by imposing standards that will cost a lot for a very little gain in the context of funding uncertainty:

- High-speed rail passenger systems should be designed to the following characteristics:
  - For metropolitan, urban and sub-regional passenger rail corridors of less than 200 km, average travelling speeds should be between 150Km/h and 200Km/h; but also allowing maximum speeds up to 300Km/h along specific long-distance sections.
  - For intercity rail passenger systems in excess of 200kms, average travelling speeds should be between 250pkh and 300Km/h; with maximum speeds of 400Km/h for specific uninterrupted sections.
  - Any railway line that will allow mixed traffic should firstly be designed to give preference to the origins and destinations of passengers; and secondly that maximum speeds for both passenger and freight should be adapted to the maximum speeds that will be allowed for freight operations.
  - All high-speed passenger rail systems should allow freight traffic limited to no more than 17tonne/axle (packages, pallets and perhaps low-mass hybrids of pallets/containers).

- High-speed rail freight systems should be designed to allow:
  - Average speeds of between 60Km/h and 100Km/h, and maximum speeds of 120Km/h.
Freight operations on lines that are used for mixed passenger and freight operations should allow for operating speeds of not less than 100Km/h and should not allow heavy freight loads. Rail design should allow for axle loads and gradients that will not exceed container traffic.

**PROPOSED INTERVENTIONS FOR RAIL NETWORK INFRASTRUCTURE**

**Freight transport interventions**
The 2050 package strategy envisaged for freight rail includes an optimised road/rail modal split strategy and identifies rail infrastructure development interventions. Alternatives to optimise road/rail infrastructure assets to provide greater efficiency at lower cost will be executed through the development of this detailed strategy and specification of regulatory measures and a time programme. This will include the following alternatives:
- A monitoring programme
- An information database as part of the DOT central database system, supplemented by a legalising process to enforce the strategy to obtain an acceptable balance between road and rail freight.

**Proposed passenger rail interventions**
Categories need to be introduced for passenger rail, ranging from metropolitan, suburban low-speed commuter and intercity medium- and low-speed systems to intercity high-speed systems. These passenger rail categories are classified in terms of service distance, speed, station spacing, and target markets.

It is envisaged that, by 2050, all metropolitan areas, high-density and high-income district centres will have rail commuter systems. Based on modal threshold specifications, residential areas will connect with CBDs (central business districts). Similarly, linkages and the integration of various passenger transport systems and modes will be implemented by means of transfer facilities and ticketing systems.

Profiles will be specified for rail systems in metropolitan/urban areas for intercity medium-speed and medium-distance corridors and for high-speed systems along all national corridors. All international airports will be linked to city centres and other rail commuter systems. Rail priorities and programmes for various long/medium-distance high/medium-speed corridors are:
- Durban–Free State–Gauteng (N3) corridor (Gauteng–KwaZulu-Natal)
- Moloto corridor to Mpumalanga
- N1 (Gauteng–Limpopo–Free State–Western Cape)
- Moloto corridor (second phase to Limpopo)
- North–west corridors to Gauteng
- Cape peninsula – northern districts
- N4 corridor from Tshwane to Mbombela (2020–2030). N2 tourism corridor (Cape Town–George–Nelson Mandela City–eThekwini), ThabaNchu–Bloemfontein corridor, and other similar medium-distance commuter corridors that are still to be subjected to feasibility studies
- Interregional connections with Zimbabwe (extension of N1 rail corridor via Beit Bridge to Harare), Namibia extension of N1 corridor (via Bloemfontein, Kimberley, Upington, Windhoek), Mozambique extension of N4 corridor (via Mbombela to Maputo), Botswana extension of Platinum corridor (via Rustenburg, Zeerust, Gaborone).

**Waterberg Mpumalanga–KwaZulu-Natal rail link (part of SIP1)**
Unlocking the northern mineral belt with Waterberg as catalyst. In July 2014, Transnet issued tenders to allow for formal investigations into the rail requirements of the Waterberg region. Transnet is seeking a prefeasibility study on the Waterberg infrastructure and feasibility studies on rail infrastructure linking the coal-mining town of Lephalale in Limpopo to Ermelo in Mpumalanga, which is a key coal-logistics junction. The studies are expected to be finalised by August 2015 and will form part of a plan to connect the coalfields in Waterberg, as well as those in Botswana, with export terminals in KwaZulu-Natal, as well as with Eskom’s power stations.

**SIP2: Durban–Free State–Gauteng logistics corridor**
According to freight forecasts, it is expected that, in the next 25 to 30 years, containers moving from the port of Durban to Gauteng will grow almost eightfold, from about 1.75 million today to 13 million a year. Without a new rail line, these expected increases in freight will see a disastrous mushrooming in the number of freight trucks travelling between the port and South Africa’s economic hub. The existing rail line is in a poor condition and has speed limits in some places of as low as 50km/h. The new rail line will be built to have a maximum speed of 120km/h and will largely be dedicated to carrying freight.

**SIP3: South–east node and corridor development**
The upgrading of port and rail capacity, the construction of a new dam in Umzimvubu in the Eastern Cape, the construction of rail infrastructure to transport manganese from the Northern Cape to Port Elizabeth, the construction of a manganese sinter facility in the Northern Cape and a smelter in the Eastern Cape.

**SIP5: Saldanha–Northern Cape development corridor**
The expansion of rail and port infrastructure in the Saldanha area, the construction of industrial capacity at the back of these ports (including a possible industrial development zone), the strengthening of maritime support for the gas and oil activities along the western coast, and the expansion of iron ore mining production.

**SIP10: Electricity transmission and distribution**
The alignment of freight rail line development with the 10-year energy transmission plan.

**SIP11: Agri-Logistics & Rural Infrastructure**
Investment in infrastructure such as storage facilities, transport links to main networks, the fencing of farms, irrigation schemes to poor areas, agricultural colleges, processing facilities (including abattoirs) and rural tourism. The expansion of transport links to main networks (rural roads, branch lines, ports).
SIP17: Regional integration for African cooperation and development
Investment in mutually beneficial projects in the free trade area, encompassing east, central and southern Africa. Projects involve transport, water and energy.

PRASA Rolling stock renewal programme
PRASA is undertaking a R123 billion investment over a 20-year period to renew its rolling stock fleet. This programme will entail the introduction of more than 7 000 new rail vehicles for passenger transport purposes. The entire PRASA fleet is expected to be fully replaced by 2034.
A R51 billion contract for the first phase of the programme was signed with Gibela Rail Transportation in October 2013 and commercial close on the contract achieved in April 2014. The contract is for the supply of 600 passenger trains, comprising 3 600 coaches, for delivery between 2015 and 2025.

PRASA passenger rail infrastructure improvements
An estimated R15.2 billion has been set aside for PRASA to expand and develop its network. About R12 billion has been set aside by PRASA to upgrade and improve its stations across South Africa. An estimated 23 stations were set to undergo modernisation in 2013, and 64 in 2014. A third phase will involve the modernisation of 50 intermediate, small and halt stations. A further R7 billion has been set aside for the improvement of bridges and platforms.

PRASA signalling system (Gauteng/KwaZulu-Natal)
The project is valued at an estimated R17 billion to implement a new, technologically advanced signalling system by 2018. The project will include the modernisation of the rail signalling, communications and train management systems in high-volume corridors such as Naledi in Soweto, Pretoria to Johannesburg; Mabopane to Pretoria; Mamelodi to Pretoria; KwaMashu–Durban–Umlazi; Khayelitsha, Mitchells Plain and Philippi to Cape Town; Kraaifontein–Belville–Cape Town; and Simon’s Town to Cape Town.

Transnet rolling stock renewal programme
Transnet is undertaking massive infrastructure and rolling stock investments at TFR as part of its market demand strategy to facilitate the ambition of increasing the volume of freight transported on rail. These investments include expenditure on TFR’s coal, iron ore and manganese export capabilities, as well as on its general freight business. As part of this expenditure, Transnet awarded locomotive supply contracts valued at R50 billion in early 2014.
Contracts for the supply of 599 electric locomotives and 465 diesel locomotives for GFB, which form the so-called 10-64 programme, have been awarded to consortiums led by four global manufacturers – GE, China North Rail (CNR), CSR and Bombardier Transportation. The first locomotives that form part of the 10-64 programme will be delivered in September 2015 and the final batch in February 2018.
In addition to its locomotive-related investments, TFR is undertaking a wagons fleet programme. In the financial year that ended March 2014, 3 281 wagons were built at Transnet facilities across the country.

Gautrain system enhancements
In 2014, a prefeasibility study was commissioned and successfully carried out for the following extensions under the Gautrain Phase 2 development:
- Extension 1: New line from Mamelodi in Tshwane to Naledi in the south of Johannesburg
- Extension 2: Extensions from ORTIA to Boksburg

Other system enhancements in the pipeline include the provision of additional parking at certain stations and the lengthening of the OR Tambo International Airport station to allow for four-and-a-half carriages to open on the platform, up from two-and-a-half carriages.

Gautrain rolling stock

A business case is to be developed for the buying of new rolling stock to further increase capacity. The current Gautrain fleet consists of 96 rail cars and reconfigured seating is being considered for the Pretoria–Johannesburg line. Also under consideration is a special, quick-turnaround service on the system’s busiest route, between the Sandton and Centurion stations.

Gautrain expansion routes
Four possible expansion routes are being considered:
- Link from Park station, underneath the city, to Westgate
- Link from Rhodesfield station to Boksburg
- Link from Sandton station to Randburg and Honeydew.
- Link from Naledi, Soweto, to Mamelodi, through either the proposed Samrand station or the existing Midrand station.

Moloto Road integrated rapid rail solution
An integrated rapid rail solution is to be implemented on the Moloto corridor, which carries more than 35 000 commuters daily to Gauteng.

Tamlo Springs inland port and logistics gateway super terminal
Tamlo Springs is planned to accommodate a new state-of-the-art rail terminal facility as well as an intermodal rail yard capable of handling point-to-point movement of freight using block trains of up to 2km in length. This is possible because the Tamlo Springs property has an existing dual-directional freight rail line that runs along the north western boundary for approximately 3.5 km.

Manganese export line
TFR is developing the rail network between the manganese-rich Northern Cape and the Port of Ngqura in the Eastern Cape, to become the utility’s third heavy haul export channel. The development aims to increase South Africa’s annual manganese export capacity to 16 million tonnes. The business case for this expansion was completed in November 2013. Earlier in 2013, Transnet indicated that TFR would invest R10.8 billion between 2012/13 and 2018/19 in rolling stock and infrastructure to
support the manganese corridor project. The manganese export line development also involves port-related expenditure, including at the Ngqura manganese terminal.

**Cross-border rail corridors**

There is a strong link between rail and the extractive commodity sectors that are considered key drivers of economic growth in Africa. A regionally linked rail network will enable the more efficient transport of these commodities to the export centres, improving the region’s supply chain capability and enhancing its level of international competitiveness. The long-planned South Africa–Swaziland rail link is an example of interregional cooperation focused on the development of symbiotic rail corridors.

**South Africa–Swaziland rail link**

A prefeasibility study was completed in March 2013 and feasibility studies for South Africa and Swaziland’s R17 billion rail link was completed end 2014. Construction is estimated to commence in 2017. The railway line is set to increase the rail capacity of general freight and coal exports. It will link Lothair in Mpumalanga with Sidvokodu in Swaziland and free up capacity on Transnet’s network, allowing it to move additional coal to the Richards Bay coal terminal. Its construction includes a new single Cape gauge line covering 146km to be built by Transnet. It will have an initial capacity of 15 million tonnes a year. The rail link is critical for the flow of goods in the region. The Swaziland connection will enable TFR not only to remove the 12 general freight trains operating daily on the corridor but also to operate the coal line exclusively on heavy haul principles. The link will divert general freight currently being moved on the Ermelo–Richards Bay line through Swaziland and, together with the introduction of new operating solutions, can potentially raise the coal export corridor’s capacity to 120 million tonnes. The completion of the first tranche of 16 million tonnes a year of additional capacity is expected in 2017/18. A further two tranches will increase capacity of the link up to 31 million tonnes a year and finally to 42 million tonnes a year.

The following proposed interventions are provincially specific:

- **Gauteng**
  - Johannesburg–Durban high-speed line (SIP 2)
  - Develop a regional passenger rail system: N4 corridor (Pretoria–eMalahleni–Middelburg–Mbombela–Kaapmuiden)
  - Develop a regional passenger rail system: N12 corridor (Johannesburg–Delmas–Ogies–eMalahleni)

- **Western Cape**
  - Ore line improve capacity (SIP 5)

- **KwaZulu-Natal**
  - Richards Bay–Piet Retief: Improve the capacity of the coal line (SIP 1)
  - Johannesburg–Durban high-speed line (SIP 2)

- **Limpopo**
  - Moloto Jane Furse: Extend new Moloto rail corridor
  - Pretoria–Polokwane high-speed rail

- **Mpumalanga**
  - Regional rail passenger system: R40/R538
  - Develop regional rail passenger system along the N4 corridor (Pretoria–Lowveld)
  - Pretoria–Moloto new medium-speed rail line and passenger service

- **Northern Cape**
  - Hotazel–Kamfersdam (Kimberley) line upgrade (SIP 3)

- **North West**
  - Development of a regional passenger rail system on the N4 corridor
  - Development of a regional passenger rail system on the N12 corridor

- **Eastern Cape**
  - Cookhouse–Addo line upgrade
  - Noupooort–Cookhouse line upgrade
Figure 6-11: NATMAP SHORT-TERM RAIL INFRASTRUCTURE INTERVENTIONS
6.5 Aviation Infrastructure

6.5.1 National Airports Development Plan (NADP)

The NADP has been developed as an outcome of the National Civil Aviation Policy (NCAP) to address gaps between the current airport network and the future desired state. The NADP aims to guide and support both overall network planning and the development of individual airports integrated within their broader spatial and transport contexts, in consultation with key airport stakeholders.

6.5.2 National Airspace Master Plan (NAMP)

The NAMP, endorsed by the Director of Civil Aviation in 2010, introduces strategies to achieve a long-term (15 years plus) desirable future. It is the highest level of strategic guidance for use in developing and implementing airspace and associated air traffic management (ATM) initiatives. The Civil Aviation Regulations (CARS) provide the regulatory framework for the establishment of the National Airspace Committee (NASCOM) and for the designation and classification of airspace.

The NAMP provides the strategic view and direction of airspace organisation and management within South Africa. The airspace organisation function will provide the strategies, rules and procedures by means of which the airspace will be structured to accommodate the different types of air activity, traffic volume, differing levels of service and rules of conduct. The organisation, flexible allocation and use of airspace will be based on the principles of access and equity. The NAMP also supports regional interoperability and harmonisation.

6.5.3 Aerotropolis

The logic behind the aerotropolis concept is that airports offer connectivity to suppliers and customers across the globe. Many of the businesses around airports can often be more dependent on distant suppliers or customers than local ones. An aerotropolis encompasses a range of commercial facilities supporting both aviation-linked businesses and the millions of air travellers who pass through the airport annually. In modern cities, airports have become major drivers of urban form, economic activity and city competitiveness. The aerotropolis aims to take advantage of these changes and optimise the positive effects airports can have on the economy and on communities.

An aerotropolis develops in concentric rings around the airport. It consists of hotels, conference facilities, offices, retail outlets, residences and light manufacturing and distribution facilities for industries that rely on speed to market for their competitive advantage. It is important to make sure that development around airports is done in a planned manner to maximise economic benefit rather than to allow ad hoc expansion. This requires city and airport authorities to develop a common vision for the future and a plan that enables airports to become major drivers of local economic development. Essentially, the aerotropolis is an economic development strategy designed to increase competitiveness in global markets, leveraging the access that air travel and air freight provides to global clients.

The aerotropolis serves an increasing number of aviation-oriented businesses and commercial service providers to cluster around the airport and outward along strategic highway corridors. The aerotropolis creates an environment where air travellers and locals can work, shop, meet, exchange knowledge, conduct business, eat, sleep, and be entertained without traveling more than 15 minutes away from the airport. The aerotropolis also typically includes free trade zones (FTZs) providing certain incentives for businesses located within this business space. This concept is currently being developed at the OR Tambo International Airport (ORTIA) and is also being considered for at least the Cape Town International Airport (CTIA) and the King Shaka International Airport (KSIA).
6.5.4 Overview of aviation infrastructure

Airports in South Africa come in varying sizes and configurations that are usually determined by the function of the airport and the size of the population it serves. Functional categories in South Africa include the type of service provided – international, domestic or local transport services, military airports, heliports, and the size of the aircrafts. Dedicated freight airports do not exist in South Africa. The National Airport Development Plan (NADP) has been developed in response to the Draft White Paper on Civil Aviation Policy (NACP) as a plan to address gaps between the current airport network and the future desired state. The NADP highlights that the network includes more than 1500 airports and airfields, of which 135 are licensed (10 internationally) and 50 voluntarily registered. Ownership is indicated as 9 ACSA, 9 provincial government, 33 military, 100 municipal and the remaining majority as private. Information related to runway capacity, rescue and firefighting provision and other facilities is summarised in NADP.

Airspace, airport network planning and individual airport planning are addressed in the NADP and NAMP.

Figure 6-12 indicates the 10 licensed international airports in South Africa, along with the remaining domestic airports that form part of the ACSA portfolio, as well as the network of registered, military and unlicensed airports.

FIGURE 6-12: AIRPORTS IN SOUTH AFRICA (Source: NADP, 2015)
6.5.5 Outcome of aviation infrastructure analysis and forecasts

South African airports are generally well developed and compare with international standards – particularly the Code D and above airports and the others that are used for international passenger and freight traffic. Airports Company South Africa (ACSA) often features in the SkyTrax awards, including African Airport of the year 2014. Other comparative standards include the runway and terminal capacities, equipment, air traffic control, and other support services and systems.

The NATMAP 2050 includes demand projections at airports that are based on various forecast models or methodologies and the next section summarises the required strategies and interventions.

6.5.6 Critical strategies and interventions proposed for aviation infrastructure

The NATMAP 2050 provincial and consolidated reports provide a breakdown of each intervention per province. The following subsections summarise the critical strategies and interventions proposed to address the prioritised needs of aviation infrastructure in South Africa. The initiatives identified in the National Airports Development Plan (NADP) (v24 April 2015) refers along with the 10 guiding principles highlighted.

Figures 6-13 shows the short-term aviation infrastructure interventions on the current network.

STRATEGIES IDENTIFIED FOR AVIATION INFRASTRUCTURE

- **International airports**
  Manage the assessed requirement, license process and land preservation for a third international airport in Gauteng to take over some of the services provided by the OR Tambo International Airport and the Lanseria International Airport before 2040.
  Manage the assessed requirement, license process and land preservation for a second international airport in the Western Cape to alleviate capacity constraints at the Cape Town International Airport before 2050.
  The airport master plan is being updated and should be utilised to consider the requirement of a second international airport in KwaZulu-Natal.
  International airports in metropolitan areas must be linked with a scheduled bus rapid transport (BRT) or similar rapid transit system or even medium-speed local or regional rail systems, with consideration of check-in services.
  The concept of an aerotropolis at international airports – in other words, the creation of a city in which the layout, infrastructure, and economy are centred on a major airport. The merit of the concept should be investigated further in future NATMAP 2050 processes.

- **Domestic airports**
  Usage of domestic airports to alleviate the forecasted growing demand at the three major international airports.
  An example is the Lanseria International Airport, which absorbed some of the demand for air transport in Gauteng and alleviated the pressure on the OR Tambo International Airport. This can coincide with a restriction on the minimum aircraft size using the three major international airports, which must coincide with planned provision for general aviation elsewhere.
  Consideration of public service airports.

- **Port Elizabeth Airport**
  The possible expansion of the Port Elizabeth airport to a future Code E international airport.

- **Country points of entry**
  Revisit the decision to limit the designated points of entry into South Africa to only 10 airports. This will favour the larger international airports and avail airspace for increasing other services.

- **Air safety and air traffic control**
  Air safety and air traffic control at all airports are non-negotiable. Suitable and well-maintained equipment must be high priorities.
  Airport network planning, along with ownership, operating and funding models, must be reviewed in accordance with the NADP and NAMP principles.

PROPOSED INTERVENTIONS FOR AVIATION INFRASTRUCTURE

- **OR Tambo International Airport**
  The airport master plan is being updated.
  Capital expenditure of R55 billion is planned over the next ten years (2015–2025), of which R46 billion is for new capacity, including midfield enablement, and R9 billion for maintenance/refurbishment/replacement.

- **Durban aerotropolis/KwaZulu-Natal aerotropolis**
  The recent rapid expansion at the King Shaka International Airport and surrounding Dube TradePort has made this area a natural selection for further development into an aerotropolis. This area is considered to be turning into a major trade and business hub in sub-Saharan Africa right on the doorstep of KwaZulu-Natal’s biggest city and primary manufacturing centre, Durban.
- **Cape Town aerotropolis**
  The Cape Town International Airport (CTIA) is currently exploring options to develop an aerotropolis as part of a general strategy to unlock the growth potential of Cape Town and the Western Cape. CTIA has the opportunity to be a catalyst of economic development for Cape Town and the Western Cape. Global research shows that every long haul destination sustains around 3 000 direct, indirect, and catalytic jobs, and that an increase in aviation by 10%, results in a 2% growth in the regional economy.

- **N8 airport development corridor**
  The development to be undertaken by the Mangaung Metropolitan Municipality will be the single largest mixed development initiative ever undertaken by the municipality. The Braam Fisher Airport forms a key node along the N8 corridor, which the Mangaung Metropolitan Municipality has identified as one along which development should be promoted. ACSA has identified 142ha of land for development around the airport. This development is expected to take place in two phases. Phase 1, the Boulevard phase, offers about 44ha of immediately available land with a bulk of approximately 200 000m², including an international convention centre, while Phase 2, the grassland phase, offers 98.4ha with just over 500 000m² of bulk and includes a cargo terminal. The airport node development will also be significant in the overall development of Botshabelo and Thaba Nchu, as it will generate the revenue necessary for the cross-subsidisation of critical projects like the Botshabelo/Thaba Nchu node.

- **Cape Town International Airport**
  Re-aligned runway construction is expected to commence in 2016 to increase taxiway, apron and terminal expansion options in the future. An airport master plan update is expected before 2020. An area at the airport known as “Precinct 3” will be used for commercial development. The airport has issued a request for proposals for the construction of a hotel and an office park.

The following interventions are deemed critical and provincially specific:

- **Gauteng**
  Study to determine the need of a second major airport in Gauteng

- **Western Cape**
  Feasibility study for a second airport near Cape Town

- **KwaZulu Natal**
  Upgrade infrastructure facilities at Richards Bay airport (runway, new terminal building, new apron)

- **Port Elizabeth Airport**
  Various upgrades, including terminal upgrade and improvements, parking, taxiways widening, runway extension

- **East London Airport**
  Various upgrades, including tower, land acquisition, aprons, runway extension

- **Kimberley Airport**
  Various upgrades, including terminal, parking

- **Kruger Mpumalanga International Airport**
  Construction of parallel taxiway

- **Polokwane International Airport**
  Prefeasibility study and construction of aero-city concept and repositioning of Polokwane International Airport
FIGURE 6-13: NATMAP SHORT-TERM AVIATION INFRASTRUCTURE INTERVENTIONS
6.6 Maritime Infrastructure

6.6.1 Ocean economy: Operation Phakisa Programme

South Africa is responsible for managing an ocean space that is greater than its land territory. Within the maritime space, the Operation Phakisa Programme aspires to implement an overarching, integrated ocean governance framework to ensure sustainable growth of the ocean economy that will maximise socio-economic benefits while ensuring adequate ocean environmental protection within the next five years.

Nine sectors were analysed as key priorities for South Africa’s ocean economy, of which the following four were selected as new growth areas with the objective of growing them and deriving value for the country. These are:

- Marine transport and manufacturing activities, such as coastal shipping, trans-shipment, boat building, repair and refurbishment
- Offshore oil and gas exploration
- Fisheries and aquaculture
- Marine protection services and governance.

The Operation Phakisa Programme has entered its implementation phase in early 2015.

6.6.2 Overview of maritime transport infrastructure

South Africa’s eight commercial seaports are managed and controlled by the Transnet National Ports Authority (TNPA) and the majority of the terminals are operated on a common user basis by Transnet Port Terminals (TPT), a business division of Transnet. The positions of these ports, along with the major road and rail corridors connecting them, are shown in Figure 6-14 below.
FIGURE 6-14: PORTS OF SOUTH AFRICA
Each port has a natural hinterland with a defined market that, to a certain extent, drives the nature of services, facilities, types of cargo handled at each port, and the synergy between the ports. The relative geographic locations, capacities, and specialisations of the ports are zoned into the following three regions:

- Western region: Saldanha, Cape Town and Mossel Bay
- Central region: Port Elizabeth, Ngqura, and East London
- Eastern region: Durban and Richards Bay.

Table 6-8 indicates the types of terminals and specialised facilities available at each of the ports.

The current planning framework of the eight multipurpose commercial ports in South Africa is based on a complementary relationship between the ports. The zoning of the three regions takes into account these areas’ relative geographic locations, capacities, and specialisations. (See Table 6-9).

| TABLE 6-8: TERMINALS AND SPECIALISED FACILITIES AT THE PORTS OF SOUTH AFRICA |
|--------------------------------|-----------------|-----------------|-----------------|
| PORT OF | SALIDANHA | CAPE TOWN | MOSSEL BAY | PORT ELIZABETH | NGQUARA | EAST LONDON | DURBAN | RICHARDS BAY |
| Region | Western region | Central region | Eastern region |
| Terminal types |
| Dry bulk | • | • | • | • | • |
| Multipurpose | • | • | • | • | • |
| Liquid bulk | • | • | • | • | • |
| Container | • | • | • | • | • |
| Car | • | • | • | • |
| Break-bulk | • | • | • |
| Fresh produce | • |
| Cold storage | • |
| Specialised facilities |
| Dry dock | • | • |
| Offshore mooring buoy | • |

| TABLE 6-9: ZONING OF REGIONS FOR COMMERCIAL PORTS |
|--------------------------------|-----------------|-----------------|
| REGION | DESCRIPTION |
| Eastern region (Durban and Richards Bay) | These two ports are complementary in that Durban focuses mainly on break-bulk cargoes, including containers. Richards Bay is largely focused on bulk cargoes, mainly coal for export. Combined, the two ports account for nearly 70% of the cargo shipped and landed at South African ports. |
| Central region (Port Elizabeth, Ngqura, and East London) | Smaller car terminals are located in Port Elizabeth and East London, and Port Elizabeth has dry bulk and container terminals. East London has the largest export grain elevator in South Africa and it has been converted to handle imports in addition to exports. Ngqura is a new port commissioned in the latter part of 2009 with an annual capacity of 750 000 TEU. |
| Western region (Saldanha, Cape Town, and Mossel Bay) | Cape Town has a container terminal and is world-renowned for the export of deciduous fruit, perishable and frozen products, and for its ashing industry. Saldanha is the deepest and largest natural port in southern Africa, and the largest iron ore exporting facility in Africa. It is the only iron ore handling port in South Africa and is the third largest tonnage handling port in the country. Mossel Bay is the smallest of the eight commercial harbours. It is the only port in South Africa that operates two off-shore mooring points within port limits and that serves as an oil rig supply boat base. |
6.6.3 Maritime infrastructure analysis and forecasting

The NATMAP 2050 analysis process has identified future infrastructure requirements by comparing the existing supply of transportation infrastructure with the future required demand. Table 6-10 indicates the issues identified through analysis and forecasting.

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| Challenges                     | The primary challenges relating to port transport infrastructure and interlinked operations are:  
• Port infrastructure that requires major repairs over the next 30 years  
• Capacity constraints at various port terminals  
• The provision of capacity ahead of demand  
• The long-term impact of the current planning framework strategy based on complementary elements of the ports and the zoning into three regions  
• The need for TPT to operate in a competitive environment to increase the utilisation of available capacity and improve efficiencies, taking into account the likely impact of the global terminal operators. |
| Cause of capacity constraints  | The NATMAP 2050 concludes that the current capacity constraints at some of the ports and terminals are a result of:  
• Under-investment in port infrastructure  
• A lack of equipment and skills  
• High berth occupancy rates  
• Limited land areas especially for container facilities  
• Limited water depths and width at entrance channels in port areas and alongside the quays. |
| Constraints impacting on future development | Constraints affecting planning for future port development across South Africa’s commercial ports include the:  
• Increasing demand for space in and around the ports  
• Resulting congestion, particularly in inland transport linkages.  
The early acquisition of additional land and the ensuring of the compatibility of adjacent land uses must be taken into account. There is also increasing pressure to provide improved integrated planning around the city and port interface. |
| Other issues                   | Other issues to be addressed include:  
• Maintenance of water quality in port areas  
• Visual impact of development, particularly container stack heights  
• Noise and light pollution.  
These and other environmental concerns need to be addressed early in the planning process to avoid delays in providing port capacity ahead of demand. |
| Bottlenecks                    | Specific bottlenecks relating to the service capacity of each port with the condition of infrastructure and the constraints were identified at each port. These are indicated separately in the following table. |
6.6.4 Critical strategies and interventions proposed for maritime infrastructure

The following section summarises the NATMAP 2050 port strategies to be considered for implementation in line with the Operation Phakisa Programme as well as the Green Paper on Maritime Transport Policy currently being developed by the DoT. Figure 6-15 shows the ports that will be impacted by the proposed interventions.

STRATEGIES IDENTIFIED FOR MARITIME INFRASTRUCTURE

- **Freight-handling activities**
  Seaport freight-handling activities are concentrated mainly in the eastern region ports of Richards Bay and Durban where, in 2014, the throughput was more than 60% of all port cargo handled in South Africa. The western region facilitates the second highest throughput in South Africa. Over two-thirds of all liquid bulk will continue to pass through the Durban, followed by Ngqura, and Saldanha where no new facilities are envisaged during the plan period. The facilities at Port Elizabeth are expected to be relocated to Ngqura in 2017 or earlier, depending on budget allocation.

- **Container facilities**
  Requirements for container facilities will be the key growth segment during the NATMAP 2050 period. Throughputs are likely to increase five-fold with the new Ngqura container terminal, which handled its first vessel in October 2009, providing the main catalyst. In 2007, across all categories of containers and direction of traffic, 67% was handled through Durban, 20% through Cape Town, while Port Elizabeth and East Landon handled 13%.

- **Ocean economy: Operation Phakisa Programme**
  With the NDP 2030 having identified the ocean economy as one of the key drivers to eliminate poverty and reduce inequality by 2030, the country’s ocean economy is estimated to have the potential to contribute up to R177 billion to South Africa’s GDP by 2033. In order to make full use of its oceans’ potential, the government is developing a blue economy strategy. A number of key areas such as aquaculture, marine transport, offshore oil and gas exploration will be crucial in growing the economy, providing much-needed jobs and improving prosperity while ensuring environmental sustainability and integrity. The need to review the National Ports Act No 12 of 2005 has been identified and will ensure that interim capacity is created to streamline the implementation of the Operation Phakisa Programme.

**PROPOSED INTERVENTIONS FOR MARITIME INFRASTRUCTURE**

- **Port of Durban**
  - Environmental impact assessment (EIA) of the options for container terminal expansion in Durban
  - Securing the current Durban International Airport site as a future seaport (agreement has been reached on price)
  - EIA for the development of a port on the site of the current Durban International Airport site at Reunion
  - Redesign and environmental and economic evaluation of the Bayhead container terminal (in progress)
  - Investigation and evaluation of an inland dry port to handle container traffic (in progress)
  - Investigation and evaluation of an alternative road route into the southern basin of Durban (in progress)
  - Replacement of certain compromised berths in the Port of Durban (in progress)

- **Port of Richards Bay**
  - Further consolidation and rationalisation of the dry bulk and break-bulk terminals on the northern side of the port
  - Planning and construction of one additional berth at non-coal dry bulk terminal, and at least three break-bulk berths
  - A detailed study of requirements for dedicated container handling facilities
  - Land acquisition to safeguard long-term developments, especially if major extensions at the Port of Durban do not go ahead.

- **Port of Ngqura**
  - A review of traffic projections with due regard to the Transnet hub strategy. The review should include the possibility of developing dedicated container handling facilities at Richards Bay (earlier than anticipated) to refine the timing and sequence of future developments.

- **Port of Port Elizabeth**
  - Consolidation and rationalisation of break-bulk and vehicle terminals after the relocation of dry and liquid bulk services to Ngqura.

- **Port of East London**
  - Identification of additional demand for port services.

- **Port of Cape Town**
  - Future expansion of the Port of Cape Town must be to seaward. The most immediate need is to widen the container stacking yard behind the container quays in the Ben Schoeman dock. This will also free up the Quay 500 area to accommodate the previously planned dry docking facilities. This, in turn, implies the filling in of the Elliot basin and the need to find alternative mooring accommodation for the small crafts. Critical projects are, therefore, the:
    - Widening of the container stacking yard
    - Implementation of maintenance projects
    - Relocation of fresh produce, dry bulk and multipurpose terminals to the Ben Schoeman basin
    - Provision of alternative small craft berthing
    - Allocation of sites for dry docking facilities
    - These projects are all essential to meet the immediate short-term growth in transport and ship repair demand.
- Port of Saldanha Bay
  Given the intention to increase the export of iron ore from the Northern Cape mines by 2018, it is imperative that the approval process of the National Environmental Management Act, 1998, be completed timeously. The intention is to increase the current levels of 32 million tonnes per annum to a final capped level of 94 million tonnes per annum by 2018.

- Port of Mossel Bay
  There are no critical interventions for Mossel Bay.

A 'South Africa Transport Blue Print for 2050' needs to be developed to achieve the proposed transport interventions and to serve as a benchmark for future developments. The aim should, therefore, be to focus on exactly what is envisaged for 2050 across all the main components of the South African transport system. The following provides highlights from the Ports and Marine Transport Blue Print.

- Harbours for international trade
  The development of Ngqura at Coega and Saldanha Bay as major ports could be considered exceptional events and a repeat of such new developments will call for similar special economic and land use events. The port of Ngqura will play an important transhipment role. Exceptions could be new port facilities for the supply of energy. A port such as Mossel Bay could be a candidate for major expansion and for handling gas by pipelines. The position of such ports could also be subject to the location of the source of oil and gas fields.

As a result of increased international trade and normal growth trends, all of South Africa’s ports require expansion of some kind or another. New capacity developments are mainly directed at the export focus areas of Transnet listed below but, in particular, bulk loads and containerisation.

The extent of growth calls for a Transnet strategy whereby specialised roles are allocated to specific ports by means of the regional grouping of port capacities. Accordingly, and as proposed above, Cape Town expansions could affect expansions at Saldanha Bay, while Durban and Richards Bay are grouped as the eastern coast port combination, and East London, Port Elizabeth and Ngqura represent the central coast port group.

While bulk handling is undertaken at a few specialised ports, containerised traffic is increasing and expanded facilities present a major challenge. Even ports specialising in bulk handling (Saldanha Bay) are considered for future container traffic but are subject to other considerations that relate to Cape Town harbour expansions. Nevertheless, future increases in international trade will call for an increased approach to port specialisation (Transnet – National Infrastructure Plan (NIP) June 2009).

- Break-bulk
  The following specialised roles are envisaged for break-bulk:
  - All current ports (excluding Ngqura) handle break-bulk. Richards Bay, Durban, and Saldanha are responsible for 90% of it, which is currently about 10 million tonnes per annum (mtpa).
  - In 25 years’ time, the volume will increase to about 23 mtpa and Ngqura will be added to the list as being responsible for 17% of the volume. Richards Bay alone is responsible for 60%.

- Dry bulk
  Dry bulk exports will increase from about 120 mtpa to 230 mtpa in 25 years – exported currently from Richards Bay and Saldanha Bay (90% of total), which are to remain export ports.

- Liquid bulk
  The current liquid bulk of 21 mtpa will increase to 40 mtpa. Durban and Saldanha are currently responsible for 73% of the traffic, which will be more evenly spread amongst all ports in the future. The spread will vary between 12% and 32% per port once the Port of Ngqura is added to the network.

- Containerisation
  Durban, Cape Town, and Port Elizabeth are currently the three main container ports with nearly 4 million twenty-foot equivalent unit (TEU) (2008/09). With the addition of Ngqura at Port Elizabeth to handle about 70% of what Durban would usually handle, the expectation is that containerisation will increase to 20 million TEU by 2034 from the same ports.

- Vehicles
  Durban, East London, and Port Elizabeth are the main ports for vehicles and will retain that role. The volumes handled in 2008/09 were 0.55 million vehicles and are expected to increase to 1.55 million vehicles by 2034.
FIGURE 6-15: CRITICAL AND HIGH-PRIORITY MARITIME MEGA INTERVENTIONS
6.7 Pipeline Infrastructure

6.7.1 Overview of pipeline infrastructure

The national pipeline network in South Africa currently spans the Western Cape, KwaZulu-Natal, Mpumalanga, Gauteng, and the Free State, and primarily serves the petroleum industries. Liquid fuels are produced at four crude oil-based refineries: Calref in Cape Town, Enref and Sapref in Durban, Natref in Sasolburg, and the synthetic fuels plants in Secunda and Mossel Bay. Figure 6-16 illustrates the existing and proposed national pipeline network in South Africa.

FIGURE 6-16: NATIONAL PIPELINE NETWORK – SOUTH AFRICA (Source: TRANSNET)
6.7.2 Pipeline infrastructure analysis

Pipelines are the most efficient and cost-effective means of transporting large quantities of liquids and gases over long distances in a safe and efficient manner. Pipelines play an important role in the NATMAP 2050 vision. There is, however, a number of constraints, which are summarised in Table 6-11.

6.7.3 Implications for pipeline infrastructure – strategies and interventions proposed

The new multi-product pipeline (NMPP) projects between the Durban harbour and various inland markets must be completed by 2015, while the supporting expanded inland network to distribute refined products should be developed systematically between 2012 and 2025.

Durban is currently the only port from which major pipeline traffic is dispatched. Ngqura in the Eastern Cape is the second envisaged port within the Transnet capital programme. Mossel Bay in the Western Cape will specialise in pipelines for gas. The implications of building a state-owned refinery in the Eastern Cape, with a possible pipeline to Gauteng, need further investigation. There is a possibility that the proposed refinery may skew the viability of further pipeline developments from KwaZulu-Natal ports. The proposed development is also questionable due to the lack of any local hinterland and the port’s distance from Gauteng. Another factor is the known impracticality of creating refining capacity in South Africa for the production of diesel.

The following sections summarise major pipeline strategies and interventions within the NATMAP 2050 planning and implementation period.

Any adjustments or additions to the current pipeline transport infrastructure will have an impact on the natural environment, as will the projected increase in utilisation. Careful consideration must, therefore, be given to the environmental consequences of major projects.

<table>
<thead>
<tr>
<th>CONSTRAINT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid fuel</td>
<td>Liquid fuel, especially diesel, is expected to run short in South Africa in the near future if there is no significant investment in pipeline infrastructure.</td>
</tr>
<tr>
<td>Diesel usage</td>
<td>There is a growing concern that the increasing usage of diesel by Eastern countries such as China and India will make diesel procurement difficult or very expensive.</td>
</tr>
<tr>
<td>Electricity</td>
<td>Given the current electricity constraints, there is an increasing risk that the South African economy will slow down, unless the existing pipeline infrastructure shortfalls are addressed.</td>
</tr>
<tr>
<td>Capital investment</td>
<td>Pipeline infrastructure requires very high capital investment – to date, the planned pipeline has not been implemented. One obvious result of the delayed expansion of the pipeline capacity is the more than 3 mtpa of fuels transported by road between Durban and the interior. Additionally, all distribution of petroleum products across Southern Africa occurs by road.</td>
</tr>
<tr>
<td>Infrastructure planning</td>
<td>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 Energy and Pipeline Systems Project (E&amp;PS Project), established by the Department of Public Enterprises in collaboration with the Department of Minerals and Energy, indicated that pipeline transport will continue to be the prerogative of government enterprises and that no private sector investment or involvement is envisaged in the future.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STRATEGIES PROPOSED FOR PIPELINE INFRASTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Policy</td>
</tr>
<tr>
<td>A comprehensive, integrated policy for pipeline ownership, operations, and development.</td>
</tr>
<tr>
<td>▪ Draft strategic fuel reserves implementation plan</td>
</tr>
<tr>
<td>The recent draft strategic fuel reserves implementation plan issued by the Department of Energy will impact on the need for storage terminals for final product and crude oil. This provides an opportunity for the development of mega terminals to achieve economies of scale and open the market up for independent terminal operators.</td>
</tr>
<tr>
<td>▪ Private sector participation</td>
</tr>
<tr>
<td>Public private partnerships (PPPs) contribute to the development of industries. Therefore, consideration should be given to the PSP framework and implementation plan currently being developed, which provides a mechanism for this process. Industry regulation is an essential component to take forward and ensure process in this regard.</td>
</tr>
<tr>
<td>▪ Regulation of pipelines</td>
</tr>
<tr>
<td>Pipelines currently fall within the regulatory responsibility of the National Energy Regulator of South Africa (NERSA), who currently regulates pipelines in terms of the Petroleum Pipelines Act, 2003 (Act 60 of 2003).</td>
</tr>
</tbody>
</table>
PROPOSED INTERVENTIONS FOR PIPELINE INFRASTRUCTURE

- **Maputo–Kendal pipeline**

  The National Energy Regulator of South Africa (NERSA) has awarded PetroSA a licence to construct a pipeline from Maputo (Mozambique) to Kendal (Gauteng). Investment in the pipeline sector is ongoing. The project entails the construction of a R5.8 billion 12-inch liquid fuels pipeline from the Mozambican Port of Matola in Maputo to Kendal via Nelspruit and the building of a petroleum storage facility at Nelspruit.

- **New multi-products pipeline (NMPP)**

  Transnet Pipelines have appealed to NERSA to construct and operate a new multi-products pipeline (NMPP) at a present-day cost of R12.66 billion. The project entails a 525-kilometre pipeline from Durban to Jameson Park in Heidelberg, Gauteng. According to the Transnet Annual Report of 2011, the NMPP construction is progressing in keeping with the revised plan. The Kendal–Waltloo, Jameson Park–Alrode and Alrode–Langlaagte sections of the pipeline were commissioned by Transnet Pipelines in May 2011.

  The MPP24 is replacing the 12-inch DJP and has a capacity of 8.7 billion litres per annum and, at full capacity, will be able to deliver 26.3 billion litres per annum. The MPP24 is aligned with the Energy Security Master Plan of the Department of Energy. The pipeline is 555km long and the system consists of a trunk line and two accumulator terminals, one on either side of the pipeline, i.e. TM1 in Durban and TM2 at Jameson Park in Gauteng. The coastal terminal (TM1) will receive product from various suppliers in Durban, from where the product will be injected into the trunk line. The scheduling of the trunk line will be driven by the demand in the off-take areas, the maximisation of batch sizes and the minimisation of interfaces between products.

  The product is received in the inland accumulator terminal (TM2) at Jameson Park, from where it is transported through various pipelines to oil industry storage depots.

  The inland terminal can also receive product from Natreff (Sasolburg) and Sasol 2 and 3 (Secunda). In exceptional cases, products can bypass the inland terminal for direct delivery to industry storage facilities. For the first phase of the implementation, the MPP24 will have five pump stations – one at TM1, three along the route and one at TM2. Adding additional pump stations to the system can increase its capacity. The interface or intermix will be stored at the Jameson Park accumulator terminal (TM2) until a batch can be scheduled to be transported by pipeline for processing at the refractionator at the Tarlton Depot.

  The MPP24 was constructed in accordance with best practice in the field of pipeline construction, reflecting the significant advances that have been made over the years in pipeline construction technology. The key issues that will impact on the timing of the expansions are:

  - The inland market demand growth
  - The ability of the inland refineries to supply a minimum base load of fuel
  - The building of a new pipeline from the proposed Mthombo refinery that could delay part of the phase 2 expansion to the 2030 to 2035 period
  - The security of supply considerations.

- **Biofuel from excess maize stocks**

  The potential for the production of biofuel from excess maize stocks has re-surfaced as a potential income generation source. The proposal relates to the construction of biodiesel plants at Matjhabeng and Bethlehem that are currently located along the refined products pipeline. The intention is, from the plants' 16 mtpa of excess maize production, to convert approximately 5 mtpa to biodiesel. Feasibility studies must include the impact on food security and prices and the integration of biofuel generation into the existing and future pipeline networks of South Africa.

- **Mthombo oil refinery at Port of Ngqura**

  The proposed Mthombo oil refinery at the Port of Ngqura is a government initiative motivated by concerns about the security of supply (SoS) of liquid fuels. The Mthombo oil refinery at the Port of Ngqura

  The Ngqura to Gauteng pipeline (potential new pipeline)

  The Ngqura to Gauteng pipeline assumes that a 288TBD Mthombo refinery will be built in the Coega IDZ in 2018 and that the refinery capacity will be expanded to 360TBD in 2024.

- **Ngqura to Gauteng pipeline**

  A new multi-products pipeline is proposed to supply liquid fuel from the proposed Mthombo refinery in Ngqura to Gauteng. The pipeline is estimated to be 1 000km long and to have a design flow rate of 1 500m³ per hour.

- **Mossel Bay liquefied natural gas imports**

  South Africa’s national oil company PetroSA has engaged a contractor to do feasibility and front-end engineering design (FEED) studies on a proposed liquefied natural gas (LNG) import facility at Mossel Bay in the Western Cape. The facility would enable PetroSA to import LNG to supplement gas reserves at the company’s gas to liquids (GTL) refinery. The supply of LNG to other potential off-takers, such as electricity producers, is considered crucial to the success of the project.

- **Liquid fuels terminal opportunities**

  The following opportunities exist and should be investigated in more detail:

  - Development of a fuel import terminal in Durban
  - Development of strategic stock storage facilities in conjunction with private sector entities
  - Integration of the current oil industry pipeline depots into the pipeline system.

- **Multimodal transfer at Jameson Park for transfer from pipeline to road**

  The proposed Mthombo oil refinery at the Port of Ngqura is a government initiative motivated by concerns about the security of supply (SoS) of liquid fuels.