NATIONAL RAIL POLICY

Green Paper
2015

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August 2015

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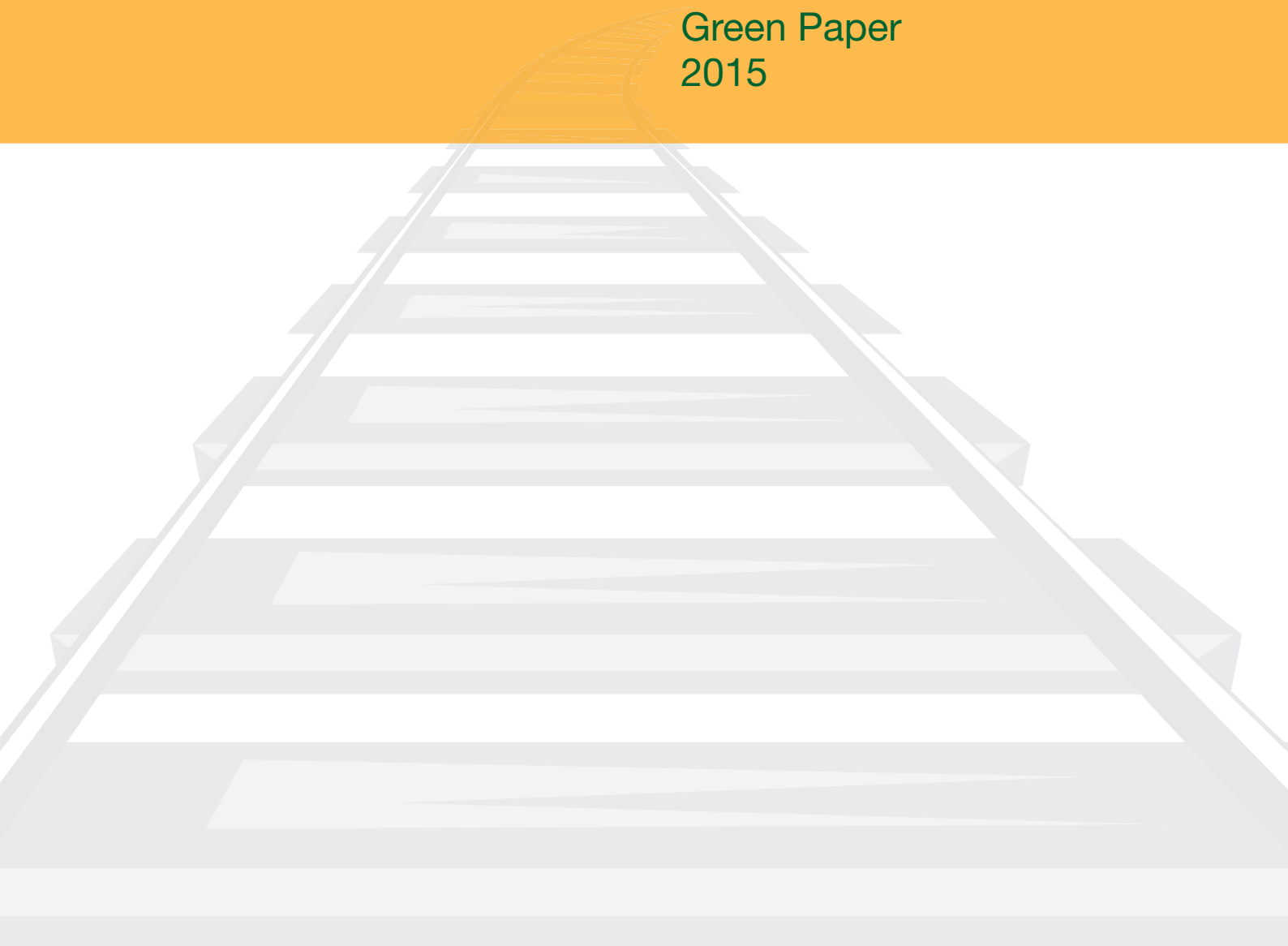

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Abbreviations and Definitions

Abbreviations

BB-BEE	Broad Based Black Economic Empowerment
CAPEX	Capital Expenditure
CCTV	Closed Circuit Television
DoT	Department of Transport
DPE	Department of Public Enterprises
EFP	Electronic Fare Payment
EMU	Electric Multiple Unit
EU	European Union
GDP	Gross Domestic Product
HDI	Historically Disadvantaged Individual
HSR	High Speed Rail
IPAP2	Industrial Policy Action Plan 2010/11 – 2012/13
IRERC	Interim Railway Economic Regulatory Capacity
ITP	Integrated Transport Plan
ITS	Intelligent Transport Systems
kN	kiloNewton
KPIs	Key Performance Indicators
MTSF	Medium Term Strategic Framework
NATMAP	National Transport Master Plan
NDP	National Development Plan
NEDLAC	National Economic Development and Labour Council
NEPAD	New Partnership for Africa's Development
NFLS	National Freight Logistics Strategy
NLTA	National Land Transport Act 5 of 2009
NLTSF	National Land Transport Strategic Framework
NRMP	National Rail Master Plan
OECD	Organisation for Economic Co-operation and Development
PICC	Presidential Infrastructure Coordinating Commission
PFMA	Public Finance Management Act

PRASA	Passenger Rail Agency of South Africa
PPP	Public Private Partnership
RER	Railway Economic Regulator
RSR	Railway Safety Regulator
SABS	South African Bureau of Standards
SADC	Southern African Development Community
SIP	Strategic Infrastructure Project
SLA	Service Level Agreement
SMMEs	Small, Medium and Micro Enterprises
SOC	State Owned Company
STER	Single Transport Economic Regulator
TFR	Transnet Freight Rail
TE	Transnet Engineering
UK	United Kingdom
USA	United States of America

Definitions

The following definitions are offered for the purpose of this document to enable readers to better understand its content.

Adaptation	The process of changing the rail industry or parts thereof to meet and successfully respond to the changing local and global rail environment.
Below Rail	Pertaining to fixed Rail network infrastructure, i.e. all earthworks, structures, ballast, sleepers, rails and fastenings; and where present also ancillary buildings, electrification and signalling.
Branch Lines	Railway lines that feed into the Core Network, and usually connected to the latter at one end only.
Bulk Freight	Commodities such as fuel, grain, and minerals that are loaded directly into wagons specially designed to convey them.
Commuter Rail	Passenger rail services that provide daily travel between home and work.
Concessionaire	The holder or operator of a concession.
Concession and Concessioning	The granting of a right by a statutory authority to one or more entities to operate, build, finance, maintain or more, railway assets or services on all or a part of a rail network, for a defined period, in return for agreed undertakings by a Concessionaire.
Core Network	The major part of the Railway Network that reaches out to ports, terminals and neighbouring countries.
Corridor	A linear single- or multimodal route characterised by few or no branches that can muster sufficient coherent traffic to achieve economies of scale and thereby support substantial investment to carry such traffic effectively and efficiently.
Fiscus	The government function that collects revenue and administers finances.
General Freight	Freight not defined in terms of the goods transported.
Green Paper	A tentative Government report of a policy proposal, published for consultative purposes, without displaying any final intent.

Heavy Haul	A railway operation that regularly meets at least two of the following requirements: Operates trains of at least 5 000 tonnes, hauls revenue freight of at least 20 million gross tonnes per year over a line haul segment of at least 150 km, and operates with axle loads of 25 tonnes or more (IHHA, 2015).
Integrated Public Transport Network	A system in a particular jurisdiction that integrates public transport modes and services, with real time information, through-ticketing and other enabling functionalities, to provide users with seamless travel solutions between origin and destination, as per the NLTA.
Intermodal	Transportation of freight or passengers by means of more than one mode of transport (e.g. aviation, rail, road, and maritime).
Land Transport Infrastructure	Fixed capital equipment and facilities comprising the land transport system. It may be confined to a single country, but more usefully and more usually Rail is connected to neighbouring and other countries on the same continent.
Light Rail	An urban rail public transportation system on partly or completely segregated right-of-way that has lower capacity and possibly lower speed than heavy rail metro- and suburban systems, but higher capacity and higher speed than traditional tram systems on right-of-way shared with motor vehicles and/or pedestrians.
Long Distance Passenger Rail	Passenger rail operations, other than urban commuter and regional passenger rail operations that cross one or more provincial borders within South Africa and possibly beyond.
Monopoly	A situation in which a single entity owns all or nearly all of the market for a given type of product or service, resulting in absence of competition.
National Railway Network	The contiguous network owned by State companies.
Network	A system of railway infrastructure that connects and serves a multiplicity of separately located nodes, the latter being customer facing sites such as freight terminals, intermodal facilities, passenger stations, ports, and public and private sidings, as well as domestic sites such as maintenance and running depots.
Network Operator	The person or persons who have ultimate accountability for one or more of: the safety of a network or part thereof including the proper design, construction, maintenance and integrity of the network; ensuring compliance of rolling stock with the applicable standards of the network; or for the authorising and directing of the safe movement of rolling stock on the network.
Private Sector	The part of a nation's economy that is not owned by the Government.
Public Sector	The part of a nation's economy that is owned and controlled by Government to facilitate or provide basic social services such as health, defence, education, justice and transport.
Rail	The transport mode provided by railways.
Rail Industry	The extended set of entities participating in railways, including infrastructure or network operators, train operators, and suppliers of equipment, materials, and services specific to such operators.
Rail Infrastructure	Facilities required to operate a railway safely, including right-of-way; track; structures and works, e.g. cuts and fills, bridges, tunnels, drainage, service roads and fencing; communication systems; train authorisation systems; electrical power supply systems; intermodal facilities, stations, terminals and yards; notices and signs; as well as associated buildings, maintenance depots, equipment, machinery, plant and workshops; and many other, but excluding rolling stock.

Rail Sector	The subset of the Rail Industry that is engaged in actually delivering freight or passenger rail services, i.e. infrastructure or network operators, and train operators.
Rail Service	A passenger or freight transport service operated on rail track or any other guiding arrangement, including heavy rail, light rail and rubber-tyred guided systems.
Railway	A guided system designed for the movement of rolling stock that has the capability of transporting passengers, freight or both, including the land and ancillary assets for the purposes of operation.
Railway Safety Regulator	The Railway Safety Regulator established in terms of the National Railway Safety Regulator Act No. 16 of 2002.
Regional Passenger Rail	Those passenger rail operations, other than urban commuter rail operations that take place within the borders of a province of South Africa.
Regulator	A public entity that regulates a particular industry or business activity, which is empowered by legislation to make regulations and to monitor and enforce compliance with those regulations.
Rolling Stock	Vehicles that are able to operate on a railway, irrespective of their capability of independent motion.
Station	A facility for passengers to enter or leave a train, including a railway passenger terminal and a passenger halt and may include facilities for passenger modal transfer and commercial activities forming part of the station and also includes any other place that may be prescribed, but excludes that part of the network running through the station.
Station Operator	An entity or person in control of a station and the management of the station and its assets.
Track Gauge	Measure of distance between the inside faces of parallel rails of a railway track.
Train Operator	A person or persons who have the ultimate accountability for: The safe movement of rolling stock on a network; safety and integrity of rolling stock; and safety of freight or persons being conveyed.
Urban Rail	An all-encompassing term for various types of commuter railway systems closely associated with cities and metropolitan areas.
Vertical Integration	The institutional integration of the entity(ies) responsible for managing railway infrastructure with the entity(ies) undertaking the operation of passenger and/or freight railway services.
Vertical Separation	The institutional separation of the entity(ies) responsible for managing railway infrastructure from the entity(ies) undertaking the operation of passenger and/or freight railway services.
White Paper	A parliamentary paper enunciating government policy.

Foreword by the Minister of Transport

The National Development Plan 2030 vision alludes to investment in the transport sector that will ensure transport serves as a key driver in empowering South Africa and its people by enabling improved access to economic opportunities and services. History reveals a compelling link between transport infrastructure and economic prosperity. New and faster connections enable economic opportunities, making markets more accessible for business and the public alike. Without good connections, businesses struggle to meet the demands of customers and suppliers, and those vital connections facilitating trade and business are lost. South Africa needs transport infrastructure to match its economic ambitions and rail has an important part to play in ensuring that we are a major economic player in an increasingly competitive global economy.

The rail sector has suffered from severe underinvestment in railways since the 1980s, and the consequential obsolete rail infrastructure and rolling stock, inefficient operations, and under-utilisation of the network has resulted in the significant loss of market share to road.

It is time to realise that the different elements of transport cannot be considered in isolation. There is no point in having an excellent road network if our railways are overstretched and not good enough to compete with the rest of the world. We should not only cater for our current transport needs, but also to consider what kind of transport infrastructure we will need in the long-term. Three key demands of a future rail network include more capacity, increased reliability and greater connectivity.

In my view, the future of railways and the prosperity of the country are inextricably linked. I therefore welcome the Green Paper's focus on how to make our rail network fit for future generations. Internationally, today's railways are very different from that of the early 1900s due to innovation and new technologies from a wide range of applications. These interventions have been successfully incorporated over the years and have significantly improved the performance of railways globally. As a result, we, as a country, need to also be innovative and introduce new technologies in our railways. The Green Paper is a step in the right direction, recognising the importance of sustainability and innovation. I fully share the vision and commitment in the development of sustainable rail transport and to stimulate innovative thinking on technical and policy perspectives in the railway sector.

Government alone cannot afford to solve all of the problems faced by the rail system. Given financial constraints in government, it is clear that more needs to be done to leverage private sector finance into infrastructure projects. This will involve going beyond the current models of public-private partnership.

Rail is an essential part of the Department's vision of transport for the next five years and the adoption of a White Paper on National Rail Policy is our main priority for this sector. As such, the Department has now developed the Green Paper on National Rail Policy, which is a discussion document that outlines policy proposals designed to address key challenges faced by the rail sector, thereby improving the performance of our railways. It proposes the revitalisation of rail in South Africa through the implementation of strategically focused investment-led policy interventions which will reposition both passenger and freight rail for inherent competitiveness by exploiting rail's genetic technologies to increase axle load, speed, and train length.

Consultation is critical during policy-making; therefore my Department will conduct extensive engagements with all stakeholders on the Green Paper through one-on-one meetings and provincial workshops. The public is also invited to rigorously engage with this process and to submit written comments. All inputs submitted to the Department will be considered in the development of the White Paper on National Rail Policy.

MS. DIPUO PETERS, MP
MINISTER OF TRANSPORT

Executive Summary

Rail is once again destined to play a pivotal role in the future South African freight and passenger land transport industry. While rail is a well-established industry in South Africa, it has experienced mixed fortunes over time, and several events that have marked South Africa's history have also impacted adversely on the industry's overall development and the socio-economic impact it should have had on the macro economy.

Historic events and other contributing factors have pushed large portions of the rail industry into acute decline. Although State Owned Entities have made investments in recent years and there has been some improvement, the rail industry still faces many major challenges. The obsolete state of much of the rail infrastructure and rolling stock, limitations of narrow gauge and under-utilised portions of the existing network are only a few of the challenges. Massive capital investment backlog and an increasing need for investment funds further exacerbate strain on the industry. Logistics service providers and shippers clearly prefer road transportation in many categories of natural rail freight, and there is also a preference by both short and long distance passengers for road transportation. A lack of security for passengers and freight, deteriorating rolling stock, ageing infrastructure, inefficient operations and inadequate availability of specialised technical skills further contribute to the current moribund state of the industry.

The foregoing challenges have resulted in uncompetitively positioned, ineffectively equipped, operationally inefficient railways that have lost both their ability to compete with road transport in the local logistics and mobility markets, and their ability to support exporters in competing effectively in the global market. The absence of equitable road pricing has advantaged road transport operators relative to railways and further eroded the latter's ability to compete effectively in the marketplace.

In the absence of a National Rail Policy, there has been no coherent national direction to guide development of the rail sector and to align and *revitalise* the industry over time according to rail's global development trajectory. No National Rail Policy is in place to guide National decision-making, both regarding rail's role in South Africa's overall transport requirements and investment strategy to meet them. Evidently existing legislation and transport policy were not conducive to repositioning railways in market spaces that could serve as backbone of its logistics and mobility systems.

To reposition rail to play its future role as preferred land transport mode and backbone with which all other transport modes integrate, current rail challenges have to be resolved at the same time as levelling the playing field by addressing unfair advantages that the road transport sector currently enjoys. This will require strategic interventions that ultimately revitalise the rail industry. From extensive international and local research, it is evident that for rail to play a leading role in the national transport task, its inherent competitiveness must be enhanced to successfully compete and collaborate with other transport modes. To achieve this, rail must exploit its natural competitive strengths compared to other transport modes. The railway renaissance of the last fifty years has demonstrated that rail's natural strength is to be a heavy duty, high speed carrier in high-volume traffic corridors, whether freight or passenger. Thus rail can compete effectively against other transport modes in the High-speed Intercity, Heavy Haul, Double Stack and contemporary Urban Rail market spaces, where it has already demonstrated robust sustainability.

The essential challenge for a country such as South Africa, whose railways have, with exceptions, been in acute decline, is to move its railways into market spaces, where they will be able to compete against or collaborate with other transport modes. A move into such market spaces can be achieved through a strategically guided rail revitalisation program that would likely include a combination of public and private funding and streamlined institutional structures to implement as many as workable of the High-Speed Intercity, Heavy Haul, Double Stacking and contemporary Urban Rail options.

It is evident that, in order to achieve successful rail revitalisation in South Africa, robust and in certain instances drastic interventions are required. Their implementation will call for strong and unwavering leadership from National Government and clear direction through National Policy to drive rail revitalisation. The National Rail Policy will give much needed direction to the rail sector and the rail revitalisation process and will also consider the South African setting and its priorities, such as promoting the developmental state,

socio-economic development, job creation, eradicating poverty, unemployment and under-development.

The fundamental purpose of the National Rail Policy is therefore to enable revitalisation of South Africa's rail industry through implementing the following strategically focussed policy interventions:

a) Invest in a relatively small high performance new network that can set extra-urban railways on a renaissance trajectory, to recapture rail's proper share of the national transport task in a developing economy; and
b) Expand funding sources by inviting private sector participation in profitable opportunities with manageable risk. To promote private sector participation, third party access to the rail network is anticipated, to be negotiated with the infrastructure owner under the oversight of the Single Transport Economic Regulator. In addition, government funding into railways will be explored particularly in respect of, but not limited to, investments for the public good or that are strategic in nature, that redress constraints inherited from colonial times, as well as rail services that are unsustainable without an external subsidy or to fulfil public service obligations.

The key to successful rail revitalisation interventions will be *centralised coordination* of rail policy and strategic planning at National Government level through the Department of Transport, and the forthcoming establishment of the envisaged Single Transport Economic Regulator, which will oversee regulation of all rail sector economic aspects, as well as of the overall transport system. The strategic vision for rail must be integrated not only with overall strategy for national transport but should be driven by the wider economic and social objectives of South Africa. In particular, strategic investment decisions should seek to enable the appropriate competitive technologies that will establish rail as the logistics and mobility backbone of South Africa and thereby fulfil its aspiration to shift substantial amounts of freight and passenger traffic from road to rail.

Successful rail revitalisation will have significant positive impact on job creation and skills development within the industry. A competitive, revitalised rail industry will not only attract potential job seekers, but the need for skilled personnel and expertise will increase exponentially and many opportunities will become available to jobseekers. Successful rail revitalisation will also lead to predictable and sustained long-term demand for rolling stock and rail infrastructure, thereby creating platforms for development of local industrial capacity and capability, and creating long-term employment opportunities in the supplier industries. Establishment of local manufacturing plants will create a substantial number of job opportunities and redevelop rail engineering capacity and skills that were lost over decades of underinvestment in railways. All this will support Government's Industrial Policy Action Plan, National Development Plan and New Growth Path objectives.

Environmental challenges have become one of the imperatives facing the global transport sector. In many countries it is indeed the largest contributor to greenhouse gas emissions, therefore, Government through legislation strongly supports protecting the environment, as well as hedging South Africa against fuel price instability and environmental costs. With current technologies, the dominant transport sector, road, is beholden to finite reserves of fossil fuels, which situation is unsustainable in the long run. This Green Paper therefore promotes the rail mode as eminently suited to lead the transport sector into the age of energy scarcity and environmental sensitivity, particularly when it is powered by clean or renewable energy.

South Africa's railway network is a national asset and its operational effectiveness impacts the whole economy and society. The National Rail Policy will guide performance improvement in all aspects of rail service delivery for passengers and freight customers, including quality, efficiency, volume, price and intermodalism. It will drive reduction in the cost of freight services at national level through encouragement of modal shift from road to rail. It will also drive passenger mobility, through higher quality services with increased intermodal connectivity. The implementation of the National Rail Policy should therefore be given high priority as its significant contribution will not be limited to the rail sector, but will go beyond that to make significant positive impact on South Africa's socio-economic development.

Chapter 1

Introduction

1.1. Background

The South African rail transport sector has experienced mixed fortunes from its inauguration in 1860 until the present day. The events that have marked South Africa's history have impacted significantly on the development of the rail sector and, together with other external factors have resulted in a railway industry that now faces several major challenges.

These challenges include the aging, deteriorating or obsolete state of much of the rail infrastructure and rolling stock, perceived under-utilisation of parts of the existing rail network, a capital investment backlog and an associated need for investment funds, a preference by logistics service providers and shippers for transporting many categories of natural rail freight by road, a preference by both short and long distance passengers for road transportation, a lack of security for both passengers and freight, inefficient operations, and shortage of specialised technical skills. The challenges inherent in rail are compounded by road transport deriving an unfair advantage due to several structural impediments such as insufficient road infrastructure charging to road hauliers, non-internalisation of externality costs, and poor overloading control. They have, with limited exceptions, resulted in uncompetitively positioned, operationally inefficient railways that have lost their ability to compete with road transport in the local market, as well as to support exporters to compete effectively in the global market.

Railways in many other countries have faced similar challenges, and a significant number of them have adapted, or are adapting, with varying degrees of success, to the changing environment in which the rail industry must position itself. In South Africa, the historical influences and present socio-economic environment have created a unique setting within which railway stakeholders must address the challenges by initiating revitalisation interventions.

Although railways are well-established in South Africa, their inherent competitiveness and ability to impact significantly on South Africa's economic and social development is constrained by the challenges that they face. The absence of a National Rail Policy hampers modernisation, development and growth of railways. A rail policy would give direction to the rail sector, addressing those factors that enable it to adapt to the qualities required of well-positioned, high performance railways that are locally and globally relevant, thus to serve the priorities of the South African setting, such as promoting the developmental state, socio-economic development, job creation, and eradicating poverty, unemployment and underdevelopment.

During the State of the Nation Address on 9 February 2012, the President pronounced on the South African National Infrastructure Plan, which includes both economic and social infrastructure. It is to be coordinated by the Presidential Infrastructure Coordinating Commission which was established in September 2011, bringing together Ministers, Premiers and Metro Mayors under the leadership of the President. The PICC is mandated to oversee implementation of eighteen Strategic Infrastructure Projects that will stimulate social and economic growth. The Infrastructure Development Act 23 of 2014 legislated the existence of the PICC, and gave it power to ensure that infrastructure development is given priority in planning, approval and implementation; and to ensure that the development goals of the State are promoted through infrastructure development. The SIPs are aimed at addressing South Africa's infrastructure deficit to boost economic growth and create much needed jobs. These include, among others, the construction of roads, power stations, pipelines and, in the present context, rail. Six of the SIPs address rail issues such as branch lines, capacity, corridors, densification, infrastructure, investment, logistics, road-to-rail-shift, and upgrading.

Transport infrastructure initiatives are planned among other in the following areas:

a) The promotion of the efficient movement of goods and economic integration through the development of logistics and industrial corridors, connecting coalfields to power stations, the expansion of the iron-ore and coal rail lines, the expansion of ports, and finalization of rail and road projects per Strategic Infrastructure Project 1.

b) Moving towards a high quality integrated Mass Rapid Transport Network which includes: rail, taxi, and bus services - public transport that is effective, affordable and safe in both regional and urban environments, per Strategic Infrastructure Project 7.

c) The establishment of local manufacturing industries which will result in substantial sustainable jobs over the twenty-year passenger rolling stock procurement period and the redevelopment of rail engineering capacity and skills that have been lost over decades of underinvestment in the local railway engineering industry, per the National Infrastructure Plan Enablers and Opportunities, and Industrial Development initiatives.

These initiatives share significant complementary interconnections with and are strongly underpinned by the New Growth Path which identifies infrastructure construction as one of five key jobs drivers for a new growth path, and the National Planning Commission's National Development Plan – Vision for 2030. Most significantly, the NDP's vision for transport calls for focus on total transport system efficiency to maximise the strengths of different modes, cut inefficiencies and reduce disparities, with the least environmental, social and economic cost. The policy positions recommended in this Green Paper have been developed in alignment with the strategic vision put forward in these key national plans.

Government is committed to adapt and to develop the existing rail industry to a 'railway of the future' – a rail industry that will perform optimally, compete effectively locally and support exports into markets abroad, satisfy stakeholder needs, and contribute positively to the economic and social development of South Africa.

1.2. Situational Analysis

This situational analysis presents information obtained through a systematic collection of past and present economic, political, social, and technological data. It provides a firm foundation for contextualising railways in South Africa within the international rail arena and its on-going development. This would support the understanding required to address the challenges that detract from high performance railways in South Africa, as well as to identify strategies to overcome them.

1.2.1. Historical Overview of Rail

This historical overview has been divided into the Early Development Phase, the South African Railways & Harbours (SAR&H) Phase and the present Pre-revitalisation Phase.

1.2.1.1. The Early Development Phase

Rail transport started as a private enterprise in 1860 with the introduction of the first steam train in Durban. In the 1870s, government took over private railways to serve the long term developmental needs perceived at the time. Until 1910, rail transport in South Africa was a colonial development used in the interests of the military and for the transportation of agricultural and mining traffic. Rail infrastructure was planned and developed to benefit the colonial power's interests, hence networks and operations were focussed on moving soldiers and military supplies and conveying farm produce and minerals. Services did not recognise the long-term developmental needs of the colonies or their people.

1.2.1.2. The South African Railways & Harbours Phase

The South Africa Act of 1909 nationalised certain transport services and established the South African Railways & Harbours (SAR&H) at unification in 1910. All railways and harbours belonging to the former Colonies became vested in the Governor-General in Council, a grouping that has endured mutatis mutandis until the present. The Act further stipulated that no railway for the conveyance of public traffic, port, harbour, or similar work, shall be constructed without the sanction of Parliament. The legislated strategic direction was the development of agriculture and industry in the Union in line with business principles. This mandate guided network development decisions, resulting in infrastructure that specifically served agricultural and industrial development, the Union and its communities as a whole. The Act also referred to *cheap transport* where affordability, which would increase access to transport, was the primary focus and stated that revenues should not exceed what was required for operations and servicing of loans.

With the establishment of the Republic of South Africa, the Republic of South Africa Constitution Act 32 of 1961 replaced the South Africa Act, and confirmed the same strategic railway focus on agricultural and industrial development as its predecessor. This resulted in development and operations taking place in these fields but there was no specific drive to serve the wider economy or social development. Economic development nevertheless took place during the SAR&H phase. Developments in the

transport sector also included harbours, and petroleum pipelines. Road transport was highly regulated during this phase, resulting in little competition from the mode, which favoured the development of rail.

The Road Transport Act 74 of 1977 introduced the first steps to relax the high degree of road transport regulation, by expanding grounds for permit applications and allowing permits to be issued more freely.

The South African Transport Services Act No. 65 of 1981 (the SATS Act) replaced the SAR&H legislative dispensation, changing the name SAR&H to South African Transport Services (SATS). SATS was empowered to control, manage, maintain and exploit certain transport services throughout the Republic. The SATS Act brought a significant change to the strategic focus of rail transport services, in that it stipulated that the SATS would be administered on business principles with due regard to the economic interests and total transport needs of the Republic. The strategic focus had moved from the development of agriculture and industry by way of cheap transport services, to the economic interests and total transport needs of the country. Further, passenger rail developments followed, although they remained principally around industrial areas and major cities, and did not extend to major areas of population growth, including settlements. Note, however, that although legislation determined that the transport services must be administered in terms of business principles, this did not take place.

During the 1980s South Africa faced severe capital shortages due to the cumulative effect of sanctions and the need to mobilise its military at significant cost. This resulted in Government having to review capital spending programs of its enterprises, including SATS. The De Villiers Report (1986) on Strategic Planning, Management Practices and Systems of SATS highlighted several shortcomings including that investments had been made in sectors of the industry that did not have the ability to compete with other modes, or that ran at a loss. Significant losses in the freight and passenger rail sectors were confirmed and the following recommendations were made:

a) SATS should cut back on new rail investment and rather focus on increasing utilisation of existing assets.
b) SATS should restructure to separate the major modes namely railways, harbours, airways and pipelines.
c) Suburban passenger services should be separated from the rest of SATS and should be subsidised directly by Government.
d) SATS should be allowed flexibility to set tariffs that would provide adequate returns.
e) SATS should operate like a private investor-owned company, required to make a profit by functioning as a commercial enterprise under government ownership whilst earning an appropriate return on capital by cutting costs and managing assets better.

Pursuant to the De Villiers Report and its recommendations, investment in SATS was severely curtailed. In the period prior to 1986 Parliament regularly allocated capital expenditures for SATS of up to R2 billion a year. Infrastructure was maintained and replaced on schedule. However, in 1986, expenditure on fixed assets fell to R1.44 billion. By 1988 the allocation was down to R699 million and it was terminated at the end of the SATS dispensation. During the same period the permit system for road transport was discontinued, effectively deregulating the road transport sector. Total deregulation of road transport came into effect with the promulgation of the Transport Deregulation Act No. 80 of 1988, which resulted in the road transport industry expanding significantly, at the expense of rail market share. Various changes were introduced in SATS culture, organisation and procedures, to prepare for a more competitive environment whilst a laissez faire approach to the road transport sector resulted in inadequate levels of road safety and protection of road infrastructure.

The rail investment curtailment and the simultaneous road transport deregulation had a major impact on the performance of SATS. Prior to road transport deregulation in 1988, SATS operations were supported by excellent technological solutions, world-class rolling stock and infrastructure being well-maintained and timeously replaced, but the cutback on investment plunged SATS into a downward spiral, leading to idle rolling stock and under-utilised infrastructure, from which it has not recovered. After road transport deregulation in 1988, rail in many business sectors was no longer the preferred freight transportation mode and it lost market share to the road transport industry, with far-reaching social and economic consequences.

The Legal Succession to the South African Transport Services Act No. 9 of 1989 replaced the SATS dispensation.

In April 1990 Transnet emerged as a fully State-owned entity responsible, among other, for freight and long distance passenger rail services through its Spoornet division, and long distance passenger and road freight services through its Autonet division, while the South African Rail Commuter Corporation (SARCC) was established to take responsibility for commuter rail services. Commuter rail services were to be directly subsidised, while long distance passenger rail services provided by Transnet did not qualify for subsidy. In general, the overall condition of freight and passenger assets continued to deteriorate and the investment backlog increased steadily.

1.2.1.3. The Pre-revitalisation Phase

Regarding passenger rail, old and inadequately maintained assets undermined redoubled efforts to develop the sector. After many years of overloading and under-maintaining, the condition of the heritage commuter rolling stock had deteriorated to crisis levels, and was unable to satisfy passenger demands. Similarly, the network infrastructure was not able to meet the demands of a rapidly changing society. To consolidate passenger rail, that is Metrorail and Shosholoza Meyl, the Passenger Rail Agency of South Africa (PRASA) was established in 2009, to position and promote rail as the preferred travel mode in high-density, high-volume corridors where it would be competitive by virtue of its only inherent strength, namely high capacity.

Regarding freight rail, most branch line traffic was lost to predatory competition from road hauliers during the 1980s. Consequently, SATS decided to disinvest from many of the branch lines, which exacerbated this loss of freight traffic. Deregulation of road freight in 1988 resulted in substantial volumes of high-value low-density freight on the core network shifting from rail to road during the 1990s. During the 2000s, continued lack of competitiveness and investment by TFR resulted in road hauliers deploying side-tipper interlinks to encroach on the last bastion of freight rail, long distance haulage of heavy bulk commodities such as coal, grain, and ore. Overall, railways in South Africa had deteriorated to a stage where the need to adapt to rail's global renaissance had become patently obvious to most stakeholders.

By contrast, two important positive steps during this phase were the establishment of the Railway Safety Regulator by Act of Parliament in 2002, and the development of the Gautrain Rapid Rail Link as a public private partnership in terms of a concession agreement between the Gauteng Provincial Government and the Bombela Concession Company. Gautrain opened for service in May 2010, in time for the FIFA Soccer World Cup.

1.2.2. The South African Rail Industry and Structure

The South African rail network is the eleventh largest in the world at 22 298 route kilometres, and total track distance of 30 400km. Within the Southern African context this is much larger than any of its neighbouring countries: Mozambique at 3 125km, followed by Zimbabwe at 3 077km, Namibia at 2 629km and Botswana at 886km. Note that the dominant track gauge is 1 067mm, also referred to as Cape gauge, and therefore narrow gauge by comparison with the globally-dominant standard gauge of 1 435mm. When making comparisons with other countries, it is therefore important to appreciate that aside from moderate competence in the heavy haul and urban rail market spaces, narrow gauge railways are less competitive than standard gauge railways and have less capacity. While South Africa may thus rank eleventh by route kilometres, many of those route kilometres are underutilised, and it therefore ranks lower by the more significant performance measures of passenger journeys or passenger-kilometres, and freight tons transported or ton-kilometres. The network can be classified as follows:

Table 1: Classification of the South African Rail Network (Branchline strategy, 2009)

Classification		Distance	Characteristics
Basic Core	Port-Rail corridor	12 801 km (63.8% of total network distance of 20 079 km) Includes 74 km of closed lines	• Freight oriented • Heavy haul • Block loads • Hub to hub • Corridors • Rail, Port and Pipeline connectivity • Limited inter-modalism • Operational flexibility
	Port Interconnect		
	Cross-Border Interconnect		
Extended Core	High Volume Feeder		
Branch lines	Closed Lines Low Volume Active Branch lines	**3 350 km** (16.7%)	• Multi-use potential • Generally low volumes • Low axle load • Low speed • Tight curves • Steep gradients • Small scale operations • Diverse origin-destination pairs
	High Volume Active Branch lines	**3 928 km** (19.6%)	
	Lifted Lines	**874 km** (not included)	
Urban Commuter Network	Active networks in Gauteng, KwaZulu-Natal, and Western Cape provinces, as well as small-scale services on lines shared with TFR in Eastern Cape Province	**2 228 km**	• Potentially high volume, high frequency service between CBDs and densely populated residential areas
Gautrain	Dedicated standard gauge network	**80 km**	• Rapid rail service between Pretoria and Johannesburg, and Sandton and OR Tambo International Airport

The Railway Safety Regulator (RSR), which was established by the National Railway Safety Regulator Act 16 of 2002, oversees safety of the South African rail sector. The RSR's mission is to promote safe railway operations through appropriate support, monitoring and enforcement, guided by an enabling regulatory framework. Furthermore, the Department of Transport recently established an Interim Rail Economic Regulatory Capacity to develop rail regulatory capacity.

Public sector railways in South Africa comprise three distinct vertically integrated entities, namely the Transnet Freight Rail (TFR) division of Transnet SOC Ltd (previously Transnet Limited), the Passenger Rail Agency of South Africa (PRASA), and the Gautrain Management Agency. They fulfil distinctly different roles and responsibilities and have different objectives and service delivery requirements. A small number of privately owned freight and passenger rail companies, the latter focussing on railway heritage and tourism, also operate in South Africa, either on their own networks or under private access arrangements negotiated with TFR and/or PRASA. Railway operators are supported in their service delivery by suppliers of equipment, consumables and services, also referred to as the Supply Industry.

1.2.2.1. Transnet SOC Ltd

Transnet SOC Ltd is a major public entity listed under Schedule 2 of the Public Finance Management Act 1 of 1999 (PFMA), reporting to the Minister of Public Enterprises. It owns and operates South Africa's principal transport infrastructure through its Operating Divisions Transnet Freight Rail (TFR). Transnet National Ports Authority, Transnet Port Terminals, Transnet Pipelines, and Transnet Engineering (TE) for its rolling stock, port and terminal equipment. TFR's core business is freight logistics solutions delivered through its Business Units (BU's) focussed on Automotive, Containers, Lime and Cement, Coal, Grain, Agriculture, Fuel, Chemicals, Fertilizer, Chrome and Manganese, Granite, and Consolidated. Its operating division comprises the GFB Commercial, Coalline, Ore Line, and Blue Train and Shosholoza Meyl businesses. It is essentially a vertically integrated railway, which means that

it owns and operates all the fixed assets under its control including all the rail infrastructure, and almost all rolling stock such as locomotives and wagons, as well as the two Blue Trains. TFR has access agreements with PRASA, to enable it to access ports where the relevant rail infrastructure is owned by PRASA, and PRASA with TFR where it requires access for its long-distance passenger services. TFR also has access agreements with municipalities and private-siding owners. Transnet receives neither government subsidy nor sovereign guarantee of its debt. Transnet funds all its investments from its balance sheet. It is currently in the third year of its Market Demand Strategy, where validated demand is lower than originally anticipated. Capital is aligned to capacity requirements to maximise value (to an unstated criterion), and capital remains a key constraint (Transnet, 2014: 42).

1.2.2.2. Passenger Rail Agency of South Africa

The Passenger Rail Agency of South Africa (PRASA) is a National Government Business Enterprise listed under schedule 3B of the PFMA that reports to the DoT through a Board of Control. Its main focus is to fulfil government's obligation by playing a major role in the development of social and economic infrastructure. PRASA merged the assets, operations, and personnel of the South African

Rail Commuter Corporation (SARCC), its Rail Operations Division (Metrorail and Shosholoza Meyl), its PRASA Corporate Real Estate Solutions (CRES) division and its subsidiaries Autopax and Intersite Investments. Metrorail delivers commuter rail services in urban areas, Shosholoza Meyl delivers regional and long-distance (inter-city) rail-based passenger services while Autopax delivers road-based regional (inter-city) passenger services under the Translux and City-to-City brands. The primary role of Intersite Investments within the PRASA Group is to develop and grow assets of PRASA to generate funding for the Group, while PRASA CRES is responsible for Real Estate Asset Management, Facilities Management and Property Development.

PRASA's rail operations division owns most of the below-rail assets for its operations, and leases the remainder from TFR.

1.2.2.3. Gautrain Management Agency

The Gautrain Management Agency (GMA) was established as a Gauteng Provincial Government entity to manage the Public Private Partnership (PPP) concession agreement between the Gauteng Provincial Government and the Bombela Concession Company in respect of the Gautrain Rapid Rail Link. The comprehensive concession agreement underpinned development of the project, as well as operation and maintenance over the 15-year concession period, after which time the assets will be transferred to Gauteng Province. Gautrain is designed to operate profitably, with support from a patronage guarantee by Gauteng Province.

The Gautrain Rapid Rail Link is clearly different from the other rail networks in South Africa in that it is currently the only service offered on standard gauge, which supports travelling at nominally 160km/hour. It provides Airport Service between O.R. Tambo International Airport and Sandton Station, as well as providing General Passenger Service between Rhodesfield Station and Sandton

Station, and Hatfield Station in Pretoria and Park Station in Johannesburg. It interchanges with PRASA services at Park, Rhodesfield and Pretoria stations. The last phase between Rosebank and Park Station became operational in June 2012. The Gautrain system currently provides service for up to 17 hours per day. Dedicated buses provide feeder and distribution services between stations and surrounding passenger catchment areas, although this service is not offered on week-ends and public holidays.

1.2.2.4. Private Operators

A small number of private train operators currently operate on the national railway network in terms of access

agreements with the relevant infrastructure owner. There are also numerous private sidings, which are tracks or networks operated by industries such as mining and steel that consign and/or receive trainloads of rail freight: They are linked to the National Railway Network to ensure that rail can serve commercial, industrial or port-related enterprises without trans-shipment. Private operators contribute to the passenger rail sector by providing heritage or tourism-related services across South Africa. A number of private train operators also participate in the rail freight sector, especially in private networks of the mineral extraction and beneficiation industry.

Private railways, and extensive private sidings, such as those operated by the mining sector, represent collateral investment by the latter to enable them to use rail service either within their production facilities or to receive raw material inputs and possibly to move bulk output consignments to their customers. They represent a strong commitment to the rail mode, and railways should therefore nurture such entities to secure their on-going support.

Small private sidings operated by municipalities represent investments to attract industries to their respective jurisdictions. As such they are a local consideration without national implications. Their continued existence is a function primarily of the scale of the businesses they serve and their developing logistics requirements, not necessarily a function of developments within the rail mode. Thus many businesses have changed over the decades, some to the extent that they have had to move out of the physical constraints of inner city locations, while others have succumbed to competition and new businesses. The redevelopment of Newtown in Johannesburg and the uplifting of its private sidings is only one of several such examples. Such events are part of normal economic adaptation. Where private sidings continue to play a meaningful role, they have tended to gravitate to large businesses that receive and or dispatch large consignments by rail, and in the context of a Green Paper on national rail policy are recognised as significant rail users.

1.2.2.5. The Supply Industry

In addition to the subset of the Rail Industry that is engaged in actually delivering freight or passenger rail service, i.e. infrastructure or network operators, and train operators, the suppliers of equipment, consumables, and services to such operators, i.e. the Supply Industry, are also significant stakeholders in railways. Equipment includes capital equipment such as track, power supply, train control, coaches, locomotives, wagons and many others. Consumables include items used for maintenance, as well as energy and many other. Services include consulting, construction, outsourced maintenance, and many other. The Supply Industry generally comprises private sector entities, and its size and vibrancy are closely coupled to that of the infrastructure or network operators, and train operators. The private sector, however, cannot support unproductive assets, and it has therefore largely exited the railway business or found markets in other businesses or other countries. Unless it is oriented towards export markets, it cannot be stimulated independently of the rail sector, but without a substantial home market it is unlikely to be successful in export markets. The recent investment upturn, by PRASA in respect of recapitalising its commuter train fleet and TFR in respect of its Market Demand Strategy, has therefore already started to revitalise the Supply Industry.

1.2.3. Rail's Role in South African Socio-Economic Development

South Africa aspires to position rail as backbone of its transport sector. Both freight and passenger rail have already developed significantly and play the following parts in South African economic and social development. As benchmark for the backbone role that rail should play, ideally it should provide a quality of service in high density corridors that no other mode can match. Quality in this context means consistently meeting expected or agreed time and capacity targets, ability to interchange freely and conveniently with other modes when and where necessary, and pricing the rail offering to win business from road transport, including attracting a substantial proportion of door-to-door traffic through intermodal alliances with road hauliers.

1.2.3.1. Freight Rail

Rail freight services move bulk or consolidated freight in large quantities. Currently the South African mining industry in particular, relies heavily on rail freight services to move raw materials from pits to ports for export. These exports can generate significant revenue for the country as well as provide the associated jobs, thereby contributing to the economy as a whole. Rail freight services also move freight over long distances within the borders of South Africa and to and from neighbouring countries.

Table 2: Comparative Rail and Road Market Shares over Time

Traffic Metric	Year	Total Market	Market Growth %	Share of Total Market %		Share of Rail Market %		
				Road	Rail	Corridor	Mining	Rural
Tonnes, million	2003	1105	-	83	17	24	54	16
	2013	1740	57	88	12	18	58	24
Tonne-km, billion	2003	296	-	63	38	27	59	14
	2013	441	49	70	31	19	63	19

Table 2 was constructed from values presented in the first and tenth Annual State of Logistics Surveys for South Africa (CSIR, 2003 and 2013). It is evident that TFR is losing both tonnage and tonne-km market share against road in a growing market, a phenomenon that is commonly considered to indicate inadequate competitiveness. Of particular concern is the distribution within the rail market share. While road-to-rail shift should see TFR emphasise general freight (*Corridor* column in the table) and de-emphasise heavy haul, it is both shedding market share and shifting the traffic mix from general to heavy freight *(Mining* column in the table). This indicates that while its overall competitiveness is inadequate, it is more uncompetitive in general freight than it is in heavy haul, a challenge that this Green Paper addresses in depth. The practical situation may be worse, because State of Logistics surveys recognise only three categories of road freight traffic, namely Corridors, Metropolitan and Rural. It is common cause that side-tipper interlinks have captured significant amounts of heavy mineral traffic, which logically should be recorded in the Corridors category for State of Logistics purposes.

Transnet provides employment to some 41 000 employees in the rail industry. Of these, 29 225 are permanently employed by TFR and 12 428 by TE, both counts from Transnet's 2014 Annual Report.

1.2.3.2. Passenger Rail

Passenger rail services are intended to move large numbers of commuters or passengers between origins and destinations. Commuter rail services in particular make work centres and central business districts accessible to the country's work force, providing affordable mobility at set times. Long-distance services, and regional passenger rail services such as Gautrain, provide mobility to passengers over longer distances for travel and tourism, but face stiff competition from air and road transport.

PRASA's Metrorail commuter services currently transport on average 560 million passengers annually in the following regions, with approximate total annual journey percentages: Gauteng 53%, Cape Town 30%, Durban13%, and Eastern Cape 4%. The average commuter journey is approximately 26 km, and Metrorail achieves 16.8 billion passenger-kilometres per year. This is variously estimated as being between 6% and 12% of the total commuter market.

PRASA's Shosholoza Meyl services currently provide long-distance passenger rail travel on five routes between key destinations in South Africa. It carries less than one million passengers per annum, many of them being migrant workers travelling between rural areas and metropolitan centres in South Africa, as well as migrant workers from neighbouring countries. These services contribute to socio-economic development by supporting the social and recreational needs of passengers. Economy Class travellers

in sitter accommodation contribute 87.5% of the total revenue of the business. In addition to this basic service, Shosholoza Meyl also provides Tourist Class services.

PRASA's Premier Classe trains currently provide air-conditioned long-distance passenger services on three major rail routes in South Africa as well as baggage and car transportation. The bus subsidiary of PRASA, Autopax, supports these passenger rail operations by feeder and distribution services.

Following from the Gauteng 25-Year Integrated Transport Master Plan, and noting steadily increasing ridership, the Gautrain Management Agency recently appointed a consortium of transaction advisors to undertake a feasibility study for the possible rapid rail extensions to the Gautrain network. Developments such as this illustrate renaissance rail ready to assume duty as transport backbone, in this instance for regional passenger transport.

1.2.3.3. Liberating Rail

Throughout the years, both passenger and freight rail operations have evolved and impacted on South Africa's socio-economic development. The challenges currently facing rail have however adversely impacted on its competitive positioning and operational efficiency and have prevented developments that would have enabled freight and passenger rail to compete effectively in the South African logistics and mobility markets and to support the country's efforts in export markets. The rail industry can only fulfil its role if it is able or enabled to do so. The issue of inherent railway competitiveness and capacity therefore becomes highly relevant.

1.3. Policy, Legislation and Strategies

1.3.1. The Status Quo

The status quo within South Africa's transport sector, and particularly the rail transport sector in the present context, has been informed by a number of legislative and policy documents, most of which have been developed since the advent of a new democratic dispensation, and some of which have been inherited from previous dispensations. This section examines the relevance and influence of these disparate pieces of legislation in informing the ongoing development of railways and a National Rail Policy.

1.3.2. Constitution of the Republic of South Africa

The Constitution Act 108 of 1996 mandates the President and other members of Cabinet with the responsibility to develop national policy. This mandate places responsibility on the Minister of Transport to ensure that any development and implementation of national transport policy by the DoT addresses the mobility needs of all citizens.

The Constitution assigns different roles and responsibilities to each sphere of Government. It is important to note that the South African Constitution has structured Government in a non-hierarchical and decentralised manner. Government is made up of three spheres, namely the National, Provincial and Local spheres. They are inter-related and inter-dependent and each has the power to legislate in its sphere of competence.

With specific reference to transport matters, Schedule 4 Part A of the Constitution assigns Public Transport as a functional area over which both the National and Provincial governments have concurrent jurisdiction, whilst Local Government has a responsibility for Municipal Public Transport. The Constitution does not, however, define Public Transport nor does it make any reference to rail. Nevertheless, it goes without saying that Public Transport in general includes passenger rail, particularly when the rail mode is assigned backbone status. Furthermore, although freight rail is not specifically mentioned in the Constitution, the only functional area that can be regarded as including Freight Rail is the category *Trade* in Part A of Schedule 4 of the Constitution, which is also a concurrent competency of both National and Provincial spheres.

In view of the above, it follows that any policy intervention that is proposed in this Green Paper ought to be cognisant of the fact that:

a) National government has the inherent competency to develop policy, to plan and to regulate passenger and freight rail; and

b) Local government has the inherent jurisdiction to regulate laws on municipal public transport.

1.3.3. White Paper on National Transport Policy

The White Paper on National Transport Policy of 1996 asserted the importance of rail for both freight and passenger transport and was a point of departure for any discussion on national land transport. It set out the vision for South African Transport as being *To provide safe, effective, efficient, and fully integrated transport operations and infrastructure, which will best meet the needs of freight and passenger customers.*

The White Paper located the customer at the core of public transport policy development, which emphasis was significant. In particular issues of safety, affordability, quality and the provision of improved service levels should feature prominently in the policy formulation process.

In addition, the White Paper highlighted Government's requirement for efficiency, integrated operations, infrastructure, support and sustainability for economic, social and environmental development.

1.3.4. Southern African Development Community Protocol on Transport

The Southern African Development Community Protocol on Transport, Communications and Meteorology of 1996, SADC Protocol on Transport for short, was intended to establish systems that provide efficient, cost-effective and fully integrated infrastructure and operations, which best meet the needs of customers and promote economic and social development while being environmentally and economically sustainable.

The SADC Protocol on Transport has as Integrated Transport and Railways objectives that member States should promote economically viable integrated transport service provision in the region and facilitate the provision of seamless, efficient, predictable, cost-effective, safe and environmentally-friendly railway service that responds to market needs and provides access to major centres of population and economic activity.

Of relevance to the current discourse on rail competitiveness is the SADC Protocol on Transport objective that *member States increase private sector involvement with a view to improving railway network and service standards*. Despite South Africa being a key member of the SADC community, its progress in fulfilling this objective has been limited, among others, due to the non-existence of a rail policy and the fragmented manner in which it has until recently undertaken rail investment. The need to achieve seamless transport services and revitalise rail transport as contemplated in this Green Paper, would go a long way towards achieving regional obligations contained in the SADC Protocol on Transport.

1.3.5. Moving South Africa

The Moving South Africa (MSA) study of 1998 captured the essence of the current public transport dilemma. It highlights four major drivers which embody the challenge facing South Africa in respect of public transport, namely:

a) Lack of affordable basic access;

b) An ineffective public transport system;

c) Increasing dependence on cars as a means of mobility; and

d) Sub-optimal spatial planning.

The MSA study offered a resolution to these challenges by identifying focus strategies for both freight and passenger transport. The identified strategies are expected to bring gradual changes to the industry over the short to medium term (5 – 20 year period) resulting in improved performance and sustainability for the transport industry in South Africa.

1.3.6. National Environmental Management Act

The National Environmental Management Act 107 of 1998 provides for *co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of State.*

Among all transport modes and at realistic operating speeds, rail uses the least energy per unit of freight or passenger throughput. This Green Paper will therefore, where appropriate, introduce aspects of rail positioning that will on the one hand ensure maximum alignment between transport activities and rail's green strengths, and on the other hand ensure minimum environmental impact by leveraging rail's natural symbiotic relationship with renewable energy.

1.3.7. National Railway Safety Regulator Act

The National Railway Safety Regulator Act 16 of 2002 provides for the establishment of a Railway Safety Regulator (RSR) as well as safety standards and regulatory practice for the protection of persons, property and the environment. The RSR Act recognises that safe railway operations are fundamental to the safety of all persons and the environment.

The RSR is charged with overseeing the safety of railway transport while operators remain responsible for such safety within their areas of responsibility. The Regulator also has to promote improved safety performance in the railway transport industry in order to promote the use of rail as a mode of transportation.

1.3.8. National Freight Logistics Strategy

The National Freight Logistics Strategy of 2005 envisaged responding to problems in institutional and regulatory frameworks, infrastructure, ownership, management, operations, skills, financing structures and methodologies for the freight system. This vision requires Government to take a more interventionist approach to regulating the freight system, to ensure that individual costs of externalities and inefficiencies are not merely passed on to freight owners or even parties outside the logistics chain such as innocent road users in the case of accidents, but are correctly allocated.

This Green Paper recognises the critical role that freight plays in the socio-economic development of the country and accordingly sought to customise relevant policy pronouncements made in the National Freight Logistics Strategy (NFLS) for inclusion into the National Rail Policy. In this regard a National Rail Policy imperative will be to ensure that freight rail serves as an appropriate mode and is enabled to perform the critical role that it should fulfil in the socio-economic development of the country, whilst highlighting the need to internalise the externalities of the road mode.

1.3.9. National Rail Plan

The Consolidated Regional Rail Plan of 2006 had as principal objective to secure the future of commuter rail in South Africa by applying the priority corridor strategy to the rail network in each of the regions, Tshwane, Wits, EThekwini, Western Cape, and Eastern Cape at that time. It established a set of criteria for rail to continue playing a meaningful role as part of the broader public transport system in South Africa, it being essential to identify the circumstances in which rail commuter transport can still operate to the technological strengths endorsed later in this document.

The need to balance the former network oriented approach with the proposed land use planning approach to defining rail corridors has meant that varying approaches to the process of corridor definition were adopted in the different regions. The transport corridor approach to rail planning represented a shift to viewing the rail mode in the context of all other transport modes and services. In some cases, the methodology applied in the Railplan process was extended to the rationalisation of bus and taxi routes as well as assisting in reviewing a provincial strategic roads network.

1.3.10. National Land Transport Strategic Framework

The National Land Transport Strategic Framework 2006-2011 envisions that, in addition to the appointment of a Rail Safety Regulator, a strategic rail capability will be developed in the national sphere of government.

Performance regulation will be introduced in the national sphere of government, and devolution, ownership and the involvement of the private sector in operations will be clarified. Furthermore, there will be an ongoing programme to progressively effect the recapitalisation of commuter rail rolling stock and related infrastructure in Priority Rail Corridors as identified in the National Rail Plan.

Local transport plans will inform the national-level institutions responsible for rail service provision. As such there will be close co-operation and information-sharing between the local planning authorities and the authorities responsible for rail services in developing the Regional Rail Plans that will form part of the National Rail Plan.

In respect of commuter rail, aspects mentioned above are underway. The remaining aspects of strategic rail capability and the implicit reference to the national rail network and freight rail are addressed in this Green Paper.

1.3.11. Public Transport Strategy

The Public Transport Strategy of 2007 had two key thrusts, namely accelerated modal upgrading and integrated rapid public transport networks. Accelerated modal upgrading refers to current initiatives to transform bus, taxi and rail service delivery in the short to medium term. Integrated rapid public transport networks were then targeted to be implemented firstly in the metropolitan cities, and thereafter in smaller cities where applicable.

A key focus area of the Public Transport Strategy is to restructure the public transport system to ensure that it meets modern public transport development and passenger

needs through skills development and integration among transport modes, ensuring access for special needs users, improving the network image, deploying Intelligent Transport Systems (ITS) and Electronic Fare Payment (EFP), and improving and expanding long-distance public transport services.

Unfortunately the Public Transport Strategy foundered because during implementation energy was focussed predominantly on restructuring and transforming other public transport modes, that is bus and taxi services. Where rail was considered, it was simply taken as a given and accorded the status of *backbone of public transport* without making material effort to upgrade it. This led to massive investment in Bus Rapid Transit systems, with less significant investment in rail services.

1.3.12. Legal Succession to the South African Transport Services Amendment Act

The Legal Succession Amendment Act 38 of 2008 provided, among others, for the establishment of the Passenger Rail Agency of South Africa (PRASA), previously known as the South African Rail Commuter Corporation (SARCC). PRASA was statutorily mandated to, among others, provide rail commuter services within, to and from South Africa, in the public interest and the long haul passenger rail in accordance with the principles of the then NLTTA.

One outcome of the Legal Succession Amendment Act was the vesting of ownership of passenger rail infrastructure and rolling stock assets in PRASA, with Metrorail and Shosholoza Meyl both being divisions of PRASA operating the commuter rail and the long-distance passenger rail services respectively.

1.3.13. National Land Transport Act

The National Land Transport Act (NLTA) 5 of 2009 is a codification of certain principles as articulated in the White Paper. It defines Land Transport as *The movement of persons and goods on or across land by means of any conveyance and through the use of any infrastructure and facilities in connection therewith.*

This is a clear indication that, despite the NLTA being mostly utilised to regulate public transport, its ambit is not limited only to public transport: It is rather intended to regulate both passenger and freight transport, rail included. Notwithstanding that, it mentions rail only as an item to take into account regarding transporting of goods by road.

The essence of the NLTA is delineation of responsibilities between the different spheres of government and the allocation of land transport functions to the most competent and appropriate sphere of government, clearly listing for what each sphere of government is responsible.

Critical for the context of the National Rail Policy is that the NLTA envisages that:

a) National government is responsible, among other, for the formulation of national transport policy and strategy and playing a coordinating role between provinces to ensure the effective and efficient execution of land transport functions between the different spheres of Government;

b) Provincial government would formulate provincial transport policy and strategy within the framework of national policy and strategy, and co-ordinate between municipalities with a view to ensuring the effective and efficient execution of land transport in the province; whilst

c) Local government would similarly develop their land transport policies based on the national and provincial guidelines.

Notwithstanding the above assignment of functions to specific spheres of government, the NLTA further contemplates competent spheres of government assigning functions to others, or requesting assignment of functions from others.

1.3.14. Industrial Policy Action Plan 2014/15–2016/17

The Industrial Policy Action Plan 2011/12–2013/14 identified locomotives, coaches and carriages related to Transnet and PRASA rolling stock programmes for designation as strategic fleets. Since then, diesel and electric locomotive production has been established at Transnet Engineering's Koedoespoort works, and following Transnet's order for a further 1064 diesel and electric locomotives in 2014 (later increased), production is scheduled to be established at TE's Durban works.

High logistics costs and economic infrastructure blockages limit South Africa's economic development, thus impeding industrial development and competitiveness. The costs of logistics as a percentage of total GDP have risen by 0.7% to 12.6% in 2011, and are estimated to have risen to 12.8% in 2012. Transport costs escalated by 24% between 2010 and 2011, while a further increase of 10.3% is estimated to have taken place between 2011 and 2012. Its contribution to overall logistics costs in 2012 is 61%, which is the highest it has been in the past nine years, and also significantly higher than the global average. Most importantly, however, the current 70/30 road and rail split has to be reversed towards the historical 30/70 split in order to give further impetus to the development of a better rail infrastructure, sharply reduce operational inefficiencies and create much more robust and efficient linkages into neighbouring markets. Better logistics performance is strongly associated with trade expansion, export diversification, ability to attract foreign direct investment and economic growth. This Green Paper sets out an investment-led intervention to achieve this road-to-rail shift, and to position rail to lower transport and logistics costs.

1.3.15. National Development Plan 2030

The National Development Plan proposes to invigorate and expand the economic opportunity through investment in more infrastructure, more innovation, more private investment and entrepreneurialism. It envisages several interventions that involve contributions from rail, which include expanding infrastructure, transitioning to a low carbon economy, and transforming urban and rural spaces. It anticipates that by 2030 investments in the transport sector will ensure that it serves as key driver in empowering South Africa and its people, enabling improved access to economic opportunities, social spaces and services; and supporting economic development through the movement of goods, facilitating regional and international trade, greater mobility of people and goods, and transport alternatives that support minimised environmental harm.

It notes that although rail is the ideal mode of transport for large, uniform freight travelling further than 400 kilometres, currently about 89% of all freight measured by total tonnes is conveyed by road. Emphasis will therefore be placed on total system efficiency to maximise the strengths of different modes, cut inefficiencies and reduce disparities, all with least environmental, social and economic cost. Furthermore, limited capacity on existing rail lines moving minerals commodities is stifling growth.

1.3.16. The New Growth Path for South Africa

The New Growth Path sets out key policy and planning priorities that, among others, would create workable urban transit solutions by increasing investment in public transport and resolving existing public transport policy issues, devolving transport management to local government, providing incentives for public transport use and renewing the commuter train fleet. The latter intervention is already underway, with the first commuter vehicles expected to arrive in 2016, and new mainline passenger locomotives currently being delivered. Regarding freight, it envisages strengthening and optimising freight corridors which, given the huge resources needed to improve performance, would need development of effective partnerships between public and private sectors, and healthy competition among service providers. The freight corridors identified for expansion and improvement are Durban-Gauteng, the coal transport corridors from Waterberg to domestic power generators and Richards Bay, and the North-South corridor from Durban to Dar es Salaam including rail linkage. Its proposals envision strategies for improving logistics, including integrated road and rail systems across the continent, and more efficient rail links to the coast. This Green Paper develops strong arguments for repositioning South Africa's rail sector to do just that.

Chapter 2

Global Experience and South Africa's Rail Challenges

2.1. Global Experience

2.1.1. The Railway Renaissance

2.1.1.1. Introduction

The following sections examine the railway renaissance, a fundamental repositioning of railways in countries that recognised the advantages of exploiting rail's inherent competitive strengths, and which made the requisite investment to enable railways to take effective, strong positions in their national transport tasks.

2.1.1.1.1. Rail's First Rise and Fall

Railways originated during the early 1800s free-for-all Industrial Revolution, when whoever could raise capital and acquire right-of-way could build a railway. Thereafter, first generation railways followed a rapid growth curve to eventually dominate land transport. As that growth curve matured in the lead-up to World War II, their potentially excessive economic power had escalated to the point where most governments had either nationalised or regulated railways under their jurisdiction. Consequently, by the mid-1950s railway objectives in many countries had become couched in social terms, while absence of competition stifled adaptation to opportunities and threats from respectively suppliers and customers.

Comfortably cosseted in their nationalised or regulated shelters, such railways lost their ability to compete with other aggressively advancing transport modes. Post-World War II civilian spin-offs from military technologies, together with shifting economic, political and social preferences, tipped the land transport competitive balance from rail to road. Post-war reconstruction introduced motorways that supported strong competition from private cars and road hauliers. First attempts at high speed rail failed due to not comprehending the nature of the challenge: Railway technology appeared to have reached a ceiling; hence innovators on both sides of the Atlantic pursued alternatives such as aircraft-inspired guided surface transport systems. By degrees, many stakeholders lost faith in the rail transport mode. Their pessimistic perception, and in many cases the reality, was that, one-and-a-half centuries after naissance, railways had entered the terminal decline phase of what with the benefit of hindsight turned out to be only a first life-cycle curve.

2.1.1.1.2. Emergence of New Growth Curves and Institutional Arrangements

Notwithstanding the aforementioned pessimism, commercially successful high-speed passenger trains eventually emerged in the 1960s. Heavy haul unit trains conveying bulk commodities followed in the 1970s; then double-stack container trains in the 1980s. Finally in the 1990s, economic globalisation stimulated intense competition among urban rail suppliers and strong demand from burgeoning cities, resulting in exponential growth in both steel-wheeled and rubber-wheeled Urban Guided Transit. The accumulation of these four events, spanning merely twenty-five years in two centuries of railway history, has been recognised as the railway renaissance. It set railways on new growth curves in each of the High-Speed Intercity, Heavy Haul, Double Stacking or Heavy Intermodal, and Urban Rail market spaces, in those countries that exploited one or more of these inherently competitive railway sub-modes. In the decades that followed, investment in and competition from modes other than rail increased apace, substantially widening differences between railway leaders and followers.

The railway renaissance once again altered the prevailing institutional arrangements. The free-for-all early adoption phase, followed by the regulated or nationalised mature phase, ultimately made way for contemporary rail revitalisation. Railway renaissance requires substantial investment in one or more of the abovementioned four inherently competitive sub-modes to achieve modal shift from both air and road to rail, with mounting evidence that long-distance rail land bridges are able to compete with maritime transport. Such large investments frequently exceed the funding ability of state-owned railways, so a range of public private partnership funding instruments has evolved. The resultant admission of multiple participants to a formerly monolithic sector has introduced a need to revise institutional arrangements, resulting in two new of regulatory forms emerging, namely railway economic regulation and railway safety regulation. Safety regulation is common-place in the railway world and already exists in South Africa.

To summarise, revitalisation moves railways into renaissance through combining public and private funding to implement one or more of Heavy Haul, High-Speed Intercity,

Heavy Intermodal and contemporary Urban Rail. Some revitalisation interventions optimise resource allocation and operating efficiency by introducing competition. Others nurture developmental objectives by appropriate investment and economic regulation. The following sections describe key aspects of the inherently competitive sub-modes and institutional arrangements appropriate to them.

2.1.1.1.3. Implications for Rail - Road Modal Split

As the world's railways increasingly changed from regulated institutions to revitalised institutions, they have inescapably found themselves drawn into a new global transport order. Since the 1950s, road has grown to become the world's confident, ubiquitous door-to-door transport mode, for both freight and passenger traffic, ultimately only limited by distance from origin to destination or by intervening geographical barriers. By comparison with rail, road's higher freedom of movement endows it with both inherent strength and inherent weakness. While its inherent strength of ubiquitous access is frequently invoked to trump rail's inability to match that access, door-to-door service requires that all 'doors', ranging from, say, those of a humble rural store, to those of a busy distribution centre, be connected by roads that support the same maximum vehicle axle load. In practice it is not economically viable to build all roads to support high axle loads, while ubiquitous access requires diverse vehicle types and operator abilities to share roadways. The road transport mode's inherent weakness is thus comparatively low, one-size-fits-all, limits on axle load and speed, a necessary sacrifice to achieve ubiquitous access.

Concurrently, railways have had to adapt from being the dominant land transport mode, to one that defines and dominates the four inherently competitive market spaces of the railway renaissance, namely Heavy Haul, High-Speed Intercity, Heavy Intermodal and contemporary Urban Rail. There railways exploit their heavy axle load and high speed capabilities to establish substantial competitive distance between them and the road mode. These attributes have endowed the rail mode and road mode with competencies that are both complementary, where intermodal movements maximise the contribution of each mode, and competitive, where one or other mode inherently wins the business. It is therefore crucial to understand how to position rail and road relative to each other, to respect the NDP emphasis on total system efficiency to maximise the strengths of different modes and cut inefficiencies. As a corollary, renaissance rail as a mode that is able to compete aggressively in high volume corridors is, by the same token, unsuited to compete effectively in low volume corridors, and should be phased out there.

2.1.1.2. Inherent Railway Competitiveness

2.1.1.2.1. Three Perspectives on Competition and Competitiveness

The following three perspectives on competition and competitiveness aid assessing the quality of fit between railways and their stakeholder environment. The first concerns a railway's ability to compete effectively against other transport modes in its business arena. Just like those from other transport modes, railway operators are not all equally competitive. To illustrate, the typical 1950s two-axle lorry powered by a non-turbocharged engine is uncompetitive against a contemporary seven-axle interlink powered by a turbocharged engine. Operators that rely on inappropriate or out-dated technologies are inherently less competitive than those that progressively implement appropriate or contemporary technologies. From the foregoing perspective this Green Paper infers the existence of the construct *Inherent Railway Competitiveness*. Thus light-axle-load low-speed trains on track alignments built to supersede ox wagons and stage coaches are inherently uncompetitive against contemporary road transport. Inherent competitiveness excludes all attributes that do not inhere in a particular mode but are common to all transport modes, for example management competence and information technology which, all things being equal, cannot influence competitiveness of one mode vis-à-vis other modes. One can thus reason that the notion of a railway being sustainable simply because it is there is unfounded. Sustainability only follows from inherent competitiveness, which will be developed in the next section.

The second perspective concerns the rules of engagement among competitors in a defined arena, for example the South African long-distance transport market. It addresses competition among an array of entities engaged in peer-to-peer competition for a share of that market, where an inherently uncompetitive entity would be unfit to participate, and would distort the ultimate outcome if it did. This is the domain of transport economic regulation.

The third perspective concerns arranging the arena within which competitors are set to engage, in the present context by reference to their contribution to economic growth and social development goals. This is the domain of national transport- and rail policy. The Green Paper uses the construct *Inherent Competitiveness* as a powerful tool for developing insight into South Africa's railway challenges.

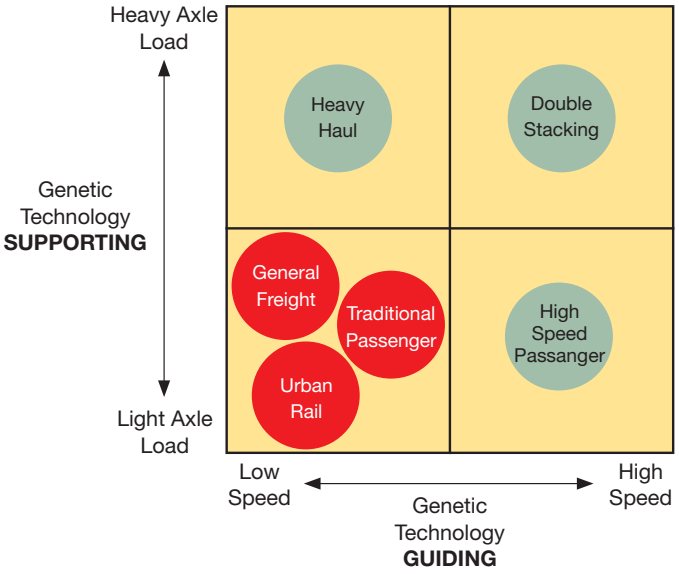
2.1.1.2.2. *Inherent Railway Competitiveness and Rail's Genetic Technologies*

Positing that technologies that do not distinguish one transport mode from another cannot increase the competitiveness of one relative to another, a research stream by Van der Meulen (1997, 2006, 2007, 2009) and Van der Meulen & Möller (2006, 2008, 2012), published in peer reviewed papers at international conferences, described and examined inherent competitiveness with respect to the technologies that distinguish railways from all other transport modes. The above-mentioned publications used the term *Genetic Technologies* to describe three such technologies.

The competitiveness of guided surface transport, of which rail is a subset, in relation to other transport modes is determined by its degrees-of-freedom-of-movement. Three degrees-of-freedom-of-movement (e.g. aerial and submarine transport) offer high spatial mobility, but at relatively high cost. Two degrees-of-freedom-of-movement (e.g. unguided surface transport such as the road mode) offer lower surface mobility at lower cost. One degree-of-freedom-of-movement (e.g. guided surface transport such as railways) offers only limited, linear mobility, back and forth on a guideway, but at comparatively low cost in high-volume corridors that can justify the cost of the guideway. Guided surface transport's limited mobility impairs its ability to compete directly with other modes that feature more degrees-of-freedom-of-movement, and hence offer greater mobility that supports door-to-door transport and more. Rail must therefore offer compensating advantages to compete successfully with the latter modes.

The vehicle-guideway system ensures application of vertical loads and lateral or sideways loads at precisely and securely located contact patches. In the case of railways, steel-wheel-on-steel-rail contact mechanics develop vertical and lateral force components, representing two genetic technologies known respectively as Supporting and Guiding: They enable respectively heavy axle load and high speed. By contrast, roads need to support unguided vehicles over the full width of two or more lanes. The cost of supporting heavy axle loads on such wide surfaces is prohibitive, whereas the cost of carrying much higher axle loads on steel rails is economically viable provided that traffic volume is sufficiently high. Similarly, rail's secure guidance raises its safe speed limit to very much higher than that of road's simple friction guidance between wheel and road surface. The rail and road transport modes thus naturally serve two very different market domains. If rail does not exploit sufficiently high axle load and/or sufficiently high speed, it cannot establish sufficient competitive distance between it and road to compete effectively. Plotting the above two genetic technologies against one another defines the four market spaces illustrated in Figure 1 below.

Figure 1: Railway Market Spaces



To indicate the boundaries between these market spaces in terms of industry-leading practice, heavy axle load is 26 tonnes or more, while light axle load is anything less, and low speed is expressed in tens of km/h, while high speed is expressed in hundreds of km/h. Thus low speed for heavy haul means up to 80km/h, high speed for double stacking means 120km/h and high speed for passengers means 300km/h or more. Railways achieve further leverage in all four market spaces by combining vehicles into trains, a genetic technology named Coupling: It enables rail to achieve unmatched throughput capacity in both freight and passenger service.

The Supporting, Guiding, and Coupling genetic technologies uniquely distinguish rail from all other transport modes and

enable it to compete successfully against two or three degrees-of-freedom-of-movement modes that offer higher mobility: Its natural strength is to serve as heavy duty, high speed carrier in high-volume corridors where rail's genetic technologies position it intensely competitively against other transport modes in the Heavy Haul, High-speed Intercity and Heavy Intermodal or double stacking market spaces, in which it has already demonstrated robust sustainability around the world. Rail's inherent competitiveness is determined by the extent to which it exploits its genetic technologies to achieve heavy axle load, high speed and long trains. Recognising and understanding these genetic technologies are important when examining ailing railways and designing interventions to revitalise them.

2.1.1.2.3. One Potentially Weak Market Space

The fourth railway market space that combines light axle load and low speed is potentially weak because it does not fully exploit rail's Supporting or Guiding genetic technologies. Further failure to exploit the Coupling genetic technology exacerbates that weakness. Trains conveying general freight, traditional long-distance passengers, e.g. Shosholoza Meyl, and commuters, e.g. Metrorail, exemplify operations in this space. Where they cannot offer significant advantage over competitive modes, especially road, they inevitably struggle and will probably fail if they have not already done so. Their lack of inherent competitiveness clearly explains the relentless decline of South Africa's railways in this market space.

Around the world road vehicles are built to axle load limits of around 9 tonnes - a basic parameter that facilitates design and manufacture of highly competitive road vehicles for the global market. The lower the rail axle load in a particular country, the smaller the competitive distance between rail and road, and the more road encroaches on rail's domain. For general freight services, the relatively low rail axle load that South Africa's narrow track gauge allows (generally 20 tonnes on its core network), puts it at a competitive disadvantage to countries whose railways support higher axle load. Major standard gauge railways work in the range 25 - 40 tonnes, with assertive railways in China, India, North America, and Russia, which move over half the world's rail freight, already operating in or aiming for 30 - 32½ tonnes for general freight and 30 - 40 tonnes for heavy haul. The lack of competitive distance is even more acute on South Africa's branch lines, with axle loads in the range 16 - 18½ tonnes.

Urban rail positioning criteria differ in so many respects from those of freight and long-distance passenger rail that it is a distinct rail sub-mode. Thus although urban rail resides in the potentially weak low-axle-load low-speed market space, the Coupling genetic technology combines vehicles into trains to reduce the effective headway between them. For example, eight-car trains at 120 second headways equates to an average 15-second headway between cars, while bus rapid transit systems generally operate at headways upwards of 25 seconds. Rail's short average headways deliver high throughput capacity to neutralise its otherwise weak competitiveness in this market space, making it a popular and valuable solution in many cities. Recognise nevertheless that rubber-tyred guided transit solutions, such as automated guided transit, monorail, and bus rapid transit have started encroaching on what has until recently been rail's eminent domain, as new investment has been channelled to support these variants. For brevity, this document will further use the term *urban rail* only, but it includes the abovementioned variants where the context permits. Thus, as for high-speed passenger, heavy haul and heavy intermodal, urban rail's natural strength is to serve as a heavy duty carrier in high volume corridors. Outside that space, it remains vulnerable to competition from other guided transit solutions or, worse, competition from buses, cars, and minibus taxis. Other guided transit solutions should therefore be considered for passenger throughput capacities in the space below full strength heavy rail, more so in the light of rail's energy efficiency that is mentioned in the next section.

2.1.1.2.4. A Frugal Transport Mode for an Energy-scarce Future

Aligning with the NDP's objective of transitioning South Africa to a low carbon economy, rail is recognised as an energy efficient transport mode, thanks to its genetic technologies. It is therefore valuable to contextualise this attribute to appreciate what role railways should fulfil in an energy-scarce future.

The Supporting genetic technology requires a strong wheel - rail interface to sustain heavy axle loads, and rail's steel-on-steel system provides just that. The wheel and rail deflect minimally to develop a small contact patch between

them, and steel-wheel-on-steel rail rolling resistance, and therefore energy consumption, is very low. By contrast, a rubber wheel on a road deflects much more to develop a large contact patch, which increases rolling resistance and hence energy consumption by comparison with rail.

The Guiding genetic technology supports high maximum speed, which allows more potential energy to be converted to kinetic energy and vice versa as speed varies over undulating terrain, thereby reducing both traction energy consumption and braking energy dissipation. High speed also reduces journey times, and hence reduces the period during which heating, ventilation, air conditioning and lighting must operate. Consequently high speed passenger trains actually consume less energy per passenger for a given journey than conventional passenger trains (Garcia, 2010).

The Coupling genetic technology averages gradients under long trains and therefore requires less traction energy input and less braking energy dissipation, particularly for heavy freight trains that run at comparatively low speed. It also reduces aerodynamic drag because the frontal area of a train in relation to its length is small compared to other transport modes - e.g. the ratio frontal area/vehicle length for a TGV Duplex train is one tenth that for an Airbus 380 aircraft, both double decked passenger vehicles.

Rail undercuts the resistance to motion of all other transport modes and therefore inherently occupies an energy consumption sweet spot that other transport modes cannot match. Relative to pipeline, it has lower resistance from speeds higher than ≈3km/h. Relative to maritime, it has lower resistance from speeds higher than ≈40km/h. Relative to road trucks, it always has lower resistance, ≈50% at low speed, increasing to ≈80% at 100km/h. Relative to aviation, resistance is also always lower although rail cannot match its top speed. Nevertheless, rail can compete on centre-city to centre-city journey times, e.g. the current Beijing to Wuhan schedule averages 285km/h over 1229km, a challenge to aviation when accounting for time to commute to the airport, check in, check security, reclaim baggage, and commute to destination in addition to scheduled flying time.

Rail's low rolling resistance causes propulsion and braking demand to swing widely over undulating gradients, and ability to transfer energy to and from its environment is therefore advantageous. Railways and renewable energy are thus natural allies, particularly when both are linked to a smart grid that can store surplus energy when necessary. Although railway electrification infrastructure is expensive,

it need be confined only to the route defined by the track. Rail should therefore be the transport mode of choice when planning for an energy scarce future, whether for freight, long-distance high speed passengers, or urban commuters.

2.1.1.2.5. Significant Renaissance Events

This section identifies significant railway renaissance markers and perspectives that sketch a landscape within which to imagine and conceive solutions for South Africa's railway challenges.

High-speed Intercity emerged in Japan in 1964, the world's first standard gauge high-speed railway that ultimately changed that country's economic geography. The concept spread to Western Europe in 1981, then to the rest of the world, including China, Korea, Morocco (under construction,

currently suspended due to expropriation issues), Russia, Saudi Arabia (under construction), Taiwan, Turkey, and the United States. Significantly for South Africa, high-speed rail has spread or is spreading to all BRIC countries. Brazil is seeking to implement a Rio de Janeiro–São Paulo–Campinas PPP project, but after two unsuccessful requests for proposals and postponement of a third, it has not yet got traction. Russia already operates 250 km/h trains on upgraded lines from Moscow to St. Petersburg and Nizhny Novgorod. India has established a High Speed Rail Corporation to develop and implement high speed rail projects, on existing as well as new rail corridors. China introduced high-speed rail service in 2007 and since then has built the world's largest network at over 19 000km in service, more than the rest of the world's high speed rail network combined. High-speed railways relieve problems associated with developed countries, such as congestion or saturation of air and road corridors, and stimulate development opportunities in less advanced countries by extending access to business and social opportunities. Appraisal criteria for high-speed rail proposals should therefore reflect the development level and aspirations of the host country. South Africa's narrow track gauge cannot support contemporary high speed trains, for which the entry level has already escalated to 300km/h and further increases are within reach. Indeed, construction of Japan's high-speed standard gauge Shinkansen network followed from an appreciation that its pre-existing narrow gauge railways (1 067mm, as South Africa) could not support the level of intercity mobility that it deemed necessary to develop the country.

Heavy Haul was recognised as a distinct railway sub-mode by Railway Gazette International in 1972. The International Heavy Haul Association, which currently has nine members including South Africa, was established in 1976. However, narrow gauge impedes attaining industry-leading heavy haul inherent competitiveness. It limits axle load to 30 tonnes, whereas standard gauge competitors achieve up to 40 tonnes and, very importantly for heavy haul, locomotive traction motor performance is superior by the ratio of track gauge, i.e.1 435mm/1 067mm or 34.5%. This results in narrow gauge heavy haul locomotives attracting a price premium over standard gauge locomotives.

Double Stacking of containers emerged on United States' railways after rate deregulation in 1980 released pent-up aspirations to raise competitiveness through innovation. High-value manufactured goods are low density and only achieve low axle load when packed into containers and single-stacked on railway wagons. Such traffic does not exploit rail's Supporting genetic technology, and is therefore vulnerable to competition from other modes, particularly road. Double stacking containers on railway wagons increases the axle load of low density freight to heavy haul level, thereby exploiting the Supporting genetic technology and extending freight rail's inherent competitiveness to high-value, low-density goods, a breakthrough achievement that had long eluded it. This sub-mode has subsequently spread to all countries in the North American Free Trade Agreement (Canada, Mexico, and United States), Australia, the Gulf Cooperation Council states (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates), China, India and Panama. However, narrow track gauge cannot provide adequate stability against overturning of high-centre-of-gravity wagons conveying double-stacked containers, hence South Africa cannot enter this inherently competitive rail market space where rail has demonstrated ability to attract general freight traffic from road.

Urban Rail grew rapidly following economic globalisation in the 1990s. Rationalisation of the supply industry by more intense competition among system integrators (that is entities that supply turnkey rail solutions such as Gautrain) stimulated the sub-mode through more competitive pricing. As example, the European Union removed restraints on own-country purchases in favour of competition among suppliers in the entire bloc. Economic globalisation also accelerated urban agglomeration in developing economies, thereby substantially expanding the size of the urban rail market. The combination of lower prices and a larger market exponentially increased the number of new projects. The following two examples manifest the urban aspect of rail renaissance. Over the past ten years, Chinese cities with urban rail have grown from nine to 39; during the same period, Indian cities with urban rail have grown from three to nine (Railway Directory, 2005, 2015). These examples include neither cities that have substantially expanded their networks, nor the many examples from elsewhere in the world. Never before in the history of railways has such rapid growth been experienced. Ekurhuleni, Johannesburg, Pretoria, Cape Town and Durban are among the world's 300 fastest growing cities: They would do well to recognise

the rapidly expanding contribution of light rail among their peers.

Urban rail dominates market spaces where rail provides higher capacity than other modes at lower total cost. Optimised capacity requires high acceleration and braking ability within a relatively low maximum speed of ≈80km/h, to give short link times between closely spaced stations: Trains with many motored axles but comparatively small traction motors meet this requirement. In addition, short journey times require short station dwell times: Single-deck vehicles meet this requirement. Narrow track gauge does not frustrate these requirements, although standard track gauge potentially achieves a price advantage in the global market. PRASA's current new commuter rolling stock acquisition process is therefore well-grounded in railway renaissance.

2.1.1.3. Selecting a Frame of Reference

The first challenge in considering the state of railways in a particular country is to find a frame of reference within which to examine it, and to identify possible role models for revitalisation. Simply selecting reference countries by outcome without due consideration of the respective underlying drivers can at best be futile, and at worst be misleading. Much research on railway positioning has been undertaken in particular countries or regions, but it does not have predictive validity outside its context, and it is therefore not possible to confidently generalise such findings to other, different settings. To establish a general understanding, it is necessary to research the entire set of the world's countries with railways, using a comprehensive set of descriptive variables[1] to ensure that all pertinent considerations have been recognised. Such work is rare, but one publication titled *Railway Globalization: Leveraging Insight from Developed into Developing Regions* (Van der Meulen & Möller, 2006), found among other, a cluster of countries named Railways in Emerging Economies. It comprised Brazil, South Africa, China, India, and Russia, in that order. With the benefit of hindsight, and the unfolding of subsequent events, this cluster comprised what is now known as the BRICS countries. Its significance in the context of developing a National Rail Policy for South Africa is that it established a statistically grounded frame of reference that is free of any bias that might have associated with a cognitively selected one. This Green Paper therefore uses the BRIC countries as a valid frame of reference for railway revitalisation in South Africa. However, there were reasons to believe that this cluster might have been unstable, and that it might change over time: The next paragraph examines this possibility.

Replicating the research with an expanded set of descriptive variables and two additional years' data later identified five railway country clusters, named by the researchers Fortuitous Railways, Insecure Railways, Enlightened Railways, Progressive Railways and Assertive Railways (Van der Meulen & Möller, 2008a). The underlying statistical analysis rested on thirty six variables in groups that described their Competitiveness, Networkability, Business, Ownership, Contribution, Society, and Sustainability[2]. The Fortuitous and Insecure Railways represented countries that had not yet commenced investment, reform or revitalisation to stimulate railway renaissance. They therefore serve no useful purpose as a frame of reference for South Africa, and are not considered further in this document. The Enlightened and Progressive Railways clusters represented countries

[1] Variables are measurable attributes of railways and the countries in which they are set. They vary from country to country and from railway to railway, hence the name variable. Two examples of railway variables are Axle Load, measurable in tons, and Track Gauge, measurable as Narrow, Standard, or Broad. Two examples of country variables are Population, measurable in Millions of People, and Gross National Income, measurable as USD per Capita per Year.

[2] The full set of variables is Infrastructure Operator Diversity; Train Operator Diversity; Information Technology Leverage; Bus-, Car-, and Motorcycle Populations; Total Road Network-, Motorways-, and Paved Roads Percentage; Research & Development Level; Relative Maximum Axle Load; Relative Maximum Speed; Distributed Power Presence; Heavy Haul Presence; High-speed Intercity Presence; Heavy Intermodal Presence; Motive Power Type; Attitude to Competition; Network Coverage; Transport Task-Freight- and Passenger Traffic Volume; Employment Created; Initiative Source; Narrow-, Standard-, and Broad Gauge; Networkability; Strategic Horizon; Infrastructure-operations Separation; Infrastructure- and Rolling Stock Ownership Locus; Infrastructure- and Rolling Stock Commitment Horizon; Country Name; Economic Freedom; Population; Gross National Income; Physical Size; Determinism; Climate-change Position; Infrastructure- and Rolling Stock Investment Capacity; Stakeholder Satisfaction Level; Service Reputation; Safety Reputation; Subsidy Influence; and Calendar Year.

[3] The inapplicability of countries in the Enlightened and Progressive clusters as a frame of reference for South Africa is addressed in section 2.1.3.1.

[4] As measured by the number of descriptive variables on which each country exceeded a one-standard-deviation band around the cluster mean.

that had already commenced investment and or reform, with emphasis on introduction of competition within the rail sector and had achieved significant railway renaissance[3]. The Assertive Railways cluster comprised the United States, China, Switzerland, Australia, Russia, Canada, India, Mexico, Brazil, and South Africa, in that order. As expected, it had changed. Furthermore, if replicated today, Saudi Arabia's recent substantial railway investments would likely also secure it a place in the Assertive Railways cluster. This cluster once again included the BRICS countries, taken as confirmation that they constitute a valid frame of reference for railway revitalisation in South Africa.

South Africa clustered with the Assertive Railways by virtue of its heavy haul railways: Without them, it would have found itself in the Insecure Railways cluster. However, when ranked by assertiveness[4], the scores were United States 20, China 15, Switzerland and Australia 14 each, Russia 13, Canada 12, India 8, Mexico 7, Brazil 5, and South Africa only 3. They present an interesting mix of countries, some with privately owned and some with state owned railways. Competition among railways or train operators is present in some and absent in others, and thus may or may not be a rail policy issue.

The eight highest ranking countries have either standard or broad gauge track. Ninth-ranked Brazil has a mix of broad gauge and narrow gauge track, and is substantially expanding its broad gauge network to raise the inherent competitiveness of its railways. If Brazil goes to such lengths to achieve railway competitiveness and sustainability, how much more South Africa, which aside from Gautrain's 80 kilometres, has only narrow gauge track? For context broad gauge railways are at least as competent as standard gauge railways: Increasingly, the former simply use commercially available standard gauge rolling stock fitted with longer axles and/or wider bogie frames, so as to leverage the price advantage of standard gauge's larger market. Broad gauge's main challenge is networkability: It is therefore significant that Brazil elected to prioritise the inherent competitiveness of its own railways over connectivity with neighbouring railways. It is however recognised that such an approach may not apply in the South African context given the strategic importance of rail interoperability and interconnectivity to promote trade and facilitate economic development in the SADC Region.

2.1.1.4. Institutional Arrangements

2.1.1.4.1. A Need for Economic Regulation

Countries whose railways have participated in the railway renaissance have needed to invest in one or more of the Heavy Haul, High-speed Intercity, Double Stacking, and contemporary Urban Rail variants, to transition from the terminal decline phase of their first growth curve to a new railway growth curve or curves. Governments have often led the requisite investments but, as contending claims on State funding have constrained the quantum available for railways, public and private sectors have increasingly shared responsibility for railway investment. In principle, they share responsibility such that each sector bears the risk for investments to achieve its objectives, developmental for the public sector, and productive for the private sector. Additionally, several countries have encouraged competition to stimulate effectiveness and efficiency within the rail sector, ranging from on-rail competition on open access infrastructure, to parallel competition among vertically integrated railways that serve co-located origins and destinations.

Such interventions have stimulated a range of economic regulation models that reflect the developmental and socio-economic objectives of particular countries, as well as the quantum and diversity of funding sources that they can muster. A railway economic regulatory function is required, either explicitly in the guise of a statutory body, or implicitly in the guise of coherent political will, to ensure that railways contribute appropriately to the broad economic and social objectives of a country.

The foregoing range of considerations has led to the evolution of new intervention- and governance models to ensure that countries that so desire, move their railways resolutely onto one or more of the renaissance growth curves. It is important to appreciate that countries that do not move their railways onto renaissance growth curves, remain in the terminal decline phase of the original railway growth curve. No middle ground is evident.

2.1.1.4.2. Governance Models - Line Haul Railways

Globally, one can distinguish between two fundamental governance models, namely privately owned railways and state owned railways. A private railway is governed like

any other private company, subject to the laws of the land. Beholden as they are to investors and shareholders, they perform as well as any other private sector enterprise. There is no statutory impediment to this model in South Africa.

Governance models for State-owned rail enterprises differ, although all address common policy and strategic direction themes, business management, investment, and regulatory compliance, the latter including safety, competition and environmental considerations. Each model has advantages and disadvantages in addressing the complete set of stakeholder expectations. Governance models for State-owned railways therefore broadly follow one of three models, which reflect different heritages, political environments, and ownership structures. They can be described as follows:

First, the *single government portfolio model*, where a ministry (usually a transport ministry, sometimes a railway ministry), is responsible for policy development and implementation, as well as for ownership and exploitation, either directly or through an agency. This model arguably provides the greatest clarity of direction at all levels from strategic to operational, but may downplay wider policy issues such as competition, environment, and social equity, when they are the responsibility of another ministry. Examples include Brazil, where the Ministry of Transport manages railway construction and operating concessions through the National Land Transport Agency; Russia, where the Federal Agency for Rail Transport is a division of the Ministry of Transport; India, where the Indian Railway Board functions as a government ministry; and China where, although they have been organizationally separated, the former Ministry of Railways, now the Ministry of Transportation, and China Railways Corporation still share the same street address. Although statistics-wise South Africa clusters with the BRIC countries; governance-wise it follows the next model, the multiple government portfolio model.

Second, the *multiple government portfolio model*, where responsibility for policy development and ownership is split between more than one government portfolio, such as Infrastructure and Transport. In addition, other agencies and regulators may pronounce on governance aspects such as safety, investment, competition, and planning, although they may also reside in a transport ministry structure. The multiple government portfolio model arguably clarifies diverse policy issues, but may adversely affect strategic coherence and decision-making ability. South Africa's current freight rail institutional arrangements follow this model, Department of Transport being responsible for rail policy and Department of Public Enterprises being responsible for TFR's positioning and performance. It would be apposite to examine whether this arrangement impedes or supports railway renaissance.

Third, the *private sector participation model*, where government retains ownership or control of some assets through one or more portfolios, but where private sector entities operate or use railway assets under access or concession arrangements. Examples include Australia and the European Union. This is distinct from a totally private structure, where all rail assets were originally owned by, or have been transferred irrevocably to, the private sector.

State ownership incurs additional governance complexity because such enterprises must recognise public policy objectives, as well as consider their assigned functional and operational purpose and customer interests. For businesses such as railways, gas, and electricity, which involve extensive physical infrastructure networks, there are further layers of complexity, including public safety, competition and security of supply of social services. Government ownership generally faces two criticisms of its governance. One is budget discipline: Where government cannot be seen to allow services to fail, budget constraints are often not regarded as binding. The other is excessive political influence: This can sacrifice strategic direction to shorter-term considerations.

Private sector ownership also faces governance weaknesses. In responding to investors and shareholders, short-term decisions relating to return on investment may drive them. Nevertheless, railways are capital intensive entities and therefore in business for the long run: The heavyweight railways of the North American Free Trade Agreement have consistently demonstrated that they can and do balance short term investor satisfaction against creation of long term value to ensure their sustainability. Potential conflict between shareholder value and public service obligations is another perceived weakness: It is therefore important to appreciate that the only reasonable obligations on private railways are those that in law apply to all other businesses in the same jurisdiction.

Unduly fragmented railway systems may lead to risk of multiple or unstable governance arrangements. This was

illustrated in the United Kingdom, where the Office of Passenger Rail Franchising, established to implement and manage passenger rail franchises, was replaced in short order by the Strategic Rail Authority (SRA), with a broader remit. Not long thereafter, the SRA's responsibilities were incorporated into the Department for Transport. These changes followed from the diverse needs of passengers, freight operators and network managers not being co-ordinated between the different institutions responsible for governance. Ultimately, governance responsibilities were consolidated among Department for Transport, Office of Rail Regulation, and the boards of the entities.

To place the foregoing organisational churning in perspective, it is salutary to appreciate that, despite the generally weak inherent competitiveness of UK line haul railways in the mid-1990s, the initial intervention to address the former British Rail financial woes was to reform the sector by deconstructing it into economically rational entities. Except two renaissance initiatives, High Speed 1 (the 108km London to Channel Tunnel route, or 28km longer than Gautrain for South Africans), and High Speed 2 (the 192km London to Manchester and Leeds route) funded by grant-in-aid from the government, investment initiatives have generally renewed or refurbished rail to existing standards rather than raising performance to raise inherent competitiveness. Meanwhile, reform continues, and will likely continue until the question of inherent uncompetitiveness has been resolved.

2.1.1.4.3. Governance Models - Urban Rail

In most countries, local authorities are responsible for all urban rail management functions from operational to strategic, enabling them to plan, fund, and deliver integrated public transport services. Where large agglomerations can benefit from integrating public transport across local jurisdictional boundaries, they commonly establish a higher-level coordinating body. A few examples are Metrolinx in Canada's greater Toronto and Hamilton area, Regional Transportation Authority of North-eastern Illinois in the United States' Chicago area, and Zweckverband Verkehrsverbund Rhine-Ruhr in Germany's Ruhr area. Coordination is bottom-up, the organizational structure rising no higher than is necessary to achieve its purpose. Appreciate then that the English translation of Zweckverband, *functional association*, connotes bottom-up coordination rather than top-down prerogative. Such bodies typically coordinate and operate rail and road services, undertake long-term planning and raise funding, for aggregate populations of ten million or more. Individual operators may retain their legal person, but function within a framework developed by the coordinating body.

Countries that plan, fund, and provide urban rail services at national level are rare. South Africa is one of them, Russia another. It is therefore interesting that one of the few, India, is in process of devolving suburban services to local corporations, first in Mumbai, and then Hyderabad, Ahmedabad, Kolkota and Chennai. The intervention is intended to bring together suburban services, metro, and other infrastructure under a single strategic body to provide faster, more efficient and affordable transport services, even though the various networks will remain independent in terms of ownership and operation.

Whereas the narrowly defined urban rail sub-mode subsumes the steel tyred variants heavy metro, automated light metro, and light rail, the broader urban guided transit sub-mode subsumes additionally the rubber-tyred variants automated guided transit, monorail, and bus rapid transit. BRT's narrow, robust runway that supports its relatively heavy 12-13 tonne axle load, plus virtual guidance by lane tracking and docking systems, justify its inclusion in urban guided transit. Bi-articulated buses, such as those operated by Buscor in the Lowveld region of Mpumalanga Province, even emulate rail's coupling genetic technology. Rubber-tyred variants may be more suited to some applications than steel-tyred variants, while light rail may be more suited to some applications than heavy rail variants: Local authorities that are empowered to determine their own solutions are in a position to optimise their own particular mix of public transport modes.

Urban rail is by nature vertically integrated. It is typically implemented in settings where other solutions such as buses and possibly bus rapid transit have already reached their capacity ceilings. New projects therefore enter settings where competition from existing modes already exists. Urban rail systems are often isolated from rail operations on other networks, with no need to or possibility of interoperating with other operators. In addition, the intensity and scale of many operations would make rail competition impractical. For these reasons urban rail systems have been excluded from EU directives on vertical separation.

Urban rail governance models should therefore respect the nature of the sub-mode.

2.1.1.5. Generic Outcomes

At face value, rail revitalisation outcomes have not been as consistent or predictable across all interventions as their promoters might have wished. For example, the European Union's open access freight rail intervention has not met expectations, whereas a similar intervention on the Australian interstate standard gauge network did. Institutional arrangements in the United Kingdom have not yet bedded down, whereas other European countries have made more visible progress toward a stable end state since liberalisation started in 1991.

In general, one can explain such differences in terms of omitted variables. By now it should be evident that very many drivers combine to determine the development trajectory of a country-and-railway combination. For example, thirty six descriptive variables were used to examine fit between the world's railways and their setting[5]. To zoom into differences between only two interventions, say, vertical integration or vertical separation, and private ownership or state ownership, while disregarding thirty-four other descriptive variables that also influence the outcome, is to court misunderstanding. As a minimum, such comparisons ignore the critical contribution of inherent railway competitiveness. Recognising its indicators leads to the profound insight that inherently competitive railways generally succeed despite their institutional and ownership arrangements, whereas inherently uncompetitive railways generally fail whatever their institutional and ownership arrangements.

By contrast, noting that sound investment raises inherent competitiveness and positions railways on new growth curves, investment-led interventions more consistently meet expectations than reform-led interventions. This explains, for example, why rail freight in Europe has become fragile—reforming the industry but making no investment in raising its inherent competitiveness was bound to disappoint; as well as why Europe's passenger railways have flourished—substantial investment in raising passenger inherent competitiveness through high speed railways was bound to succeed. Dysfunctional railways have probably either not been liberated or have inherently uncompetitive technologies.

2.1.2. Examples of Realising Railway Renaissance

2.1.2.1. The Value of Comparisons

Comparison is a valuable tool with which to identify and examine the risks and opportunities that are likely to associate with a proposed intervention. Railways in many countries have already initiated interventions to adapt to a future they have envisioned. However, some interventions have evidently been more successful than others. It is therefore valuable to probe deeper than obvious differences such as ownership structure and institutional arrangements. When comparing the outcomes of particular interventions, it is important to examine their settings for alternative explanations. The notion of inherent competitiveness is useful for this purpose, because it frequently explains differences between outcomes. Thus, when comparing the outcomes of interventions among countries, indicators of inherent uncompetitiveness, such as low axle load, low speed, and short trains tend to associate with outcomes that do not live up to expectations, irrespective of the type of reform.

2.1.2.2. Two Development Streams

To develop a role model for moving railways in South Africa into renaissance, it is useful to review how other countries have set about the process. Noting that the Assertive Railways cluster represented an interesting mix of countries[6], some with privately owned and some with state owned railways, and that competition among railways or train operators associates with private ownership, it is necessary to separate out distinctions among members of that cluster. By inspection, it is evident that the form of ownership associates with two different development levels. There are thus two paths by which to develop assertive railways.

There is no established convention for categorising developed and developing countries in the systems of the International Monetary Fund, United Nations, World Bank, or World Trade Organization, nor are those the only designations used. Notwithstanding that, to distinguish between two fundamentally different approaches to

[5] See section 2.1.1.3.

[6] See section 2.1.1.3.

stimulating railway renaissance, it is useful to consider what are commonly known as developed countries on the one hand, and developing countries on the other hand. At the time of writing South Africa and its BRIC reference group were fortuitously all categorised as developing countries (Developing country, 2015).

2.1.2.3. Developed Countries

Railway renaissance is well advanced in many developed countries or regions, e.g. Japan, the North American Free Trade Agreement, the European Union and Switzerland, Australia, as well as members of the Gulf Cooperation Council (GCC). Differences among countries nuanced the railway renaissance in each of them. One way or another all, except the GCC countries that are discussed separately below, had sufficient inherent competitiveness to compete against other transport modes. One can thus characterise the interventions implemented by their respective governments essentially as reform-led. That is, the primary intervention was to reform the institutional arrangements, to introduce or stimulate competition in the rail sector: While elements of investment have been present, investment was not the primary objective. The thrust was rather to minimise government participation and maximise freedom to compete, among railways themselves, or among train operators on shared infrastructure, and in all cases against other transport modes.

The line-haul railways of the North American Free Trade Agreement are privately owned and compete with one another on notionally parallel routes. Many of them were originally built this way, while Mexico concessioned its former State railway to this model in the mid-1990s. They therefore only needed safety and economic regulation, the latter being applied only in the case of errant market behaviour. The former State railways of the European Union had monolithic networks that cannot support parallel competition. They therefore had no alternative but to open access to competing train operators. This is arguably second-best solution after parallel competition, for two reasons. First, equitable train path allocation is open to question, particularly if a former State railway is also a train operator in Europe's open access dispensation. Second, while regulation may ensure equitable sharing of cost and value between infrastructure managers and train operators, the absence of competing infrastructure providers cannot assure that access to rail infrastructure is priced competitively against access to infrastructure of other transport modes.

Japan's three Shinkansen or high-speed railway operators have been privatised and are now listed on the Tokyo Stock Exchange as Central Japan Railway (CJR), East Japan Railway (EJR), and West Japan Railway (WJR). Each of them also owns a narrow gauge network, on which it operates single deck electric and diesel multiple unit passenger trains over short distances at relatively low speed, so narrow gauge does not hinder them. The former Japanese National Railway networks on the islands of Hokkaido, Kyushu, and Shikoku, as well as the former freight operations now known as JR Freight, all residual narrow gauge operations after privatization of CJR, EJR, and WJR, have been retained under government ownership.

The GCC countries are difficult to categorise and therefore represent an interesting exception. All but Oman are developed countries. Saudi Arabia's original modest railway network was statistically clustered as Fortuitous in 2008 - inherently competitive standard gauge, but without exploiting the potential. The other GCC countries had no railways at all. Since then, the GCC countries have become one of the world's railway investment hotspots. All four railway renaissance market spaces are present - heavy haul, heavy intermodal and contemporary urban rail, and high speed intercity is under construction. This region illustrates how quickly railway renaissance can be implemented to support a common market and customs union between the six countries and facilitate movement of capital and trade. Railways in the GCC countries have been funded predominantly by the governments involved, with some contribution from private financing initiatives.

In summary, railways in developed countries were sufficiently inherently competitive when the railway renaissance started, and therefore did not need investment-led intervention to prepare them for participation in the renaissance. Their revitalization could be stimulated by introducing competition within the sector to enhance their efficiency and effectiveness. Of course, no railway can survive without investment, and substantial investments were also made in market spaces where rail is strongly positioned, such as high-speed intercity. The developed countries thus do not provide an appropriate role model for South Africa, because South Africa's inherent railway competitiveness is low, and it needs an investment-led intervention to develop its competitiveness to a sufficient level.

2.1.2.4. Developing Countries

Following identification of the BRIC countries as relevant reference group for South Africa in §2.1.1.3.1, the following subsections examine how each one of them in turn positioned itself within the Assertive Railways Cluster. In terms of start date, the BRIC countries are followers, by some ten to fifteen years, who should have had the benefit of learning from railway renaissance early adopters in developed countries. The following sections examine key aspects of their railway revitalization interventions as role models for South Africa.

2.1.2.4.1. Brazil

Brazil initially followed a reform-led intervention by entering into long-term (30-years renewable for another 30 years) vertically integrated concessions over a total of twelve regional freight railways that existed in the mid-1990s. Its heavy haul operations on both broad and narrow gauge, as well as general freight on broad gauge networks have since flourished, attaining creditable densities of 81 million tonne-km/route km for Vale's dedicated heavy haul operations (for comparison, TFR achieves around 37 and 57 for coal and iron ore respectively, and to be fair its RBaycor conveys traffic other than coal), and 37 million tonne-km/route km in heavy general freight. However, its narrow gauge general freight railways achieve less than 2 million tonne-km/route km (for comparison, TFR averages 4.3 on its general freight corridors). It is therefore evident that the inherent competitiveness of Brazil's narrow gauge general freight railways is low and that they underperform by comparison with its BRIC peers reviewed in the next three sections.

Lease income from concessions, and taxes on concessionaires, have become a source of revenue for the Brazilian Government. Accumulated losses from the former Brazilian Federal Railways of Reais 2.2 billion (approximately R8.1 billion) in 1997 had been replaced by accumulated concession fees, leases, and taxes of Reais 12.8 billion (approximately R47.4 billion) by 2010. However, notwithstanding its economic upswing, high logistics costs, estimated at ≈20% of GDP or double the average in OECD countries, characterise Brazil. The high costs are attributed to regional differences in the state of infrastructure, even though organisation of the Brazilian transport sector has improved substantially since the 1990s. The national rail network other than heavy haul lacks investments and modernisation, while high harbour fees further contribute to high logistics costs. The logistics sector is highly dependent on the highway network, which transports 60% of total freight volume (National Plan, circa 2005).

Brazil therefore recently changed to investment-led intervention, the Logistics Investment Program, a State strategic project (Figueiredo, undated). Regarding railways, the primary intervention is investment to increase inherent competitiveness, so that they can support economic development. While elements of reform are still present, that is no longer the prime objective. Brazil has connected its formerly isolated northern- and southern broad gauge networks by its new North-South Railway that now runs the length of the country, albeit at this time still with breaks of gauge. It is following up with more priority freight rail projects of more ≈4700km in a first phase - the East-West and Trans-Northeastern line - to develop the interior of the country (Smith, 2015). Funding will partly be by PPP, involving USD 121 billion over 30 years.

Importantly, Brazil has changed the way its new railways will operate to break rail service monopolies. Instead of awarding a single vertically integrated concession to operate and maintain a railway, a concessionaire will construct and maintain a line as well as control train movements on it for 35 years. Independent train operators will have open access through the whole new rail network. The government will bear demand risk by guaranteeing to purchase all capacity and then on-selling it to users. The process is being implemented through state agency National Land Transport Agency (ANTT) and state-owned company VALEC. This unique railway development is something to follow closely. Thus far, observers feel that the significant sunk costs of building or improving a railway have deterred more private investment, but the federal government has filled the gap, and they expect continued government railway investment in the long term. Nevertheless, the World Bank considers several steps could improve private investment in railways, among them enhancing interconnectivity between railways - Brazil operates on a heritage of two different track gauges, and the lack of physical interconnectivity between the lines slows return on investment (Biedermann & Galal, 2013).

Brazil is working on a high speed railway in the Rio de Janeiro-São Paulo-Campinas corridor, to be implemented by PPP, although after two false starts tendering has been postponed to give prospective bidders sufficient time to prepare. Rio de Janeiro-São Paulo is eighth of the

world's top 50 busiest passenger air routes. The envisaged concession period is 40 years, with commercial operation to start in 2020.

Brazil's cities have benefited since urban rail renaissance started in 1989. Projects completed or under construction include light rail routes in Brasilia and Santos; twelve metro routes in Fortaleza, Porto Alegre, Recife, Rio de Janeiro, Salvador and São Paulo, as well as two monorail lines in São Paulo (Railway Directory, 2015). Interestingly, São Paulo's Lines 1 to 3 are 1600mm broad gauge, while Lines 4 and 5 are standard gauge, to benefit from lower prices in the larger standard gauge market.

2.1.2.4.2. Russia

The Russian Federation is sole shareholder in Russian Railways (RZD). The latter exploits its strategic geographical position by fully integrating the Russian railway system into the Eurasian transport network (Eurasian routes, 2015) despite having a broader track gauge than many of its neighbours. RZD's strategy for developing rail transport to 2030 envisages significant network expansion, in two stages.

The first stage from 2008 to 2015 involves modernisation to ensure necessary capacity on key routes, a fundamental renewal and upgrading of existing infrastructure, planning and surveying work for expansion, as well as starting construction of some high-priority lines. Among its top priorities were reconstruction and technical enhancement of existing main lines plus construction of new lines to remove infrastructural limitations on Russia's economic growth. The next focus was on the Baikal-Amur Mainline in its Far Eastern region as an investment in Russia's future, by substantially increasing transportation of oil products and exports to the East, more intensive development and exploitation of Far Eastern raw materials and an increase in the line's share of East-West transit traffic. The latter catchment area stretches from China, South Korea and Vietnam in the East to Estonia, Finland, Germany, Hungary, Latvia, Lithuania, Poland, Slovakia, Romania in the West. A further priority was construction of dedicated freight lines to tap natural resources and develop new industrial zones in Western Siberia. Around 13 800 route-km were upgraded for heavy axle loads, to reduce the cost of bulk freight shipments. RZD has operated high speed passenger trains, essentially wide-bodied German Intercity Express trains with bogies adapted for Russia's broad gauge, in the upgraded Moscow-St Petersburg corridor since 2009.

The second stage from 2016 to 2030 will involve large-scale expansion. It will create infrastructure to develop new areas of economic growth across Russia's vast territory, deploy world-class technology and improve competitiveness of the country's rail system on the global market (RZD adopts, 2008). This includes the North-South International Transport Corridor in strategic partnership with countries to the south, initially India and Iran, while Belarus, Kazakhstan, Oman and Tajikistan have subsequently opted in, and requests to join from Syria, Azerbaijan and Armenia are currently under consideration (North–South, 2015). It also includes ambitions to build a 104km tunnel under the Bering Strait to connect the Asian and North American continents (Russia eyes, 2011). To be fair, the recent Ukraine imbroglio has dampened Russia's ability and aspirations to network railways on continental and intercontinental scale. And hot off the press, in March 2015 RZD called for tenders to undertake surveys, project development and route planning for the proposed 770 km Moscow - Kazan dedicated high speed line.

Because State funding is limited, RZD is financing its huge investment programme through public-private partnerships, in the ratio 46% by RZD, 30% by the private sector, 19·5% by the Russian Federation, and 4·5% by regional governments. This spread could be a useful role model for South Africa. Raising outside capital is done in accordance with RZD's Loan Programme, which provides for various instruments to finance its requirements, including syndicated and bilateral loans, rouble bonds and Euro bonds, as well as leasing and others. Key RZD focus areas are interests of shareholders and partners, as well as on increasing efficiency and speed of management decision-making and improving transparency of the Group's activities (Russian Railways, 2014).

RZD was separated from ministry control in 2003 to become a public company responsible for operational and commercial functions. Separate daughter operating companies have been set up for freight and passenger activities as a possible prelude to sale of shares. It has commenced unbundling the former monolithic entity into subsidiaries, among other at time of writing, Eurosib, which

runs container services linking Russia's ports with central Russia and Siberia; Federal Passenger Company, which manages long-distance passenger operations; Freight One, which offers cargo and intermodal shipment using its own fleet of hired wagons and offers rolling stock leasing; Freight Two, a second freight subsidiary that will lease or acquire new and modernised wagons; Globaltrans, a rail freight operator and freight forwarder; JSC High Speed Rail Lines, to promote development of high speed lines including HSR1 from Moscow to St. Petersburg, and HSR2 from Moscow to Kazan and later Yekaterinburg; and RailTransAuto JSC, which handles a range of commodities including finished motor vehicles. RZD has the right to transfer as collateral and to sell assets which amount to transfer of ownership of shares in subsidiaries run as single business entities, including little-used railway lines and stations with attendant equipment facilities and land.

RZD achieves line densities of 23.6 million tonne-km/route km plus 1.6 million passenger-km/route km in operations where block-load freight trains rather than dedicated heavy haul trains share the same infrastructure with passenger trains. It is therefore a credible peer role model from perspectives of both performance and planning, as well as implementing substantial investment to enhance inherent competitiveness locally and globally to support Russia's development objectives.

Russia has generally lagged its BRIC peers since urban rail renaissance started in 1989. Projects completed or under construction include three metro lines, in Moscow, Kazan and Chelyabinsk, a new monorail line in Moscow, and metro extensions in Nizhni Novgorod, Naberezhnye Chelny, Yekaterinburg and Novosibirsk (Railway Directory, 2015). Note that Moscow, Nizhni Novgorod, Kazan, Naberezhnye Chelny, Yekaterinburg Chelyabinsk and Novosibirsk lie in a development corridor east of Moscow (mentioned also two paragraphs above in the context of the new Moscow Kazan Yekaterinburg high speed line). RZD owns and maintains infrastructure and rolling stock, which it leases to suburban companies, and receives a subsidy from the state for providing infrastructure services at a reduced rate. The primary institutional weakness is unprofitability due to ticket revenue failing to cover expenditure and insufficient compensation from state authorities. Thus ageing and under-maintained rolling stock is gradually being withdrawn from service and not being replaced (Savchuk, 2014). Appreciate also that other than in cities with metros, heritage urban railways from the Soviet era tend to be extensive networks typically served by single trams. They therefore exploit not one of rail's heavy axle load, high speed, long train strengths, and have been unable to fend off encroachment by more attractive transport modes.

2.1.2.4.3. India

A Railway Budget presented to Parliament has traditionally funded Indian Railways (IR). The Ministry of Railways also controls a dedicated financing entity, Indian Railway Finance Corporation Ltd (IRFC) whose objective is to raise funds in the market to part finance IR's planned outlay. IR uses money so provided to acquire rolling stock and to meet other developmental needs. Rolling stock assets funded by IRFC are leased to the Ministry of Railways. IR also operates a Wagon Leasing Scheme to encourage shippers and private operators to invest in rolling stock, but it has continued to flounder. IR spends some 94% of revenue on operating expenditure, leaving little for essential investment. It appears that the politicised relations between IR and the Government, and the consequent apparent lack of strategic direction, have deterred private participation. To overcome such obstacles in moving its railways into renaissance, IR has established special purpose vehicles, described in the next two paragraphs.

First was Dedicated Freight Corridor Corporation of India Ltd (DFCCIL) in 2006 under Ministry of Railways administrative control, to plan, develop, fund, resource, construct, maintain and operate Dedicated Freight Corridors (DFCs). Building DFCs across the country, to operate double stack container trains and/or heavy haul trains, marked a strategic inflexion point in the history of IR, which has traditionally run mixed freight and passenger traffic across its network. DFCs will enable IR to improve customer orientation and meet market needs more effectively. Creation of rail infrastructure on such a scale - unprecedented in independent India - is expected to stimulate industrial corridors and logistic parks along its alignment. Currently under construction, the Eastern DFC between Ludhiana and Dankuni is being funded in three sections in different ways; by the World Bank through an International Bank for Reconstruction and Development loan; by Ministry of Railways directly; and by Public Private Partnership. Also currently under construction, the Western DFC between Dadri and Mumbai is being funded through

foreign direct investment by Government of Japan who provided a Special Terms of Economic Partnership Loan as well as by the Ministry of Railways that is bearing a portion of project construction cost as equity funding to DFCCIL. Thereafter, four more DFCs are slated to complete India's Golden Quadrilateral that connects Delhi, Kolkata, Chennai and Mumbai, as well as its two diagonals.

Second was High Speed Rail Corporation of India Ltd in 2013 also under the Ministry of Railways to prepare financial and implementation models, and develop technical standards. A 540km dedicated high speed line between Mumbai and Ahmedabad could be first, followed by connecting the major metropolitan centres Delhi-Amritsar, Delhi-Chennai and Chennai-Mysore. Two projects are set to serve portions of the Delhi-Mumbai corridor, currently tenth of the world's top 50 busiest passenger air routes. The recently elected Modi government will fast track an investment-friendly PPP mechanism to modernise railways and implement mega-projects such as high speed (Thakur, 2013).

India is a member of the International Heavy Haul Association, and already operates double stack container trains. IR achieves overall line densities of 10.9 million tonne-km/route km plus 16.6 million passenger-km/route km in operations that at present include freight and passenger trains sharing the same infrastructure.

India's networking strategic horizon includes pursuing the North-South International Transport Corridor in partnership with Iran and Russia. However, the 1 676mm broad gauge that it shares with neighbours Bangladesh and Pakistan is incompatible with the two other major track gauges in Asia, China's and Eurasia's standard gauge, and the CIS' 1 520mm broad gauge, which constrain networkability. So it is beholden to transloading containers, bogie changing or gauge-changing wheelsets, which would dampen networking enthusiasm unless major traffic flows were at stake.

India's cities have benefited since urban rail renaissance started in 1989. Projects completed or under construction include 17 metro lines in Bangalore, Chennai, Delhi, Gurgaon, Hyderabad, Kolkata, Mumbai and Navi Mumbai, as well as a monorail line in Mumbai (Railway Directory, 2015). Interestingly, Delhi's three Phase 1 lines are 1676mm broad gauge, while its four Phase 2 lines are standard gauge, to benefit from lower prices in the larger standard gauge market. This practice subsequently spread to Bangalore, Chennai, Gurgaon, Hyderabad, Mumbai and the planned metro in Pune.

Note that the foregoing information relates to the current IR institutional arrangements. As this document was finalised, the Bibek Debroy Committee interim report on the Indian Railways recommended sweeping changes in the way IR runs. They include transition to commercial accounting, streamlined human resources processes, focus on core activities to efficiently compete with the private sector, a substantial amount of decentralisation, placing existing production units under a government SPV to be known as Indian Railway Manufacturing Company, encourage private entry into running freight and passenger trains in competition with IR, institute independent railway economic regulation, separating out the relationship between the Union Government and IR, and raising resources for investments through investment banks and other financial institutions (Economic Times, 2015).

2.1.2.4.4. China

China's railway financing is based on government leadership, diversified investment and market orientation. Joint ventures are the major model for new projects. By end 2008, RMB300 billion (≈ZAR385 billion) had been committed from outside Ministry of Transport. Major finance channels include the Railway Construction Fund; contributions from local governments and cooperative agreements between Ministry of Railways and provincial governments; treasury bonds; budget from central government; strategic investors such as power plants, coal mines, ports, insurance groups; the Dedicated Construction Fund from operation revenue; restructuring railway assets through initial public offering; Railway Construction Bonds; and domestic and foreign bank lending. Implementation rests on clear vision, a good plan, efficient implementation, and creative financing.

China Railways achieves 26.9 million tonne-km/route km plus 8.89 million passenger-km/route km on a network that at present includes dedicated freight lines (heavy haul) and dedicated passenger lines (high speed), as well as extensive mixed traffic heritage infrastructure that has been progressively upgraded. China has developed means to finance its huge railway expansion to support rapid economic growth, and now participates in all

four railway renaissance market spaces. It is a strong role model for railway renaissance through investing in inherently competitive railway technologies. China Railways commenced high speed service as recently as 2007, and today operates the largest and most heavily used high-speed railway network in the world (High-speed rail, 2014).

China's cities have benefited since urban rail renaissance started in 1989. Projects completed or under construction include 107 metro lines in Beijing, Changchun, Changsha, Chengdu, Chongqing, Dalian, Dongguan, Foshan, Fuzhou, Guangzhou, Guiyang, Hangzhou, Harbin, Hefei, Kunming, Lanzhou, Nanchang, Nanjing, Nanning, Ningbo, Qingdao, Shanghai, Shenyang, Shenzhen, Shijiazhuang, Suzhou, Taiyuan, Tianjin, Ürümqi, Wenzhou, Wuhan, Wuxi, Xi'an, Xiamen, Xuzhou, and Zhengzhou; nine light rail lines in Changchun, Nanjing and Suzhou; six rubber- or steel-tyred automated light metro lines in Macau and Wuhan; two monorail lines in Chongqing; and two suburban lines in Wenzhou (Railway Directory, 2015). China also operates bus rapid transit systems: Its urban guided transit catalogue thus includes the full range of three steel-tyred solutions, namely heavy metro, automated light metro, and light rail; and three rubber-tyred solutions, namely automated light metro, monorail, and bus rapid transit. It is therefore able to nuance solutions for particular city requirements.

One aspect of China's railway development has recently elevated it above all BRIC peers, and indeed all other railway countries, namely its global railway network aspirations and progress. China's railway strategic horizon reaches out from its 107 000km standard gauge home network to surrounding and more remote regions, e.g. all Asia, North America, Western Europe and Africa. The following examples start from north and proceed clockwise to show its ambitious vision for standard gauge trade routes.

a) Build standard gauge into broad-gauge Mongolia's territory to support mineral exports.

b) Strengthen linkages with Russia through more border crossings, including from China's northern provinces to Russia's Sea of Japan ports Pos'et and Slavyanka.

c) Cooperate with Russia to build a high speed line from Beijing to Moscow.

d) With Russia, reach out to North America: Counter-intuitively, the shortest or great circle route from, say, Chinese factory city Chongqing to the western US, is not over the Pacific Ocean, but overland from Asia to North America via the Bering Strait.

e) Route rail traffic from standard-gauge North- and South Korea through China to Europe, at present routed through Russia and Belarus.

f) Link Nanning and Kunming in southern China to Vietnam, Laos, Myanmar and Thailand, and thence through Malaysia to Singapore, by re-gauging from narrow gauge to standard gauge in the countries mentioned.

g) Complete rail links to India, Nepal and Bhutan by 2020 (Tibet extension, 2014).

h) Link Xigaze railhead in Tibet around China's western border to Ürümqi railhead, to springboard from Kashgar in China through Kyrgyzstan and Tajikistan to Herat, in Afghanistan, soon to be easternmost outpost of Eurasia's standard gauge network.

i) China already links to Kazakhstan's broad-gauge network via two lines from Ürümqi.

j) Promote new standard gauge railways in several equatorial African countries. This topic is addressed in more detail in §2.2.

k) Upgrade lines from the port of Piraeus in Greece through the Balkan states to Hungary, to access the heart of Western Europe.

To be fair, China is not having it all its own way. While its propositions appear generous, smaller countries seem wary of a longer term agenda. Some would like to leverage China's overtures to their own benefit. Negotiations can take a long time. But ultimately high performance rail has become the backbone of choice for integrated, multimodal freight and passenger transport in an energy-scarce world. Countries that cannot achieve that by their own means eventually tend to accept what is on offer.

2.1.2.5. The Essential Challenge

From the foregoing discussion and examples, it is evident that the essential challenge for a country whose railways are

not robustly positioned to support a developing economy, or to defend their market space from domestic competition from other transport modes and global competition from other countries, or even worse, are in terminal decline, is to move them onto one or more of the new renaissance growth curves. This cannot be achieved without investing substantially to position rail in one or more of its inherently competitive market spaces and concurrently addressing the institutional arrangements by which railways are funded and governed. The requisite investment may be government funded, privately funded, or a combination of both as in public private partnerships, and the institutional arrangements need to be supportive. The BRIC countries provide ample evidence of aggressive intervention to position rail as the foundation of their transport sectors. By contrast, there are no known examples of countries that have achieved renaissance by other means, such as making sustaining investments in existing inherently uncompetitive railways, or introducing competition among operators on them. The following sections discuss possible revitalisation interventions.

2.1.3. High-level Intervention Design

2.1.3.1. Competition and Reform-led Interventions

Competition may or may not be used to enhance the efficiency of railway exploitation as an element of an intervention to revitalise a railway. In developed countries, where existing railways may already have adequate inherent competitiveness by virtue of prudent choice of track gauge and parameters for axle load, speed and train length, increasing efficiency and performance by introducing competition among elements of service delivery may be appropriate, and may indeed be the only available intervention lever. Thus several countries in the Enlightened and Progressive Railways Clusters have embraced competition to maximise the exploitation efficiency of investments in expensive long-lived assets. Such competition can take several forms for example, competing in a market, as in open access train operations on vertically separated infrastructure; or competing for a market, as in periodic refranchising of passenger services, or competing to finance and supply capital assets, or to provide services such as maintenance.

It is however important to appreciate that competition alone is not a remedy or solution. Railways that operate, or contemplate operating, freight and passenger trains on the same network usually cannot simultaneously optimise the train-infrastructure interface for both train types. The characteristics of fast passenger and heavy freight trains differ to the extent that optimising that interface for one train type unavoidably sub-optimises it for the other. For example, high speed passenger trains require wide curves but tolerate steep gradients, while heavy freight trains require easy gradients, but tolerate tight curves. Freight rail in the European Union is a case in point. Its train-infrastructure combination optimised for dominant passenger traffic precludes concurrent optimisation for freight trains. The latter have therefore failed to prosper despite penetrating government encouragement and intervention, and currently face a bleak future (Müller, Girardet, *et al.*, 2014).

Furthermore, in settings where inherent competitiveness is inadequate and investment is required to raise it to an adequate level, it is futile to introduce competition and/or private sector participation only. Such interventions in an inadequately inherently competitive setting, typically by way of concessions, run the risk of failure to invest and even asset stripping, as concessionaires eke out an existence on stagnant or declining income. Narrow gauge concessions in Sub-Saharan African countries (Burkina Faso, Cameroon, Congo Republic, Côte d'Ivoire, Kenya, Madagascar, Malawi, Mali, Mozambique, Senegal, Tanzania, Uganda, Zambia, and Zimbabwe) have line densities of 1.5 million tonne-km/route km or less, in some instances very much less. Sustainability is questionable at such low line densities, as the classic case of privatisation and subsequent re-nationalisation of railways in New Zealand illustrates, where line density is as low as 0.3 tonne-km/route km (Railway Directory 2015). The World Bank has identified that in Sub-Saharan Africa, few passenger train services cover even their above-rail operating costs; few, if any, concessions generate significant profits for their operators and certainly not enough to fund long-term track renewals; regulation of private rail operators is absent, not effective or efficient; and government oversight of railway concessionaires is inconsistent and/or not aligned with good business practices, which results in expectations not being met (Bullock, 2009).

Competition can therefore be the intervention of choice only in settings where inherent railway competitiveness is adequate for all operations that are present, both freight

and passenger. South Africa should therefore not follow the example of the countries in the Enlightened and Progressive Railways clusters, but will need to build its rail revitalisation intervention on investments that increase the inherent competitiveness of its railways.

2.1.3.2. Investment and Investment-led Interventions

Throughout the world, railway renaissance has been achieved only by investment in assets that have increased rail's inherent competiveness against other transport modes. This is true both for railways competing against other transport modes, or supporting competition against other countries in export markets, as well as for railways cooperating in intermodal alliances, particularly with road hauliers. Noting that inherent competitiveness associates with the market spaces heavy haul, high speed intercity, heavy intermodal[7] or double stacking, and urban rail, all supported by full strength application of rail's genetic technologies, it is evident that South Africa will need to build its rail revitalisation intervention on investment that will support entry into these inherently competitive market spaces. Thereafter, if and when the political climate is right, it could be beneficial to consider introducing competition in the railway sector.

Regarding competition between rail and road, it is important to appreciate that while a railway might perceive itself not to be competing against road hauliers; the latter perceive themselves to be competing for whatever business is available. Customers, whether passengers or logistics service providers, by nature lean toward the more aggressive competitor, and will choose road until rail comes up with a superior offer, either alone or in partnership with road hauliers. Inherent competitiveness is thus a critically important element of railway positioning because, whether rail stakeholders acknowledge it or not, as long as logistics service providers and passengers have a choice, rail is competing with road, either over the entire distance where rail can offer such a service, or for the long-haul portion where customers want a door to door service and rail needs to complement its offer with last-mile service by another mode.

2.1.4. Regulation

2.1.4.1. Forms of Railway Economic Regulation

In the light of accumulated global experiences in achieving railway renaissance, it is evident that the form of railway economic regulation is essentially a function of the political will behind the intervention to achieve renaissance. Thus there may be less need for economic regulation in instances where coherent political will and state-funded investment drive railway renaissance. By contrast, where reform-led intervention and/or private participation drive railway renaissance, there may be more need for economic regulation over matters for which multiple participants contend, such as access rights and charges, investment modalities, path allocation, and more.

2.1.4.2. Examples of the Presence of Railway Economic Regulation

Those countries that have embraced railway economic regulation exhibit a variety of approaches. The following examples suggest that a particular regulatory dispensation is best set up to align with a country's or region's overall policy objectives.

The European Rail Agency (ERA) recognises that one of the European Union's major priorities is constructing a safe, modern integrated railway network. Railways must become more competitive and offer high-quality, end-to-end services without national border restrictions. The ERA was established to facilitate that priority by reinforcing safety and interoperability. It also acts as the system authority for the European Rail Traffic Management System project, and is developing a common approach to homologate railway vehicles and their subsystems. Economic evaluation is common to all ERA activities: It therefore includes an Economic Evaluation Unit to provide the European Commission and stakeholders with adequate insight. It avoids decreasing the competitiveness of railway transportation, and provides decision-makers with a fair estimate of the effects of Agency recommendations. It also avoids an accounting view of railways, but takes into account qualitative aspects and development potential, i.e. the long-term interests of railway clients and third parties.

[7] Appreciate that heavy intermodal goes beyond simply transferring a load unit (container, swap body, whatever) from one mode to another, such as between road and rail and vice-versa. When rail is involved, it requires raising the axle load of the container wagons into the heavy haul domain, by double stacking containers, to exploit the competitive strength of rail's high axle load genetic technology Supporting.

The United States Surface Transportation Board is an economic regulatory agency mandated to resolve rail-road rate- and service disputes and review proposed railway mergers. Its decision-making is independent from, but administratively affiliated with, the Department of Transportation. It serves as both adjudicatory and regulatory body, having jurisdiction over railway rate and service issues, mergers, and line- sales, construction, and abandonments. It also has jurisdiction over certain road transport, ocean shipping and pipelines matters.

The Australian Department of Infrastructure and Transport recognises that comprehensive and accessible rail transport is an important link in Australia's transport chain that joins communities and strengthens industry. It assists the Government to manage Nation Building Program rail investments and oversees Australian Rail Track Corporation (ARTC). ARTC itself originated in the 1990s Australia-wide competition reform agenda. The Department also assists the Government, States and Territories regarding an agreed national model for rail safety legislation and associated regulations.

Research[8] further indicates that responsibility for rail economic regulation may rest with national government, sub-national government or shared by both. A wide range of regulatory institutional arrangements at the national level across selected OECD countries exists, as follows. One option is *ministerial responsibility* for economic regulation decisions. In Japan it is the Ministry of Land, Infrastructure and Transport. In France it is the Ministry of Ecology, Energy, Sustainable Development and Planning, assisted by the Mission for Control of Rail Activity as an advisory committee. In Switzerland it is the Federal Office of Transport, but additionally the Railways Arbitration Commission settles access disputes. In Ireland the Department of Transport oversees passenger fare changes, while rail infrastructure development is subject to approval by an independent planning authority. Another option is *a regulator encompassing all main infrastructure sectors, including some rail functions*. This option prevails in Germany (FNA) and Australia (ACCC). The FNA shares regulatory responsibility with two ministries: The Federal Ministry of Transport, Construction and Town Development supervises railway regulation; while the Federal Ministry of Economics and Technology takes organisational responsibility. Then there are *rail or transport-specific regulators*. The UK the Office of Rail Regulation is an example. The Netherlands Office of Transport Regulation is located within its Competition Authority. The Canadian Transportation Agency mandate includes economic regulation, dispute resolution and accessibility. The transport-wide Swedish Transport Agency was introduced in 2009 to regulate competition and security for an efficient transport market.

The foregoing examples show that arrangements to regulate access and introduce competition to the rail sector have come to include a variety of issues. No clear golden thread runs through them, other than that they have been structured around government imperatives and objectives, which differ from country to country. Railway economic regulation in South Africa would therefore need to address aspects of its railway revitalisation intervention that promote development of a competitive, efficient and sustainable railway industry that contributes to economic growth and social development.

2.1.4.3. Examples of the Absence of Railway Economic Regulation

Brazil, Russia, India, and China have moved or are moving their railways into renaissance largely through coherent political will, and appear therefore not yet to have perceived a compelling need to enact legislation to enable economic regulation. These countries have demonstrated exemplary single-mindedness in implementing their respective pro-renaissance interventions.

Brazil has existing vertically integrated concessions, but has advanced to a democratic open access dispensation on newly-built national routes. The other three currently have vertically integrated operations. Their arrangements tend to minimise overlapping interests and responsibilities, which in turn minimise points of contention and hence the need to intervene by way of regulation. Nevertheless, they are diversifying their funding sources, so economic regulation is likely to emerge. Expect Russia to move in that direction, as it has already commenced unbundling Russian Railways above-rail assets. The Indian Railway Board functions as a ministry and exercises all powers of central government

[8] Albon, R and Wu, S (2009) Economic Regulation of Rail infrastructure – Design and Process across OECD Countries; Discussion Document on the establishment of interim rail economic regulatory capacity within the DOT (November 2011).

regarding railway regulation, construction, maintenance, and operation. India is thus comparable to the South African dispensation before creation of the Railway Safety Regulator in 2002 and the forthcoming Single Transport Economic Regulator. China unbundled its Ministry of Railways in 2013, creating the State Railways Administration to monitor the safety, project quality and technical standards employed at vertically integrated operator China Railways Corporation. At least there seems to be safety regulation of sorts, and project quality might include an economic perspective.
It thus seems that even the BRIC countries could be moving toward a dispensation where the presence of multiple contending interests could lead to a need to introduce railway economic regulation.

2.2. Developments in Africa

During the time that this Green Paper has been in preparation, Africa Rising, the notion of a giant continent awakening from poverty and disaster, and now bursting with hope and opportunity, has received increasing recognition. Progress is real, dramatic and well established. The International Monetary Fund reported that since 2003, GDP across Sub-Saharan Africa's 48 countries grew an average of 5-7% per year. In the past decade, six of the ten fastest growing countries in the world were African, some of them outgrowing China in recent years. Africa is experiencing a historic transition: During the next few decades hundreds of millions of Africans will likely be lifted out of poverty, just as hundreds of millions of Asians were in the past few decades. Africans are better educated than ever. With almost a billion cell phones in use, the most essential tool for entrepreneurialism is at hand. The world's emerging economic powerhouses find it easier to digest Africa's simultaneous potential and pitfalls. China has taken the lead in two-way trade with Africa - often in infrastructure-for-resource swaps that have given the continent an infrastructure makeover. India, Brazil, Malaysia, Turkey, and the Gulf states are also pursuing Africa's oil and gas, coal, timber, minerals and farmland (Perry, 2012).

Africa's population is already over one billion, and is projected to rise to over four billion by the end of this century. Africa could reap a massive demographic dividend from its bigger labour force. Its population boom could transform the continent, breaking centuries-old cycles of poverty and inequality (York, 2014). Already, among the world's 300 fastest-growing cities, 37 are in Africa.

To contextualise the African continent's 30.4 million km2 area with respect to railways, note that the areas of the BRICS countries (also in million km2) are habitable Russia 10.0 (only some 59% of its 17.1 million km2 is habitable), China 9.6, Brazil 8.5, India 3.2, and South Africa 1.2. Thus the combined area of all BRICS countries is only 7% larger than that of the African continent. The United States has the largest railway network in the world, followed by China, Russia, and India: Their combined areas will overspill Africa, coincidentally, also by only 7%. One can only conclude that if Africa is to succeed in rail-based intra-continental trade, it is improbable that a narrow gauge continental network will ever play in the league of the world's four largest railway networks combined: A standard gauge continental network is therefore called for.

When contemplating a matter as weighty as changing track gauge, it is important to take a broad and long view of the context. The solution to Africa's gauge muddle is common cause: The African Union Protocol on Gauge indeed concluded that conversion to standard gauge (1 435mm) for new railway lines should enable African railways to benefit further from the wide range of material and equipment at global level, and would contribute significantly to resolving the problem of interoperability in the future Pan-African railway network. However, it did not find traction during the era when much of Africa was beholden to donors. Now that Africa enjoys high economic growth, is attracting more foreign direct investment than aid, and is contemplating its developmental infrastructure foundation, it is appropriate to revisit the track gauge issue. South Africa is inseparably part of this dynamic and, from a railway policy perspective, needs to recognise events to its north.

In the light of the previously mentioned Chinese ambition to forge an extensive standard gauge network radiating from its own network, the following is the status in equatorial Africa. A Djibouti to Addis Ababa standard gauge railway is currently under construction by a Chinese contractor, track laying having started in May 2014. Member countries of the East African Community, Burundi, Kenya, Rwanda, Tanzania and Uganda have agreed to build a new standard gauge network, with funding arrangements also finalised with China in May 2014 and construction now evident. China Railway Construction Corporation signed a $12 billion deal in November 2014 with Nigeria to build a railway along its coast. Other standard gauge ambitions or initiatives have

been reported in Cameroon, Chad, Ghana, Mali, Senegal, and South Sudan. All have Chinese involvement. All have potential linkage to the standard gauge railways of North Africa. Furthermore, energetic railway investment across the Red Sea in the Gulf Cooperation Council states is rapidly creating a neighbouring network that would offer potential rail-based multilateral trade opportunities with northeast African countries and further.

From southernmost railhead of the East African network to northernmost railhead of the South African Network would be some 2500km, not a huge distance on the scale of continental and intercontinental railway networks. The proposition should attract consideration in the context of the Durban to Dar es Salaam North-South corridor. What was unthinkable until recently has now become an item on the track gauge agenda.

2.3. *Rail Challenges for South Africa*

The foregoing material has provided a comprehensive global overview of railway renaissance drivers and the modalities of achieving renaissance through appropriately designed interventions. The following sections examine railways in South Africa from the perspective of identifying aspects that call for attention and appropriate interventions.

2.3.1. Underutilised Infrastructure Assets

The notion has often been expressed that many of South Africa's railway infrastructure assets are underutilised. Simply observing the absence of traffic seems to confirm its truth. While the White Paper on National Transport Policy indeed mentions the need to optimise capacity utilisation, there are many underlying reasons why traffic is absent, and it is equally true that much apparently underutilised rail infrastructure is also obsolete. Most of South Africa's main rail routes were completed before 1900, and most of the branch lines were completed by 1910. The construction technology of the time was labour intensive, with limited explosives and no earth-moving machinery. Consequently, earthworks were minimal, and routes avoided rather than passed through difficult terrain. The resulting alignments were roundabout, frequently with many tight curves and steep grades.

To illustrate the present challenge by example, appreciate that the Cape Town-Kimberley-Johannesburg railway generally still follows its original pre-1900 alignment, although a few sections have been realigned, most notably replacement of the Hex River pass by a series of tunnels in 1989. While the railway line still follows its original alignment through Tulbagh kloof between Wellington and Worcester, the original road through the same kloof was first widened, later replaced by a new alignment on the opposite bank of the river, then largely displaced by the Du Toits Kloof pass, and ultimately relegated to local traffic by the Huguenot tunnel in 1988. Furthermore, the entire parallel N1 road has benefited from several substantial upgrades, and now features wide lanes and shoulders, no blind rises, and climbing lanes on long upgrades. Is it reasonable to expect rail on first-generation alignment to hold its own against state-of-the-art road transport on fifth-generation alignment? Similarly, opportunistic realignment to ease curves and grades on the main lines from Gauteng to the ports of Durban, East London, and Port Elizabeth was also undertaken, mostly before 1960, although the Volksrust-Newcastle section of the Gauteng-Durban route was realigned and re-graded as late as 1989. By contrast, over the same period the original port of Cape Town, now the V&A Waterfront, was first expanded by the Duncan Dock in 1939, and then by the Ben Schoeman Dock in 1977. Rail is therefore not underutilised, but continued investment to upgrade and expand infrastructure for other transport modes has simply relegated it to insignificance. Its apparent underutilisation should therefore not surprise.

One consequence of piecemeal railway upgrading was that consistent end-to-end ruling grades were not achieved. This perpetuated changing the class or number of locomotives on a train where ruling grades changed en route, a heritage embedded in the vertical alignment by steam locomotives that have long been retired. When mainlines were electrified to secure the benefits of electric traction, the pre-existing need to change class or number of locomotives at yards where steam locomotive depots had formerly been located obscured the fundamental ideal of a single electrification voltage over an entire route. Increasing axle load followed a similar path, piecemeal upgrades resulting in the present axle load diversity on the national network. These inconsistencies have persistently exacerbated freight rail operational inefficiencies.

Obsolete narrow gauge infrastructure has also obstructed progress toward achieving competitive globally-referenced

passenger train performance. Numerous speed-restricted curves, many no higher than 90km/h, are a first impediment. While such curves do not unduly impede heavy freight trains, they seriously impede long-distance passenger trains. Passengers accept long distances at low speed with long journey times only as a last resort. The inherent speed limitations of narrow gauge are a second impediment. Even if there were no tight curves, the potential to increase speed remains limited, resulting in inability to progressively increase speed over time. Compare this heritage to Europe, where ongoing upgrading of its standard- and broad gauge railways raised maximum speed on much of the original 19th Century infrastructure to 200km/h, today considered eminently suitable infrastructure for mixed freight and passenger traffic.

Recall that the De Villiers Report (1986) found that SATS had invested in rail sectors that were unable to compete with other modes, or that ran at a loss, and recommended that it should restrain new rail investment and rather focus on increasing utilisation of existing assets. However, the Report recognised neither the importance of inherent railway competitiveness, nor that narrow gauge railways are significantly disadvantaged against wider-gauge railways and other transport modes in this respect. Recommending SATS should focus on increasing asset utilisation, when the assets themselves were inherently uncompetitive, was the kiss of death to general freight- and long distance passenger services. The timing of the report was also inopportune, coming when the railway renaissance was manifestly underway to discerning observers but had not yet fully bloomed, and preceding deregulation of road freight that tipped the modal balance in favour of road. Through locking most railways in South Africa into inherent uncompetitiveness, this set of circumstances affirmed their acute decline.

Underutilised railway infrastructure is thus not an underlying problem concerning railways in South Africa, but is symptomatic of obsolete standards and technologies that have run their course, and of subsequent failure to invest in the current generation of technologies of the railway renaissance. Only line capacity that has economic value is readily saleable. Line capacity that is inherently uncompetitive is probably unsaleable. The solution to this perceived problem is thus not regulating traffic from road to rail and then having it conveyed by an inherently uncompetitive mode, but rather investing in realising the railway renaissance in South Africa, and thereby enabling rail to attract substantial amounts of traffic from road to rail with concomitant economic, environmental and social benefits.

2.3.2. Over-age Equipment

Absence of competition within the railway sector has over time resulted in equipment and standards lagging well behind global norms. The last series-produced technical generation of Metrorail coaches, the 5M, was placed into

service in 1958. It was followed by the 6M, 7M, 8M, and 9M New Generation projects in the 1980s, which however did not achieve large scale fleet deployment due to financial constraints. The 10M upgrade of the 5M generation achieved lower maintenance and improved appearance, but even the 10Ms fall short of many contemporary convenience, greening, mobility, performance, safety, and security requirements. Similarly, the design of the last generation of long distance coaches used by Shosholoza Meyl originated in the 1960s. No new passenger rolling stock has been built since the mid-1980s.

Present passenger rail positioning in South Africa is fundamentally constrained by the trains currently operated under the Metrorail and Shosholoza Meyl brands. Their technologies are out-dated, and they have consequently placed no demand for higher performance on infrastructure, which in turn has also become out-dated. Metrorail currently offers only a one-size-fits-all solution, which might not be able to match the performance of contemporary higher capacity, lower cost, and/or faster guided transit solutions on lower density routes. Shosholoza Meyl is handicapped by limited speed on narrow gauge track, and cannot differentiate itself competitively from offerings by other transport modes. Fortunately, the current major recapitalisation of commuter stock, and the renewal of the control infrastructure, will in due course reposition PRASA's urban rail offerings to world class standards, which will support the ability to shift commuter traffic from road to rail. The recent arrival of new locomotives for Shosholoza Meyl trains should improve service reliability, but may offer only marginal reduction in journey times because they are beholden to TFR for access to its constrained infrastructure.

Positioning of freight rail in South Africa also reflects an inability to raise inherent competitiveness. With the exception of the ore line, relatively few new wagons have entered service in recent years other than to replace those damaged in accidents. Wagon design has also become outdated. The jumbo coal wagon design was a world leader with its 4.2 load-to-tare ratio when it was conceived in the early 1980s, but thirty years later it is mediocre by global norms of 6.0 or higher. Can road rigs from the early 1980s compete with contemporary designs? To begin with, there were no side-tipper interlinks in those days.

Similarly, the locomotive fleet aged steadily to the point where it could no longer support reliable service. Fortunately TFR started acquiring new locomotives for heavy haul trains, commencing with new Class 15E locomotives for the ore line, new Class 19E locomotives for the coal line, and new Class 43 diesel locomotives for heavy haul and general freight service. It has followed through with further orders for more than a thousand diesel and electric locomotives for heavy haul and general freight service, an event that was highlighted in Industrial Policy Action Plan 2014/15 - 2016/17. While this intervention will support reliable service delivery, recognise that new narrow gauge freight locomotives attract a price premium. Narrow gauge axle load is low by standard- or broad gauge norms, while lower longitudinal track resistance constrains the tractive effort that may be exerted. Thus even if narrow gauge locomotives cost the same as standard or broad gauge locomotives, they haul less tonnage, resulting in a premium price per unit tractive effort.

In addition to gradually declining competitiveness against other transport modes, failure to upgrade equipment at every opportunity due to lack of understanding of inherent competitiveness means that there has been a tendency to refurbish assets to existing standards rather than to replace them with new equipment to ever higher performance standards. Competing as it does against road freight, which replaces vehicles with new higher performing ones on a shorter cycle than rail, this practice effectively and continuously diminishes rail's relative competitiveness.

Furthermore, the set of out-dated technologies widely still used for signalling and train braking negatively affects overall railway safety because it does not design out human error as do off-the-shelf contemporary technologies. This situation further exacerbates human factor management challenges in safety-critical jobs, such as train controllers and train drivers, which manifest themselves in unsafe responses to abnormal conditions. Under-investment in railway infrastructure and rolling stock furthermore results in frequent technical failures, which increases the prevalence of abnormal conditions. Adequate investment in contemporary technologies is required to close that gap and eliminate the risk of accidents and incidents that could damage assets and freight and injure, fatally or otherwise, crews, passengers, and the public. Gautrain is a good local example of a railway for which all hazards have been identified up front, the risks assessed, and the system then designed to reduce residual risks to known and acceptable levels. Fortunately PRASA's new signalling systems and

TFR's Long Term Planning Framework have recognised the benefits that contemporary technology can deliver in this regard.

2.3.3. Capitalised Maintenance



Refurbishing assets rather than routinely replacing them with higher performing new ones not only insidiously diminishes inherent competitiveness, but encourages capitalisation of maintenance expenditure. Thus while the total quantum of capital investment may leave an overall impression of substance, the net effect on increasing rail's competitiveness is diluted by continuing to maintain inherently uncompetitive obsolete assets. For example, TFR's 2014 capital spend of R33.3 billion comprised 24.5% sustaining capital and 75.5% expansion capital (Transnet Integrated Annual Report, 2014: 74). This is nevertheless a substantial improvement on three years earlier prior to Transnet's Market Demand Strategy, when Freight Rail's 2011 capital spend of R12.5 billion comprised 65.6% sustaining capital and 34.4% expansion capital (Transnet Integrated Annual Report, 2011:121). Noting that sustaining capital investment is the periodic addition of capital to maintain operations at existing levels, it is questionable whether this practice is tenable in a setting where rail's inherent competitiveness does not pass muster in the first instance, where road competitors raise the bar each time new vehicle models bring technology enhancements to the market, where traffic volumes fail to meet expectations, and where alignment with national transport objectives such as intermodal transport solutions and road-to-rail shift struggles to get traction.

Appreciate that as road transport raises the bar by emulating rail's genetic technologies when implementing performance based specification trucks (Supporting), and systems such as lane departure warning (Guiding) and adaptive speed control (Coupling), and allowing longer vehicle combination lengths (Coupling), it increases the challenge of achieving road-to-rail shift. It would be churlish to deny a competitive transport mode the opportunity to upgrade as best it can, but equally rail needs to leverage its genetic technologies to maximum extent so as not to distort the outcome of the competition. South Africa's existing railway asset base is largely obsolete and over-age[9]. Investing substantial capital to sustain performance at its existing levels foregoes the opportunity to invest in projects that can position railways at the forefront of the national transport task.

2.3.4. Low Performance

Railway costs include a relatively high infrastructure fixed cost component, and rail therefore becomes more cost effective when traffic volume increases for a given route distance. Conversely, rail becomes less cost effective when traffic volume decreases for a given route distance. The generally accepted measure of railway network utilisation is Line Density, expressed as million tonne-kilometres or passenger-kilometres per route kilometre on an annual basis. Table 3 compares a relevant selection of railways (from Railway Directory 2015 and Transnet Annual Report 2014). For each freight traffic category, namely all Freight, Heavy Haul, and General Freight, narrow gauge railways do not attain the comparatively high line density of standard gauge or broad gauge railways, but consistently gravitate to the bottom of each category. The many apparently underutilised railway routes in South Africa bear out this observation. Note that public domain data does not respect user requirements: The foregoing three freight traffic categories were therefore chosen to extract maximum insight from available data.

Table 3: Comparative Line Densities for Selected Railways

Operation	Track Gauge	Freight Traffic Category	Density10^6 tonne-km per route km	Density 10^6 passenger-km per route km
Brazil: MRS	Broad	All Freight	37.2	
China Railways	Standard		26.9	8.9
Russian Railways	Broad		23.6	1.8
USA: BNSF	Standard		20.3	
USA: Union Pacific	Standard		16.0	
USA: CSX	Standard		12.4	
Indian Railways	Broad		10.9	16.6
USA: Norfolk Southern	Standard		8.3	
South Africa: TFR	**Narrow**		**7.4**	**0.1**
Australia: BHP Billiton	Standard	Heavy Haul	126	
Brazil: EFC	Broad		82.3	
Brazil: EFVM	Narrow		79.6	
South Africa: TFR Ore Line	**Narrow**		**58.1**	
South Africa: TFR Coal Line	**Narrow**		**37.5**	
South Africa: TFR	**Narrow**	General Freight	**4.3**	
Brazil: ALL, FCA, Transnordestina	Narrow		1.2	

Appreciate that Indian Railways and China Railways, and to a lesser extent Russian Railways, convey substantial long-distance passenger traffic on the same infrastructure as their freight traffic: The last column gives the passenger line density, which is not significant where no value is given. The value against TFR is an estimate of Shosholoza Meyl's contribution. The basis for aggregating total freight-plus-passenger line density is the subject of debate, but equivalence of one tonne-kilometer equals one passenger-kilometer is sometimes used. Thus one might compare, say, India's 10.9+16.6=27.5 line density units to Russia's 23.6+1.8=25.4 line density units and conclude that they are in the same line density league. The passenger statistics exclude Railway Directory's City Rail category, i.e. metro and light railways.

Raising metrics such as availability and reliability from 70% (typical of a mediocre railway) to 90% (typical of a good railway) can potentially gain an improvement of only some 30%. It is therefore evident that efficiency improvements alone, though always necessary, cannot raise performance sufficiently to move railways in South Africa into the league of its Assertive Railways cluster fellows. It is also evident that narrow gauge simply does not cut it, whether that be general freight or heavy haul in Brazil or in South Africa. More incisive interventions are necessary. Among other, a reduction of TFR's network by two thirds, without material loss of traffic, would go a long way to increasing its line density to that of its fellows, and usefully reduce the infrastructure fixed cost component.

Stakeholders have frequently suggested that TFR should increase the efficiency of its current operations, rather than contemplate new investment. Aside from repeating a De Villiers recommendation from 1986, such suggestions need to consider some practical realities. Essentially, railway key performance indicators are a function of track gauge, as the following tabulation shows:

Many of them exceed the track gauge ratio of 1.34, the differences being attributable to the following drivers. First, economies of scale come with wider track gauge: Vehicle components such as wheels, brake gear, draw gear, couplers, and material thicknesses are common to all track gauges, but their mass is proportionally less on higher capacity vehicles, hence load/tare ratio is higher for

[9] See sections 2.3.1 and 2.3.2.

standard gauge wagons. Second, traction motors have end-effect losses: They are proportionally less on longer standard gauge motors, hence standard gauge motors achieve higher power outputs. Third, in addition to higher load/tare ratio, higher axle load yields higher capacity, so fewer locomotives and wagons and trains are required to deliver given throughput. Fourth, fewer trains cause less congestion and hence line capacity at saturation is higher. Fifth, fewer locomotives and wagons to perform the same task cost less to acquire and to maintain. Sixth, higher tractive effort per freight locomotive reduces their capital cost per unit tractive effort. Seventh, higher power per passenger locomotive reduces their capital cost per unit power output. Eighth, the difference between passenger train speed comparing standard gauge and narrow gauge is simply out of reach for the latter. Thus to equal standard gauge performance, a narrow gauge railway would in principle need to increase performance metrics in the range 30 to 100%, or more in the case of maximum speed, which is extremely improbable.

It is evident that the argument for increasing performance of narrow gauge railways is trapped in a Catch 22 paradox: They need to exceed all applicable standard or broad gauge performance metrics to equal standard gauge performance, but are not able to do so by virtue of narrow gauge constraining their performance to less than standard gauge performance. The comparatively low performance of narrow gauge railways shown in Table 3 is thus not a reflection on potential for improvement; rather it shows that the performance of narrow gauge railways is handicapped to substantially less than that of standard gauge railways. Unsurprisingly then, narrow gauge railways currently carry less than 3% of global tonne-km.

2.3.5. The Status Quo is Unsustainable

Narrow gauge track precludes implementing full-strength heavy haul, as well as double stacking containers; the two indispensable weapons in freight rail's offensive against the road mode. Consequent deterioration in rail's

Table 4: Key Performance Indicators for Standard Gauge and Narrow Gauge

Key Performance Indicator	Standard Gauge	Narrow Gauge	Ratio
Track gauge, mm	1435	1067	1,34
Load/tare ratio, iron ore wagons, number	6	5	1,20
Locomotive adhesion, %	37	30	1,23
Heavy haul axle load, tonnes	40	30	1,33
Load/tare ratio, coal wagons, number	6	4,2	1,43
General freight locomotive axle load, tonnes	32,4	21	1,54
Passenger traction motor power, kW	1600	1000	1,60
Container TEUs per meter, number	0,251	0,137	1,83
Maximum single line capacity, Mta	150	80	1,88
Locomotive usable tractive effort, kN	705	371	1,90
Passenger train speed, km/h	380	130	2,92

inherent competitiveness has resulted in substantial loss of market share and modal shift from rail to road. Road, and not rail, is now the transport mode of choice of freight owners and logistics service providers. Freight rail in South Africa therefore cannot achieve renaissance without a wider gauge core network and appropriate institutional re-arrangements. While Transnet's Market Demand Strategy is driving investment to catch up with history, it fails to drill down to inherent railway competitiveness fundamentals, and private industry is quite sceptical of the investment (CSIR, 2013: 46).

South Africa's present line density, expressed as tonne-km per route km, is far below that in countries that have made intermodalism work. However, no amount of efficiency improvement can move freight rail into a sufficiently competitive line density range, without which it is improbable that long haul rail costs will decrease sufficiently to induce market-driven road-to-rail shift, and thereby stimulate intermodalism. In response to industry requirements, TFR is mobilising a multi-faceted Intermodal Strategy that entails integration of technology solutions, revised operating models as well as development of intermodal facilities, to reduce logistics costs and improve efficiencies for rail customers and logistics service providers. An integrated road and rail solution will have to be less costly than that of either mode used on its own (CSIR, 2013: 44), and will need to match the precision and reliability requirements of users.

In short, freight rail in its current form is locked into acute decline, unless appropriate and significant investments are made in rail infrastructure and associated rolling stock. Another far-reaching consequence of this decline is the modal imbalance caused by the rise in South Africa's truck fleet, which was an inevitable consequence of rail not carrying its share of the national transport task. The truck fleet has increased from 6 000 vehicles in 1938 to 270 000 in 2006 and 474 000 heavy load vehicles and -trailers in 2010 (latest available National Traffic Information System statistics), causing major damage to the national road network and contributing to road congestion. Road accidents involving heavy transport vehicles occur frequently and cause major traffic disruption, while clearing and restoring accident scenes is a costly externality.

As with freight, road transport has also become the mode of choice for passengers as it offers faster and more frequent service, especially over longer distances. Low-speed long-distance and regional passenger trains, Gautrain excepted, are now the mode of last resort. To reduce journey times substantially, PRASA will ultimately need access to high speed intercity rail infrastructure. This need should inform future wider gauge core network requirements. Without sufficient high speed infrastructure, long distance passenger rail will remain in terminal decline.

Appreciate nevertheless that PRASA is moving urban rail in the right direction by committing to acquire new electric multiple unit commuter stock. This intervention will address the problem of over-aged rolling stock and its associated unreliability: In conjunction with appropriate signalling to maximise the inherent high performance and safety of contemporary urban trains, PRASA will then be able to provide high capacity on its present urban network and future extensions thereof. This means that for planning South Africa's future railway network, it would be appropriate to consider narrow gauge urban rail, and wider gauge intercity freight and/or passenger routes, as responding to separate needs.

The introduction of an essential wider gauge high performance core network, for freight trains as well as for regional and long-distance passenger trains, should set railways on a trajectory to renaissance, thereby to recapture their proper share of the national transport task. The existing core network supports 95% of its traffic on some 30% of its route distance: This indicates that an essential wider gauge new network of some 7 000 - 10 000km should suffice to move railways into renaissance. However, the implications of freight and passenger trains on a new wider gauge network will need careful consideration. While a network capable of supporting heavy intermodal trains at 120km/h as well as regional trains at 200km/h would be workable, higher speeds would be challenging. Considering also alternative modes such as low cost airlines, a staged approach could emerge. Over distances radiating from Johannesburg to, for example, Bloemfontein and Polokwane, 200km/h trains could give acceptable journey times. Still further, to Durban, journey time would be too long (at least when compared to air travel) and very high speed rail, 300km/h or higher, would be indicated. Beyond that, even very high speed rail journey times might possibly be too long. Cape

Town would therefore more likely prove to be a low cost airline destination than a rail destination. Managing a wider gauge South African core railway network would also pose interesting challenges and opportunities regarding dynamic scheduling to maximise freight and passenger throughput, and to harmonise higher speeds for container trains and passenger trains.

Note that this section has introduced the notion of wider gauge track, to satisfy stakeholders who believe that if South Africa widens the distance between its rails, an optimum gauge needs to be determined. In the light of the networking and technical aspects mentioned thus far, it is improbable that from a rail policy perspective changing gauge to anything other than standard gauge will receive support. The term wider gauge is used henceforth in this document.

2.3.6. Branch Lines

Branch lines comprise 7 278km or 35% the total rail network. Nominally 3 928km of them are currently operational, but many are in varying states of disuse. The remaining 3 350km are closed lines. Over the years, branch line traffic

declined because it no longer made business sense for a large commercially operated railway to provide rail services to this market segment, nor to maintain or invest in the network infrastructure supporting such operations due to a lack of scale and profitability per the Transnet mandate that pre-dated the New Growth Path. This decline over 20-plus years has led to a significant maintenance backlog of track infrastructure, stations and yards that still might serve marginal traffic. Furthermore, vandalism has taken its toll on routes where there are no train operations.

Branch lines are characterised by multiple origin-destination pairs, often single wagonloads, multiple loading sites, low axle load limits (11.5 - 15 tons/axle on lines that have been closed, and 15 - 20 tons/axle on lines that have not been closed) and diesel traction. They are owned and operated by TFR. Currently there is no open access policy position, although some private entities have negotiated access arrangements with TFR, these arrangements tend to be very limited and confined to discrete areas associated with private sidings attached to agricultural, manufacturing or mining facilities.

This represents an important challenge for Government, Transnet and the private sector on which to collaborate, as Government's mandate addresses national strategic objectives and informs Transnet's strategic objectives as a commercial organisation. Another factor, and potentially a source of inherent tension within the branch lines issue, will be the need to ensure that where opportunities are offered

to the private sector, they should contain genuine value and an appropriate sharing of risks. Without these, attempts at revitalisation by involving the private sector will probably not succeed. Transnet has recently made a first move, by inviting proposals to concession the 85km 18.5 tonne/axle Belmont - Douglas branch line.

Achieving railway renaissance requires investment in heavy axle load, high speed, high density rail corridors that are inherently competitive against road transport: It will not be easy to integrate existing branch lines into such a milieu. Their frequently steep gradients and many tight curves do create challenges, but they are not necessarily show stoppers. However, their infrastructure frequently supports only light axle loads, which represents an ominous two-edged sword. From a branch line perspective, low axle load can exclude wagons fully loaded to permissible core network standards, as was the case before Belmont–Douglas was upgraded from 11.5 to 18.5 tonnes/axle in 2014, and all that goes with that, such as loss of revenue on traffic foregone and/or cost of topping up wagons to full load where a branch line joins a main line. From a mainline perspective, a lightly loaded wagon from or to a branch line uses the same line capacity as a wagon fully loaded to permissible core network axle load, and ought therefore to attract the same haulage charge as a fully loaded wagon. Either way, such movements are probably uncompetitive against road on a cents per net ton-km basis.

The foregoing is not a uniquely South African challenge and has been experienced around the world as a side effect of railway renaissance. It is exacerbated by raising axle load on the core network, to increase rail's competitive advantage vis-à-vis road. For perspective, axle loads in unrestricted interchange in North America have increased periodically as railways have increased their inherent competitiveness in defence against truckers also finding ways to increase their competitiveness. This challenge has been addressed by parties that have an interest in branch lines in one or more ways, depending on the haul length at stake. Where a single large plant near a main line could be isolated by closure of a branch line, with possible repercussions on the town in which it is located, one or both stakeholders come up with funding to strengthen the line. State governments have contributed where more extensive impact is likely, and even federal government has made once-off contributions to upgrading branch line axle loads. As a last resort, noting that none of the foregoing examples carry passenger trains, other than possibly tourist trains, affected railroads simply reduce train speed because the Federal Railroad Administration does not prescribe track standards for speed lower than 10 miles per hour (16km/h). Thus whatever the outcome of increasing axle load, between operation at reduced speed and strengthening the track, it has generally been possible to keep branch lines in operation. This could be a role model for South Africa.

It is improbable that the amount of traffic on many of South Africa's branch lines, with the possible exception of those that convey output from mines, will be able to support investment to increase their axle loads. Absent comprehensive feasibility studies on the potential viability of branch lines, it must be concluded that many branch lines probably cannot be economically viable. Those that need to be kept operational because they have development- or strategic value will therefore need financial support by willing government or other institutions. Such support could target either the capital cost of increasing axle load, or the operating cost of hauling under-loaded wagons.

Appreciate that the foregoing issue is unaffected by differences in track gauge between existing narrow gauge branch lines and a wider gauge new network. Using the example of Spain's conversion from broad gauge to standard gauge, vehicles with variable gauge axles facilitate through running between one gauge and the other: Access from the core network to branch lines and vice versa will therefore be possible. However, variable gauge axles can do nothing for differences in axle load between the core network and branch lines, and the associated economic problems will not go away.

2.3.7. Institutional Arrangements

In the White Paper on National Transport Policy of 1996, Government recognised that in fulfilling its role within the transport context, it should focus on:

a) Policy and strategy formulation as its prime role, in order to bring together key players in broader national strategies, and

b) Substantive regulation, which is its responsibility, to ensure unbiased regulation of safety and quality, to control market access, and to prohibit excessive tariffs in the case of monopolies.

In the absence of a National Rail Policy, stakeholders and bodies other than Government have through the years, developed and implemented quasi-policy and strategies. Because they were driven by stakeholders with particular interests, this situation further fragmented the regulatory

environment and contributed to on-going decline of the rail sector. The distinction between Government's role and the roles of other entities has not been clear. Clarity regarding the roles and responsibilities of all entities in the industry, including all spheres of Government, public agencies and State owned companies, as well as the private sector, is therefore required. This will facilitate decision-making regarding the role of rail in the country's overall transport requirements and the investment strategy to realise it, clarify the respective accountabilities, redirect allocation of resources to appropriate areas, and encourage smooth implementation of policy initiatives.

2.3.8. Rail Transport Planning

A direct and far reaching consequence of the rail sector's current institutional arrangements and governance structure has been the absence of coordinated and integrated planning. Noting that Government envisages integrated transport with rail as its backbone, this means that both freight and passenger rail transport should be spoken for before consideration of all other transport modes, so that rail planning and development can inform the role of the latter in the economy and in society.

The National Land Transport Strategic Framework 2006 (NLTSF) is a key enabler in developing South Africa's transport infrastructure capabilities. It is derived from provisions in the National Land Transport Transition Act 22 of 2000, Section 21 and embodies the national land transport strategy. The NLTSF defines South Africa's transport objectives, key strategy areas and national transport key performance indicators. National Government has an important role to play in the development of all transport systems and in establishing the policy framework within which provincial and local governments as well as other stakeholders act. At present, responsibilities for planning transport infrastructure and systems are spread across all three spheres of Government, and some plans and strategies within the rail sector, or that affect the rail sector through substitution of road for rail, have effectively been conceived and implemented by entities other than Government. To compound this issue, the provision of information and data by operators to relevant planning authorities is at present uncoordinated and inconsistent.

Furthermore, despite Government's commitment to an integrated transport system, modal competition is increasing. The lack of modal integration prevents or discourages potential rail users from regarding rail rather than road as their mode of choice. International experience (especially in the countries of the North American Free Trade Agreement), has shown that inherently competitive railways can stimulate a return to rail for freight, in particular for high-value low-density goods in containers, in which market double stack or heavy intermodal trains are aggressively competitive. Similarly in Europe, there is ever-increasing integration of passenger modes at nodal points. In both regions, this has led to spontaneous development of comprehensive and extensive inter-modal systems. By contrast, road transport is by far the mode of choice in the current South African transport setting, while inherently uncompetitive railways do not have the ability to successfully complement road transport by offering a competitive alternative on the long haul. This has contributed significantly to the current imbalance experienced between road and rail and the lack of intermodalism between these modes, despite TFR's efforts at road-to-rail shift. In order to restore the balance, promote integrated transport systems, and support intermodalism, rail must be re-positioned for inherent competitiveness through appropriate investment interventions to compete effectively with road transport so that it can offer a credible alternative on long hauls.

When reviewing the present outcome of previous rail planning, with a view to formalising rail planning for the future, it is important to recognise that constrained funding inevitably frustrated the achievement of policy objectives. It is therefore useful to examine the planning of passenger rail and freight rail from separate perspectives.

Although there are exceptions, passenger rail around the world is generally subsidised, also in South Africa, and therefore effectively a ward of the state. This is indeed the present institutional arrangement, PRASA being an agency under control of the Department of Transport. Government therefore controls the amount of funding made available, and by extension the contribution that rail can make to transport in each of PRASA's operational areas. However, the overall outcome is dynamic, because minibus taxis compete aggressively with formal transport entities and do so with neither regulation nor subsidy. In between these two strong players, metropolitan municipalities plan their bus public transport services.

Long distance rail is a PRASA responsibility in terms of rolling stock and operation. The planning function for these items can be well managed within PRASA. However, the Shosholoza Meyl service runs generally on infrastructure that is managed by TFR, and therefore planning coordination needs to take place between PRASA and TFR.

By contrast, and although there are exceptions, freight rail around the world is a commercial activity that is generally not subsidised. Freight rail can have one of two drivers. Firstly, much of its business is by nature organic, where demand for its services depends on many small, and some larger, incremental decisions by others. Planning is only realistically possible at high level, although larger investment decisions are usually also associated with investment projects undertaken by major clients or potential clients, such as mines, and those that are involved in such decisions are best informed to plan the projects. Secondly, railways have at many times been used to develop countries or regions, including South Africa. Where this is a government initiative, as development usually is, government is best placed to plan it. The essence of the reasoning is that freight rail planning and funding needs to be more nuanced than in the case of passenger rail. While high level planning of new freight rail routes would always be initiated by or attract the interest of Government, rapid response to dynamic market opportunities would best be managed by those that are close to the market.

The maritime industry as a vehicle to develop and facilitate trade plays a pivotal role in the growth and development of the country. It stimulates intermodalism, development corridors, regional transport strategies and major commercial and industrial initiatives for South Africa and the region. It is a consolidation initiative that should seek to integrate ports as freight transfer points extending maritime corridors all the way to dry inland terminals, thus ensuring South Africa's trading competitiveness. The National Ports Authority, established in terms of the National Ports Act, is mandated to provide or arrange for road and rail access within ports. This function recognises the need for rail-port modal integration and supports Government's vision of intermodalism and road-to-rail shift.

For the South African rail sector to successfully enter renaissance it will be critical that the planning of the required interventions be co-ordinated and the overall accountability for effective implementation be vested at national government level. The strategic vision for rail must be integrated not only with overall strategy for national transport but should be driven by the wider economic and social objectives of South Africa. In particular, narrow commercially objectives of attempting to maintain the status quo and retain dwindling market share should no longer guide strategic investment decisions, but should instead seek to enable approporiate competitive technologies that will re-establish rail as the logistics and mobility backbone of the economy.

It is important to add that the planning must take into account regional realities in the sense that it should recognise the existing protocols and agreements in place within the SADC. Revitalisation should be achieved in conjunction with the development of the region and should in no way disadvantage South Africa's neighbours.

2.3.9. Skills Development and Job Creation

Whereas the rail sector remains one of the largest employers, job creation, training and skills development continue to challenge its development and transformation.

The industry operates in a highly specialised environment that requires scarce and specific skills to support the rail developments and investments currently being rolled out by PRASA and TFR.

The gradual decline of the rail sector over the years and its impact has caused it to disposition itself regarding skills development and retention. The rail has become unattractive as potential employer, attributable to its largely obsolete, run down condition and reputation for poor service, and it has failed to lure high-quality jobseekers that could bring their expertise and skills to the industry. This despite the fact that unemployment in South Africa remains very high at 24.3% or 4.9 million persons in January 2015.

An inherently competitive rail sector would facilitate road-to-rail modal shift, so that it will once again be the transport mode of choice, and would lead to a demand for skilled personnel. The employment drive and associated training and skills development that would follow revitalisation of the rail sector would of course be contingent on huge investment to revitalise it in the first instance. Government is mindful of the urgent need to invest in creation of employment opportunities at operational, technical, managerial and senior levels as an integral part of its investment plan to adapt the rail industry to the future.

The following challenges currently experienced by the rail sector will also need to be addressed:

a) Inadequate market entrants to supply the increasing market demand;

b) Inadequate critical skills and reluctance of staff to be retrained to ensure efficient performance of operational and technical tasks;

c) Inadequate educational structures addressing rail market needs;

d) Inadequate training facilities for railway-specific safety critical skills; and

e) Unsuitable human resources mean that railway projects will be less attractive to current and future investors. The shortage of skilled personnel is presently viewed as a threat to many projects.

These challenges are exacerbated by outdated and inefficient rail training systems, remuneration packages for employees with specialist skills[10] that are not competitive in the South African market, and a lack of policy guidance. Skills acquisition, or employment, skills development, and retention of existing skills is largely seen as inadequate by market participants and need to be addressed through workable and implementable policy positions.

To their credit, entities involved in rejuvenating the sector are rising to these challenges. Gautrain implemented skills development and capacity building initiatives to sustain socio-economic development in Gauteng. The project explored previously disadvantaged areas to select suitable candidates to provide skills in critical areas like project management and engineering: Gautrain is not a transport project only, but should also stimulate investment and economic growth, create jobs and redress economic inequalities from the past. PRASA, through Gibela who is contracted to deliver PRASA's new commuter stock, is to train and upskill some 19 000 people in various rail industry skills as part of the broader vision to revitalize the once proud local industry. TFR has introduced Strategic Workforce Planning based on current supply and future demand, while its School of Rail has achieved ISO 9001 certification and has partnered with the Universities of Cape Town and Pretoria for engineering development.

2.3.10. Economic Regulation

Global trends indicate increasing demand for both passenger and freight rail services as the railway renaissance advances. As the National Rail Policy bears fruit by increasing investment and possibly the number and diversity of train operators, the proposed industry model will call for more decisive governance of rail access, and possibly competing claims thereon.

Currently, all operators using the TFR-owned network negotiate access with TFR, whilst TFR and PRASA negotiate access to tracks owned by the other. A regulatory framework to oversee these negotiations is however lacking. In the absence of State driven regulation, the SOCs and agencies have self-regulated. The rail industry and the wider logistics industry are concerned that current practices relating to setting of fares and tariffs, access to the network and customer redress processes are not transparent and

[10] These specifically exclude train driver and executive remuneration packages

might impact negatively on customers' businesses and commuters' socio-economic circumstances. Even when self-regulating, the SOCs and agencies have not achieved the required efficiencies, profitability and service levels, and have either been cross subsidised from profitable business or have been subsidised from the fiscus. In addition, new and prospective new players entering the rail sector have discovered a dearth of fair and transparent economic regulatory practices with no recourse to an independent regulatory body. With the envisaged increase in rail services, clear and appropriate regulation and access arrangements for all operators need to be established.

2.3.11. Rail Safety Management

Rail Safety is by its very nature a policy issue and is explicitly included in Government's vision for Transport. The National Rail Safety Regulator (RSR) has been established by the National Railway Safety Regulator Act and mandated to oversee safety in the South African rail transport industry. The Act mandates the RSR to, among others, develop standards and regulations to promote the use of rail as a mode of transport through improved safety performance. It is foreseen that Government's commitment to rail revitalisation will require safety standards and regulations to be re-aligned and/or expanded to accommodate and support the anticipated institutional and technological changes in the South African rail setting.

2.3.12. Security Management

The rail industry no longer satisfies all logistics and mobility demands, and its contribution to South Africa's socio-economic development has therefore waned. Both freight and passenger rail have suffered the effects of criminal acts such as vandalism and copper cable theft, which impact significantly on their ability to deliver on expectations. Apart from the direct loss resulting from such criminal acts, the more costly knock-on consequence is that they disrupt rail operations, leading to significant loss of confidence and revenue, and ultimate migration of logistics service providers and passengers to road.

Mushrooming informal settlements along rail reserves also pose major safety and security risks. There are instances of informal settlements having prevented or frustrated access to railway lines for maintenance vehicles and personnel. Aside from unfortunate instances where pedestrians from informal settlements have been struck by trains while

crossing railway lines, there has been an increase of illegal or informal pedestrian crossings, where foot traffic disturbs the ballast bed on which the track is laid to the detriment of its safety.

After many years of under-investment, the state of the existing commuter rail and long-distance transport system has reached crisis levels, and much of its infrastructure and rolling stock is inadequate for the requirements of a rapidly changing and modernising society. The services that are provided are often unsafe, particularly for vulnerable passengers such as women and the aged, because there is generally insufficient security on trains, at stations and in passenger catchment areas. Because available feeder services are limited, and no alternative public transport is available, commuters are easy victims of violent crimes such as murder, rape, and robbery, when walking to or from stations.

In addition to cable theft and vandalism, freight rail is also vulnerable to pilferage and theft of high value goods, either from containers or directly out of a wagon. The traditional freight railway operating model, where the normal state is everything stationary and movement is an event, needs to be inverted to minimise opportunities for criminals to strike. High value freight has gravitated to road because it offers door-to-door service with minimal opportunity for crime en route. Hijacking is of course a road transport problem, but stopping a container train in section by short circuitng the two running rails by means of a piece of wire is easy, and allows hit and run robbers to quickly unload what they want. Thus in addition to all the other expectations that customers who move high value freight may have, impenetrable security is also a requirement.

Outside of urban areas, level crossings pose a hazard, mainly to vehicles and their occupants, but also to TFR in the case of heavy vehicles, more so if they are carrying a hazardous material. While inattentive and reckless road users may precipitate a collision, the railway operator is held accountable and expected to bear the externality cost of mitigation. Thus Transnet has recently developed an impenetrable barrier that deploys automatically when a train approaches a level crossing. While safety is assured, the solution is an expensive burden on an innocent party. From a policy perspective it is important that this does not develop into the last straw that breaks the camel's back, particularly on marginally economic routes.

2.3.13. Funding

The heavy haul lines, Ermelo-Richards Bay for coal export, and Sishen-Saldanha for iron ore export, and in future possibly one for manganese export, are closely related to the fortunes and prospects of their respective mining industries. In recent years it has proven difficult for TFR to align rail capacity investment with global demand for those commodities, and this had led to South Africa missing the recent commodities boom. The opportunity cost to South Africa of foregoing the exports that could have been made is substantial, in terms of both jobs and revenue lost to competitors in other countries.

The limited funding that can be leveraged off Transnet's balance sheet has often been upheld as reason why all required freight rail investments could not be funded. While Transnet's financial management prudence must be respected, to the extent that it constrains economic activity that is in South Africa's best interests in terms of domestic output, foreign earnings and jobs, alternative funding sources must be allowed or developed. Private sector participation (PSP) has therefore become a significant source of railway renaissance funding. However, the darker side of PSP may appear in inherently uncompetitive railway settings: If the business proposition is not inherently sound, cherry picking, asset stripping, and absence of long term vision and objectives may prevail.

The foregoing funding challenges have resulted in uncompetitively positioned, ineffectively equipped, operationally inefficient railways that have lost their ability to compete with road transport in the local logistics market, and to support exporters in competing effectively in the global market. Unfair advantages available to road transporters have further eroded rail's ability to compete effectively in the marketplace. The most pertinent among these are: A high gross vehicle or combination mass limit of 56 tonnes, although a constitutional challenge would likely elicit the response that rail is not fighting back with the highest axle load that its genetic technology Bearing will allow; high incidence of truck overloading and lack of enforcement of applicable regulations; externality costs such as congestion, emissions and accidents not internalised into road hauliers' cost structure; inadequate road infrastructure charging to road hauliers; and government funding support for road infrastructure but not for freight rail. Other issues such as the ability of marginal road hauliers to circumvent compliance with driver training

standards, vehicle maintenance prescriptions and safe operating practices further increase the unfair advantages that marginal road operators may enjoy over rail operators. These unfair advantages have exacerbated the rail mode's inherent uncompetitiveness in the marketplace, particularly in terms of prices or rates to users. They have contributed to rail's uncompetitiveness in market segments where it ought to be inherently competitive, and in market segments where road ought not to be able to compete with rail at all, such as long-distance conveyance of bulk minerals.

2.4. Lessons Learned

As a reference group, the BRIC countries present a coherent approach to moving their railways into renaissance to support their progression to global economic significance. They have structured their railway development programs to move away from their heritage to embrace the four sub-modes of the railway renaissance, Heavy Haul, Heavy intermodal, High-speed Intercity, and Urban Rail. Their railway interventions have recognised the areas where their inherent competitiveness was not up to the mark, and they have marshalled funding and other necessary resources to address their shortcomings. With the exception of Brazil, itself the fifth largest country in the world that already occupies almost half its continent, the BRIC countries aspire to leverage their railways to extend their influence or strategic horizon far beyond their own territory. Renaissance rail, particularly freight, is a high volume mode that needs to attract traffic from large catchment areas. Per Metcalfe's Law, which states that network value increases as the square of the number of nodes, global railway networking is the way to go to maximise catchment area size. Two key attributes of BRIC countries are large area and large population, and they understand the advantages of large scale railway networking very well.

Table 5: Key Comparative Attributes by Country

Attribute	Brazil	Russia	India	China	South Africa
Governing Ministry(ies)	Ministry of Transport	Ministry of Transport	Indian Railway Board[11]	Ministry of Transportation	Department of Transport & Department of Public Enterprises
Intermediary Institutions	National Land Transport Agency and VALEC Engineering, Construction & Railroad Inc. (SOE)	Federal Agency for Rail Transport	None	State Railways Administration plus Hong Kong Transport Department	None
Operators	12 Vertically integrated concessionaires on existing infrastructure	Russian Railways 17 Regions; plus Russian High-Speed Railway Co; Federal Passenger Co; Freight One; Globaltrans; JSC High Speed Rail Lines; plus 160 other subsidiaries.	15 Zonal Railways plus Dedicated Freight Corridor Corp of India Ltd (SPV); High Speed Rail Corp of India Ltd; Konkan Railway; National Capital Region Transport Corporation Ltd; plus 9 other PPPs	China Railways Corporation plus MTR Corporation (Hong Kong)[12] plus ≈26 local and joint venture railways	Rail freight SOE plus Passenger Rail Agency plus Bombela Concession Co.

[11] The Railway Board at present functions as a government ministry headed by the Minister of Railways. Note however that per §2.1.2.4.3 incisive transformation of the entire IR dispensation has been recommended.

[12] Hong Kong is a Special Administrative Region and institutional arrangements do not necessarily align with those of the rest of China.

Attribute	Brazil	Russia	India	China	South Africa
Investment Funding Sources	Federal Government, Regional Government, State Owned Enterprise, Private Sector Participation	Federal Government, Regional Government, State-owned Enterprise, Private Sector Participation, Capital Markets	Union Government, State Government, State Owned Enterprise, Private Sector Participation, World Bank, Foreign Direct Investment	National Government, Regional Government, State-owned Enterprise, Private Sector Participation, Capital Markets	Freight: State-owned Enterprise plus Capital Markets; Passenger: National Government
Market Structure	Existing network: Vertically Integrated; New network: Vertically Separated	Vertically Integrated	Vertically Integrated	Vertically Integrated	Vertically Integrated
3rd Party Access	Sole Concessionaire on existing lines; Open Access on new lines	Negotiated access	Closed	Closed	Limited negotiated access
Renaissance Achievements	High Speed, Heavy Haul, Long Stacks, Urban Rail	High Speed, Heavy Haul, Urban Rail	High Speed, Heavy Haul, Double Stacks, Urban Rail	High Speed, Heavy Haul, Double stacks, Urban Rail	Heavy Haul, Urban Rail
Strategic Horizon for railway networking	Occupies half of South American continent, currently extending railway coverage to access its full territory	East Asia–Western Europe Corridor, Russia–India Corridor, and North America	North–South Russia-India Corridor	Developmental Railway Corridors to Africa, Asian neighbours, Europe, and North America	North-South Corridor, Heavy Hauls, General Freight Corridors, Branchlines
Heavy Haul Line Density, tonne-km/route km	82.3	No information available	No information available	400	58.1
All Freight Line Density, tonne-km/route km	37.2	23.6	10.9	26.9	7.4
Line Density, passenger-km/ route km	0	1.8	16.6	8.9	0.1
Overall Line Density, line density units	37.2	25.4	27.5	35.8	7.5

The last column shows the parameters for South Africa. It is evidently not aligned with its peers in respect of Governing Ministries, Institutional Setup, Funding Sources, Renaissance Achievements, Strategic Horizon, Track Gauge and Overall Line Density.

Chapter 3

National Rail Policy Fundamentals and Policy Positions

3.1. Policy Vision and Mission

The National Rail Policy vision is *an integrated railway transport system that is efficient, reliable, effective, safe, and stimulates the economic and social development of South Africa.*

The National Rail Policy mission is *to lead the development of a sustainable and competitive rail transport industry that stimulates economic growth and social development including the safe, reliable, efficient, and effective movement of passengers and freight.*

3.2. Strategic Policy Objectives

The strategic policy objectives of the National Rail Policy are, in no particular order:

a) To revitalise the South African rail transport industry, substantially increasing its performance, turning around its decline and maximising its utilisation.

b) To provide an enabling environment for South Africa's economic and social development including:
- promotion of SMMEs, co-operatives, rural development and BBBEE;
- creation of employment, maintenance and production capacity in the rail sector; and
- development of rail within appropriate environmental protection legislation.

c) To reduce the cost of doing business in South Africa by maximising the rail freight sector's contribution to the national transport task, encouraging the use of the most cost-effective transport mode, and promoting intermodalism.

d) To provide value-for-money mobility for South Africa's citizens and visitors in densely populated urban settings a well as in densely travelled long-distance corridors.

e) To proactively facilitate shifting freight and passengers from road to rail and to promote rail as the mode of choice by providing an efficient, reliable and safe setting for passengers and freight.

f) To establish a governance, institutional and regulatory framework for managing, operating and maintaining railways, as well as to encourage appropriate infrastructure and rolling stock investments through aligning funding sources with application of appropriate and new technologies.

g) To encourage, introduce and regulate private sector participation in the rail sector where appropriate, to aid revitalisation, drive development and maximise growth.

h) To facilitate trade between South Africa and its partners, to enhance the competitiveness of South African exports in global markets, and to elevate the role of South Africa in rail transport in the SADC region and the rest of Africa.

3.3. Policy Principles

The National Rail Policy will be guided by the following principles:

a) Maximise the competitive and environmental advantages of rail transport for moving high volumes of people and goods;

b) Encourage appropriate use of rail transport through promoting effective inter-modal planning, efficiency, regulation, facilities and collaboration;

c) Retain all State-owned railway network and right-of-way in State ownership but, where appropriate, make it available to the private sector on mutually agreed terms to facilitate private sector participation;

d) Fund all national rail policy objectives to ensure their achievement;

e) Accommodate prospective rail users who are able and willing to fund their rail access and service

requirements when incumbent entities are unable to fund the requisite capacity or unwilling to bear the investment risk;

f) Define and regulate private sector participation in railway investment, operations and maintenance, where it may be introduced, to ensure accessible, affordable and effective service delivery to present and prospective railway users;

g) Institute independent economic regulation by government of the national rail network in respect of all operators to ensure fairness and transparency;

h) Subsidies, where provided, must be transparent, targeted and monitored;

i) Safety and security for railway passengers and freight are of prime importance;

j) Adequately protect and secure railway assets and those of customers; and

k) Underpin the formulation and implementation of National Rail Policy and resulting actions by consultation with affected and interested stakeholders.

3.4. Policy Statement

The fundamental purpose of the National Rail Policy is to *revitalise* the railway industry in South Africa through the implementation of strategic investment-led policy interventions. These interventions will aim at repositioning both passenger and freight rail for inherent competitiveness, by exploiting rail's genetic technologies to increase axle load, speed and train length across the board.

To achieve this, the National Rail Policy envisages investing in a world class high performance new network comprising, where appropriate, high density freight- and passenger corridors, to move South African railways into renaissance, and so recapture rail's proper share of the national transport task in a developmental economy. Underpinned by wider-gauge technologies as the most rational foundation for South Africa's future rail network, this investment will target selected high volume sections of the national freight and passenger rail networks, while the existing narrow gauge arrangement will remain sufficient for urban commuter networks. The entire logistics and mobility value chain involving passenger and freight movement should be recognised, namely airports, dry and maritime ports, maintenance and storage facilities, intermodal facilities, loading and unloading facilities, railways, roads, stations, warehousing and more.

The National Rail Policy envisages private sector participation or investment in projects where Government or State Owned Companies cannot presently afford to invest, or where the private sector is better positioned to manage the risk. Where appropriate, PSP will extend to negotiated third party access to necessary portions of the national railway network, subject to regulation by the Single Transport Economic Regulator.

In accordance with the provisions of the National Land Transport Act and the National Development Plan, that transport functions are to be assigned to the most appropriate sphere of Government, the National Rail Policy will provide for the creation of capacity in the local government sphere. The operational subsidies for urban commuter rail will eventually be devolved to local governments when the necessary capacity has been created and they are ready and able to manage these as part of their Integrated Transport Plans. Urban commuter rail will continue to be operated by Metrorail.

Key to the success of the rail revitalisation interventions will be centralised coordination of rail policy and strategic planning in the National Government sphere through the Department of Transport, the recently established Interim Railway Economic Regulator, and ultimately the envisaged Single Transport Economic Regulator, which will provide regulatory oversight of railway economic aspects including, but not limited to, funding adequacy, access to the rail network, market entry and exit, service levels, rates and tariffs, and commercial dispute resolution.

The National Rail Policy furthermore will serve to provide clear direction on interventions that will promote skills development and job creation within the industry and ensure the safety and security of its users. Detailed policy positions underpinning these statements are outlined in the following sections.

3.5. Recommended Policy Positions

3.5.1. Recommended Policy Position - Investment

Government recognises the urgent need for rail revitalisation and will provide the necessary policy direction and facilitate the necessary resources for the revitalisation intervention to be successful. Rail revitalisation in this context means:

a) Halting and reversing the decline of the rail sector by setting a rail strategy and investment path;

b) Investing in the rail sector to position it to compete effectively and sustainably in the local transport market and support exporters in global markets;

c) Stimulating railway renaissance by deploying High-speed Intercity, Heavy Haul, Double Stacking or Heavy Intermodal, and contemporary Urban Rail where appropriate;

d) Positioning the rail sector to aggressively exploit the rail mode's inherently competitive technologies;

e) Improving the overall performance levels of the rail sector, and ultimately those of the rail industry;

f) Increasing economic growth and social development; and

g) Establishing rail as the backbone of the South African transport industry of the future.

The revitalisation design will best suit the current industry disposition and achieve the above objectives most effectively. As part of the process, the National Rail Policy will provide clear guidelines on revitalising the rail sector. Thereafter, an investment-led intervention will focus on raising rail's inherent competitiveness by investing in appropriate assets to move the rail sector onto as many as possible of its renaissance growth curves. It is submitted that this can only be achieved by investing in a minimalist high performance network that can move railways into renaissance, and so to function as the backbone of the national transport task. However, the contribution that efficiency can play in improving South African railways performance is also recognized, therefore operational efficiency is also recommended.

The following guidelines will inform the investment-led revitalisation intervention:

a) National Government must drive the investment strategy and decision making, guided by its economic, social and National Rail Policy objectives;

b) Re-focus the South African core railway network on value to the national economy, with due regard for the requirements of freight traffic, as well as regional- and long distance passenger traffic, and without compromising the economic potential of the heavy haul export lines;

c) Gear investment to re-gauging infrastructure, where appropriate, for the world class new high performance network, to maximise inherent competitiveness and capacity;

d) Transnet, under direction from Government, would manage investment in the new network infrastructure, although it would not necessarily provide the total funding required;

e) Retain a vertically integrated core railway network operated by TFR, who will provide access to PRASA for regional and long-distance passenger trains as well as to private operators, subject to third party access agreements and regulation by the STER;

f) TFR should invest in freight rolling stock to meet the demands of its customers, but where it is unable or unwilling to do so, it should allow private sector participants to step up to the opportunity;

g) Align PRASA passenger rail capital investment with the overall investment strategy. For urban rail, this means infrastructure plus rolling stock: For regional- and long-distance services this means rolling stock that can best exploit the prevailing national railway network;

h) PRASA will continue to operate long-distance and regional passenger services under the guidance and support of DoT;

i) Government supports environmental protection as well as hedging South Africa against imported fuel price

instability and rising environmental costs. Investment in repositioning rail for inherent competitiveness will shift freight and passengers from road to rail. In turn this will leverage rail's green credentials to reduce the amount of energy consumed in respect of traffic shifted by some three quarters, and correspondingly reduce greenhouse gas emissions, thereby contributing significantly to the country's environmental objectives.

Primary investment decisions will by their nature call for supportive investments in track and its gauge, lineside and fixed structures, and rolling stock. Although PRASA and TFR have begun investing in new equipment, much of what currently exists is in no condition to support revitalisation. It is emphasised that investment to achieve inherent competitiveness needs to be supported by all other elements of good railway governance and positioning, i.e. adequate and sustainable investment, fair economic regulation, competent management, nimble market responsiveness, and more. Investment interventions which will be required in each of these areas are set out below.

3.5.1.1. *Infrastructure and Track Gauge*

3.5.1.1.1. The Plan and its Justification

Investment in infrastructure will focus on increasing rail's ability to compete in market spaces where it has potential to win back substantial contestable or rail-friendly freight- and passenger traffic from other transport modes, particularly road, especially in high density corridors. Government is therefore committed to a comprehensive upgrade and renewal of infrastructure to position railways at the centre of South Africa's freight and passenger transportation. There is an urgent need to create an inherently competitive high performance new network, where possible by upgrading or re-gauging portions of the existing network, otherwise by new alignments, to respond to future social and economic imperatives and logistics pressures. Future strategic rail investment decisions will be driven by Government's vision of a modern railway that will drive economic growth. TFR as owner of the network assets will be responsible for managing the rail infrastructure life cycle, including investment, development, operation, maintenance, as well as concessioning and leasing if and when applicable.

3.5.1.1.2. A New High Performance Network

Government recognises that for general freight as well as regional and long distance passenger operations to become inherently competitive, a move to a new high performance network is required. DoT has undertaken a cost benefit pre-feasibility analysis, and prima facie a positive cost benefit ratio was found. Among others, the cost benefit pre-feasibility analysis was predicated on upgrading or renewing infrastructure more or less on its current alignment. This Green Paper phase is too early to speculate on detail design, but once underway, value engineering would find the best solution. This could result in either the current alignment being upgraded, or new alignment being built to take advantage of the opportunity to eliminate current bottlenecks and weaknesses, but most likely a blend of both approaches will prevail.

Due to narrow gauge rail's low inherent competitiveness, and its consequent inability to aggressively gain market share, road hauliers are able to secure entry into the rail friendly freight market, even going so far as to make significant inroads into the market for natural heavy haul freight. They are able to do so because the trucks that they import are bred to compete against the best of global standard gauge and broad gauge railways. Maintaining the status quo will prolong a dispensation structurally skewed in favour of road transport, with the high costs, high emissions, high congestion, and high maintenance that goes with it.



3.5.1.1.3. The Position of Urban Rail and the Narrow Gauge Network

Where appropriate, as in the case of urban rail, relevant portions of the existing narrow gauge network should continue to be used, and they should be maintained normally and extended where justified. The rest of the narrow gauge network will either be exploited where business and or strategic considerations so require, or otherwise be disposed of as mentioned in §3.5.2.2. As an overall guiding principle, Government will recognise and plan for routes that would be appropriate for re-gauging, so as to roll out and exploit the railway renaissance in South Africa.

In the light of the life-expired condition of most assets, and their inherent uncompetitiveness, Government will also be careful not to renew or to replace inherently uncompetitive narrow gauge assets, which for a similar quantum of investment could and should be replaced by inherently competitive re-gauged assets.

3.5.1.1.4. Cross-impact Between Interventions

It is important to recognise that the cross-impact between some of the proposed policy interventions can be complex. It is therefore important to identify and address those complexities to avoid frustrated outcomes and unintended consequences during investment rollout. In particular, it appears that some stakeholders find difficulty in appreciating the implications of interventions in the following two areas.
The first area concerns the modalities of migrating from narrow gauge to a standard gauge track. South Africa seems to find itself in a dilemma regarding its contending options of refurbishing the entire existing network, which would perpetuate its unsustainability, and re-gauging it, which would be unaffordable. Not to re-gauge would shut out the railway renaissance and let South Africa fall further and further behind the Assertive, Progressive, and Enlightened railways of the world in all but the urban rail market space.

South Africa needs to face this dilemma squarely: Substantial investment in revitalising railways will not achieve its intended purpose without addressing the track gauge issue, private sector participation and railway economic regulation. To ensure that new investment actually raises rail's inherent competitiveness vis-à-vis road, it should be directed to projects that enter one or more of rail's inherently competitive market spaces, namely full strength Heavy Haul, Double Stacking, High-speed Intercity, and contemporary Urban Rail. Continued investment in sustaining a technological dispensation that is rooted in colonial standards will be ineffective.

Some stakeholders have difficulty in appreciating that the four post-renaissance market spaces in which rail is intensely competitive require substantial investment, as proposed later in this Green Paper, which in turn requires high line density (expressed as passenger-km per route km, or tonne-km per route km) to support that investment. To restate and emphasise the point, post-renaissance rail is a high capacity or high speed (or both) transport mode suited only to corridors where the traffic potential is high enough to justify the requisite investment. South Africa's present and projected economic geography indicate that such high density routes will constitute a smaller core railway network than the current one. While such a solution may disappoint stakeholders that expect ubiquitous rail service at any cost, it does offer a viable resolution of the country's track gauge dilemma, and ultimately of its freight rail, as well as its regional and long-distance passenger rail challenges. It will enable rail to compete effectively against other transport modes, and to complement them in intermodal service arrangements, thereby delivering the road-to-rail shift that will reduce road traffic congestion, reduce non-renewable fuel consumption, reduce their associated emissions, reduce road accidents, reduce the high cost of logistics, and increase South Africa's competitiveness in global markets.

To spell out the implications in detail, the proposed investment solution would result in an intensely competitive, high performance railway network of about 10 000 track-km. It will be able to attract both freight and passenger traffic from road, and to serve as backbone of the country's land transport infrastructure. This in turn will stimulate voluntary participation in the intermodalism sought by policy makers and transport professionals. But the process cannot even commence without commitment to re-gauging to create a high performance network, where feasible, and all that goes with that.

The second area concerns aspirations to revitalise branch lines. Investment in an intensely competitive re-gauged high performance new network in many respects mutually

excludes significant support for existing branch lines, unless they carry sufficient traffic to support re-gauging them. The obvious difference in track gauge can exceptionally be accommodated by deploying gauge-changing rolling stock, as in Japan and Spain. However, the more insidious issue is that of axle load differences between branch lines and the core network. It is an issue even with the present relatively low axle loads on the core network. Raising axle loads on a re-gauged high performance new network to as high as 32.4 tonnes per axle would render much lighter branch line traffic an expensive hindrance (in terms of opportunity cost) on high performance routes. Road could provide more flexible and lower cost solutions in many instances. It is therefore important that stakeholders be sensitive to the hard realities of where rail can and cannot compete effectively against road. Where rail cannot compete against road, stakeholders should participate actively in seeking alternative solutions rather than clinging to outdated notions that lead to frustration.

3.5.1.1.5. Timing

The timing of the investment and the re-gauging of the network, where necessary, is critical as it determines the likelihood of getting the intended outcome, therefore the timing has to be perfect. The timing for investment and re-gauging will be strongly influenced by capacity requirements and demand, amongst other variables. Gauge change will also be determined on a case by case basis, pending the feasibility studies that will be conducted.

3.5.1.2. Rolling Stock and Technology

Government recognises that continued and repeated refurbishment and rehabilitation has propped up obsolete and uncompetitive railway assets rather than raised inherent competitiveness, and that the introduction of new rolling stock and technologies into the system is therefore imperative. The current sustaining capital investments in South Africa's ageing railway system are not productive in terms of delivering future capacity demand, meeting customer performance expectations and reducing logistics-, mobility- and maintenance costs. In general, global technology advances in passenger- and freight rail have moved far beyond the local assortment of mostly obsolete general freight, urban, regional and long distance passenger rail equipment. A substantial range of new technologies has evolved globally, which have made available attractive rail solutions. However, to stimulate railway renaissance, they must in the first instance increase inherent competitiveness through higher axle load, higher speed, and longer trains.

Thus PRASA's forthcoming new commuter EMU trains are positioned to offer attractive service. However, to the extent that TFR's routes include 20-tonne axle loads, 60km/h wagons, and 40-wagon trains, its recently announced acquisition program for 1064 locomotives and associated investments do not maximise the value of the intervention.

Government is committed to introducing new rolling stock and technologies to the freight and passenger rail sectors. The massive investment required will be guided by appropriate planning mechanisms[13] and be driven by demand, network development and track gauge decisions. Government has facilitated establishment of local manufacturing plants to supply adequate quantities of passenger and freight rolling stock suitable for local requirements as determined by the revitalisation interventions. They will spearhead the opportunities promoted and described in the Industrial Policy Action Plan 2 (IPAP2), within the transport industry and therefore be *at the centre of economic development*.

Continued local research and development in the rolling stock and rail technology fields is considered an investment priority. It will enhance the quality of rolling stock and technology utilised in the local rail industry and will support optimum investment decisions. The intellectual property accumulated by this approach will contribute significantly to rail revitalisation by building a sustainable indigenous rail industry. Such research and development would ultimately enable the South African rail industry to not only build but also design rolling stock and other technology applications specifically for the local market.

3.5.2. Recommended Policy Position - Funding and Private Sector Participation

Noting how the BRIC countries as relevant reference group have set about funding their railway renaissance, it is evident that similar substantial scope and potential for funding has not yet been tapped in South Africa. Essentially four sources of funding are available. First, the traditional source through financial instruments secured by the assets of a State owned entity. Gearing may be encouraged or restrained by whether or not lenders have legal recourse to the State. Second, where substantial funding may be required to reposition an entity to restore its inherent competitiveness ahead of earning a return, directly by the fiscus or through instruments secured by sovereign guarantee. Third, through Private Sector Participation (PSP) in a potentially deep and wide range of projects where private sector willingness to fund and the ability to manage risk can launch projects that otherwise would not come to fruition. Fourth, debt and equity financing, where the state is not involved, such as heavy haul railways that are an integral part of a mining investment.

Government will consider ways to attract additional capital to finance investment in rail. The enormity of the investment required in achieving rail revitalisation is recognised and it is clear that existing resources will be inadequate to fund all requirements. The private sector has a key role to play in growing the economy and creating jobs, however, private sector investors seek to earn a return on their investment that is equal to the risk. The private sector will therefore be attracted to profitable opportunities with manageable risk. Government's role in creating an investment-friendly environment is to change business fundamentals and remove regulatory uncertainty so as to encourage and enable the private sector to play its natural role in the economy. Government will invite private sector participation to invest in projects where it cannot presently afford to invest or where private sector participation can demonstrate value for money.

Potential private sector funding models include private involvement in operations or the provision of assets such as rolling stock; Public-Private Partnerships; leveraging the commercial value of railway land and the development opportunities around stations, and debt or equity financing. Any of these can be applied to secure funding in rail assets. Furthermore, the rail network has a high potential for asset sharing opportunities and PPP initiatives, particularly in the rail-linked logistics sector.

In promoting private sector participation, negotiated third party access to the core rail network is anticipated. The impact of regulatory uncertainty on private sector investment is recognised and a framework will be developed that protects the interests of different types of private investors and manages the perception of risk. The establishment of rail economic regulation under the STER will create a legal framework that is clear, objective and neutral between public and private operators and sets clear tariff regulation to reduce revenue risk.

[13] See section 3.5.5

To minimise disruption of existing institutional arrangements and smooth the transition to a new funding dispensation, it is proposed to use existing Government entities as vehicles to procure and manage concessions, leases, PPPs and any other legitimate private sector participation contractual vehicle that aligns with government policy.

It is important to appreciate that a large portion of unfulfilled demand for rail service simply defaults to road. This outcome runs counter to the desired road-to-rail shift. SOCs involved in procuring PSP transactions will therefore need to ensure that they present themselves as attractive partners to potential investors and structure their approval processes to make quick decisions.

Government, through its SOCs and Agencies, will retain ultimate ownership of all below- rail infrastructure assets, although they may be made available where appropriate on long term concession or lease to facilitate PSP in below-rail infrastructure investment for a sufficiently long period to amortise the investment.

Government recognises that PSP has a more natural affinity with freight rail than with passenger rail, because freight rail is closely related to real markets where one can structure finance around a project. Passenger rail usually attracts developmental and social obligations that are best funded by a government. While bankable projects can and have been structured in the passenger rail sector, PSP is more likely to appear in the guise of services provided to government funded projects, such as operations and maintenance, which are amenable to outsourcing.

3.5.2.1. Branch lines

Government recognises that although the economic viability of branch lines may be in question, in certain instances they may nevertheless have a role to play in South Africa's wider social and economic objectives. It is therefore recommended that, for policy purposes, branch lines be categorised as Strategic and Non-strategic. Identifying the criteria that qualify a branch line as Strategic would be a railway economic regulation function. Considerations may include food security (e.g. grain), developmental infrastructure, the traffic volume to be transported, road congestion and the impact on maintenance of secondary roads, socio-economic benefits to uplift rural communities, air pollution and greenhouse gas emissions, accidents, and more.

TFR, as the custodian of the national freight network, will have first right of refusal to operate any existing branch line. Economically non-viable branch lines that TFR refuses to operate, which any sphere of Government categorises as Strategic and on which it requires rail service for whatever reason, developmental, strategic, or other, must willingly be sponsored by that sphere of Government in respect of the difference between any revenue collected and the actual cost to TFR of carrying and maintaining the line. Train operations could be provided by TFR or by a concessionaire to TFR, for the account of the sponsor.

Economically viable or marginal branch lines that TFR refuses to operate, and that are categorised as Non-strategic, are to be concessioned at Government discretion to stakeholders that may include provincial or local government, private sector investors, and affected local entities such as industry, in a vertically integrated arrangement. Train operations and infrastructure maintenance would in such instances be provided by the concessionaire. The concession terms should not require private sector investment in infrastructure, but should nevertheless permit concessionaires to invest in infrastructure at their discretion and risk, in which case the concession period should be sufficiently long to allow recovery of such investment. It is recognised that in these cases the only viable solution might be to harvest the residual value by running down the assets.

Branch lines that have neither developmental nor strategic value and fail to attract interest from prospective concessionaires should be decommissioned and formally withdrawn from service. If economically feasible, track should be recovered. Right-of-way may re-acquire value at some time in the future, for example when it becomes opportune to extract mineral wealth say by fracking South Africa's shale gas deposits and large scale transport of fracking materials and extracted product is required. It should therefore be retained by TFR in perpetuity.

TFR will continue to operate and maintain all currently active branch lines until appropriate concessioning or disposal arrangements have been finalised. It is expected that Government discretion, as mentioned in this section, would be exercised by the STER.

3.5.3. Recommended Policy Position - Interconnectivity with Neighbouring Countries and the rest of Africa

The SADC Protocol on Transport encourages member states to promote economically viable integrated transport services in the region and facilitate seamless, efficient, predictable, cost-effective, safe and environmentally-friendly railway service that responds to market needs and provides access to major centres of population and economic activity. Although interoperability is not explicitly addressed, it is nevertheless implicitly accepted.

Government recognises that investing in inherently competitive rail technologies in South Africa will raise the dilemma of interoperability with neighbouring countries. Yet allowing interoperability considerations with respect to relatively smaller traffic volumes between neighbours to dominate resolving the inherent uncompetitiveness of the relatively larger current and potential volumes within South Africa, will frustrate South Africa's railway renaissance. Access to neighbouring countries is thus a critical issue: The ideal solution is to concurrently support renaissance in South Africa as well as uninterrupted rail traffic to and from neighbouring countries.

In the light of standard gauge developments in equatorial Africa and in line with the fundamental investment-led intervention proposed herein, and further afield, SA's national rail policy should not turn a blind eye to continental networking. South Africa will therefore have to coordinate very carefully with the SADC Region in its consideration and implementation of a wider track gauge, if required and feasible. The following modalities are proposed to respect good neighbourliness:

In the first instance South Africa needs to engage neighbouring countries and their railways in dialogue. In an era of continental and intercontinental railway networking, no single country can go it alone. This will start with South Africa's position on wider gauge and also concern their development trajectory. Ultimately it will develop into a wide-ranging strategic conversation.

Recognising admission of equitably negotiated third party access on South Africa's railway network to promote private sector participation, it would be interesting to entertain a similar cross-border dispensation with neighbouring countries. Such operations have the potential to promote intra-African trade and facilitate economic and socio-economic integration of the continent, but they do raise the issue of cabotage, or the right of foreign registered entities to operate transport services within a particular territory. This is a thorny issue in intra-African shipping, and has not yet been broached in the rail sector, so it would need to be placed on the engagement agenda. Note that while wagons and coaches have for from the outset freely crossed South Africa's national borders, from a practical perspective train drivers need to be certified for the route on which they drive and they therefore only cross national borders to agreed interchange stations near the border. Cabotage would thus require train drivers to be certified in more than one country. In principle, locomotives may work across national borders, but two key considerations should be recognised. They may be equipped with radio communication and movement authorisation systems, which if not compatible may not cross the border. Furthermore, few operators entrust operation and maintenance of their expensive locomotives to others. Small locomotive leasing businesses have nevertheless emerged, and the last constraint may be easing somewhat. It goes without saying that extant railway safety regulation would apply. The Railway Safety Regulator and Southern African Railway Association are already involved, including also interoperability matters.

Regarding the mechanics, South Africa could commence building a wider gauge high performance national new network for general freight plus regional and long distance passenger services. Where desirable and workable, it would recycle existing right-of-way and dual-gauge portions where relatively short distances of shared right-of-way are required. Access to some neighbouring countries and branch lines may be achieved by deploying rolling stock with variable gauge axles. Botswana and Namibia currently have relatively low traffic volumes, so variable gauge axles with gauge change at respectively Mafikeng and De Aar would be appropriate. Mozambique potentially has higher traffic volume, so dual-gauging the approximately 80km from Ressano Garcia to Maputo would be appropriate. Zimbabwe and further north, and Swaziland at present, have relatively low traffic volumes, but the countries are landlocked: Therefore retain the existing narrow-gauge route to South African ports, namely Beit Bridge - Soekmekaar - Komatipoort - Swaziland - Richards Bay -

Durban. Gauge change with the South African wider gauge new network at Soekmekaar. Future South African traffic through Swaziland might justify portions of dual gauge. The underlying rationale, as developed during Spain's change from broad gauge to standard gauge, is to initially develop an anchor standard gauge network, and use variable gauge axles to serve destinations outside its reach. As gauge changing progresses, the gauge change sites are moved ever outward, and in the case of South Africa might not necessarily be on international borders, but could well be inside or outside the country, depending on how traffic flows, operating arrangements, and future developments are optimised. From this beginning, it will be possible to expand the wider gauge network further into Africa as opportunities arise.

3.5.4. Recommended Policy Position - Institutional Arrangements

Schedule 4 Part A of the Constitution assigns Public Transport as a functional area over which both the National and Provincial government spheres have concurrent jurisdiction, whilst Local Government has a responsibility for Municipal Public Transport.[14]

Government believes that the institutional framework envisaged by existing legislation including the NLTA is appropriate. It is the lack of an effective National Rail Policy to guide and co-ordinate strategic planning at a national level that has inevitably resulted in fragmented and disjointed decision making across the rail sector. It is therefore not the intention of the National Rail Policy to "re-legislate" institutional structures that have already been legislated but to ensure that the objectives and sequencing of the proposed revitalisation interventions are centrally co-ordinated and effectively implemented by the respective spheres of Government and other role-players under the auspices of the PICC.

3.5.4.1. The Role of National Government

Transport Policy and Strategy are the responsibility of the Minister of Transport, while all other spheres and agencies of government are stakeholders, with whom it is appropriate that the DoT consults. Accordingly, the DoT will ultimately be responsible for policy formulation, co-ordination of policy implementation, strategic planning and provision of leadership. This applies equally to freight and passenger transport.

National Government's role overall will further be to facilitate the wider functioning of rail, providing for the development of specific rail services that are not sustainable without government assistance, as well as nurturing those services which are essential for the country's trade. All policy and high-level planning decisions relating to future rail revitalisation, including the necessary investment strategies will be developed and co-ordinated by the DoT.

The formulation of an investment strategy as part of a national rail strategy, which would incorporate planning for all sources of funding including any government funding for rail transport, will be through the DoT as part of the integrated approach to transport planning.
The Department of Public Enterprises, as shareholder's representative of Transnet, will continue to provide overall governance and oversight in ensuring that Transnet effectively fulfils its mandate as envisioned in the revitalisation interventions prescribed by the National Rail Policy.

3.5.4.2. The Role of Provincial Governments

According to the NLTA, Provincial government is responsible for the formulation of provincial transport policy and strategy, within the framework of national policy and strategy, planning, co-ordination and facilitation of land transport functions in the province. Note that the NLTA stipulates that Provincial Government must perform these functions within the framework of national policy and strategy. In the case of rail, it is critical that Provincial Governments align their plans with the objectives and sequencing of the interventions specified in the National Rail Policy and the associated national plans and strategies developed by National Government through the DoT. This is essential if the revitalisation of rail and its envisioned role as the backbone of an integrated transport system is to be realised.

Where appropriate and in line with the objectives of the National Rail Policy, National Government may assign current obligations in respect of future regional or interprovincial rail service delivery to Provincial Government.

[14] See section 1.3.2

Where Metropolitan and local municipalities can benefit from the integration of public transport across metropolitan and local municipal boundaries, individual authorities involved may establish a coordinating body at a higher level. Coordination should, however, follow a bottom-up approach, with the organisational structure rising no higher than is necessary to achieve its purpose. Such bodies could typically contract rail services, coordinate transport services, undertake long-term planning and raise funding. The intervention is intended to address the fragmentation of public transport governance and bring together public transport services under a single strategic body in order to provide faster, more efficient and affordable transport services, even though the various networks will remain independent in terms of ownership and operation.

In the interim, regional and interprovincial passenger services will be delivered on infrastructure owned by TFR, under performance-based service level agreements between the DoT and PRASA.

3.5.4.3. The Role of Local Governments

The NLTA envisages that land transport functions be assigned to the most appropriate sphere of government. This includes, among other, Local Government requesting assignment of functions from either DoT or the provinces where such a Local Government has already developed acceptable integrated transport plans.

It is important that local rail services be procured and managed at Local Government level as far as possible, to ensure consistency with local Integrated Transport Plans and urban development programmes. However, many Local Governments do not yet have the required capacity to fulfil this role. Urban commuter rail will therefore continue to be operated by PRASA and delivered under performance based Service Level Agreements between DoT and PRASA. Only operational subsidies will be devolved to Local Governments, allowing them to enter into Service Level Agreements with PRASA. The integration of rail with other transport modes, performance management of PRASA, and other sub-contracted entities, and the development and administration of budgets for all transport modes, including commuter rail services, will be conducted at Local Government level.

3.5.4.4. The Role of Operators and Infrastructure Owners

PRASA and TFR are Government's enablers as operators in the rail sector. Services will be provided by operators, which may be SOCs, or the private sector, or a combination of any of them. Operators will be responsible for service delivery, management and maintenance of the rolling stock utilised by them, infrastructure owned by them, concessioned to them or leased by them. The latter will be undertaken in accordance with the principles and guidelines set out in the National Rail Policy and by Government from time to time. Freight rail will continue to be exclusively operated by TFR on a vertically integrated basis except in those cases where the private sector participates, when those operations may be run exclusively by private operators or a combination of TFR and private operators. Commuter rail (except where Local Government has capacity), long-distance and Regional passenger rail will continue to be operated by PRASA under the guidance and support of DoT.

Ultimate ownership of all below rail infrastructure will remain with Transnet and PRASA (on behalf of Government) regardless of any private sector participation. The maintenance and refurbishment of these assets will therefore remain the responsibility of TFR and PRASA unless otherwise agreed in whatever private sector participation arrangements that may emerge.

PRASA and TFR will be responsible for managing the implementation of the investment initiatives envisioned in the revitalisation interventions prescribed in the National Rail Policy and associated strategic plans unless otherwise agreed in whatever private sector participation arrangements may emerge.

3.5.5. Recommended Policy Position - Rail Transport Planning

The DoT will be responsible for developing a National Rail Master Plan (NRMP) which will set out a collaborative, consistent and sustainable approach to rail transport planning, which can be applied nationally, at provincial and at municipal levels. The document will provide a greater level of detail for application by practitioners than the NLTSF, which provides a higher level of strategic guidance. The NRMP will be developed in order to centralise and co-ordinate all rail planning in South Africa and will be

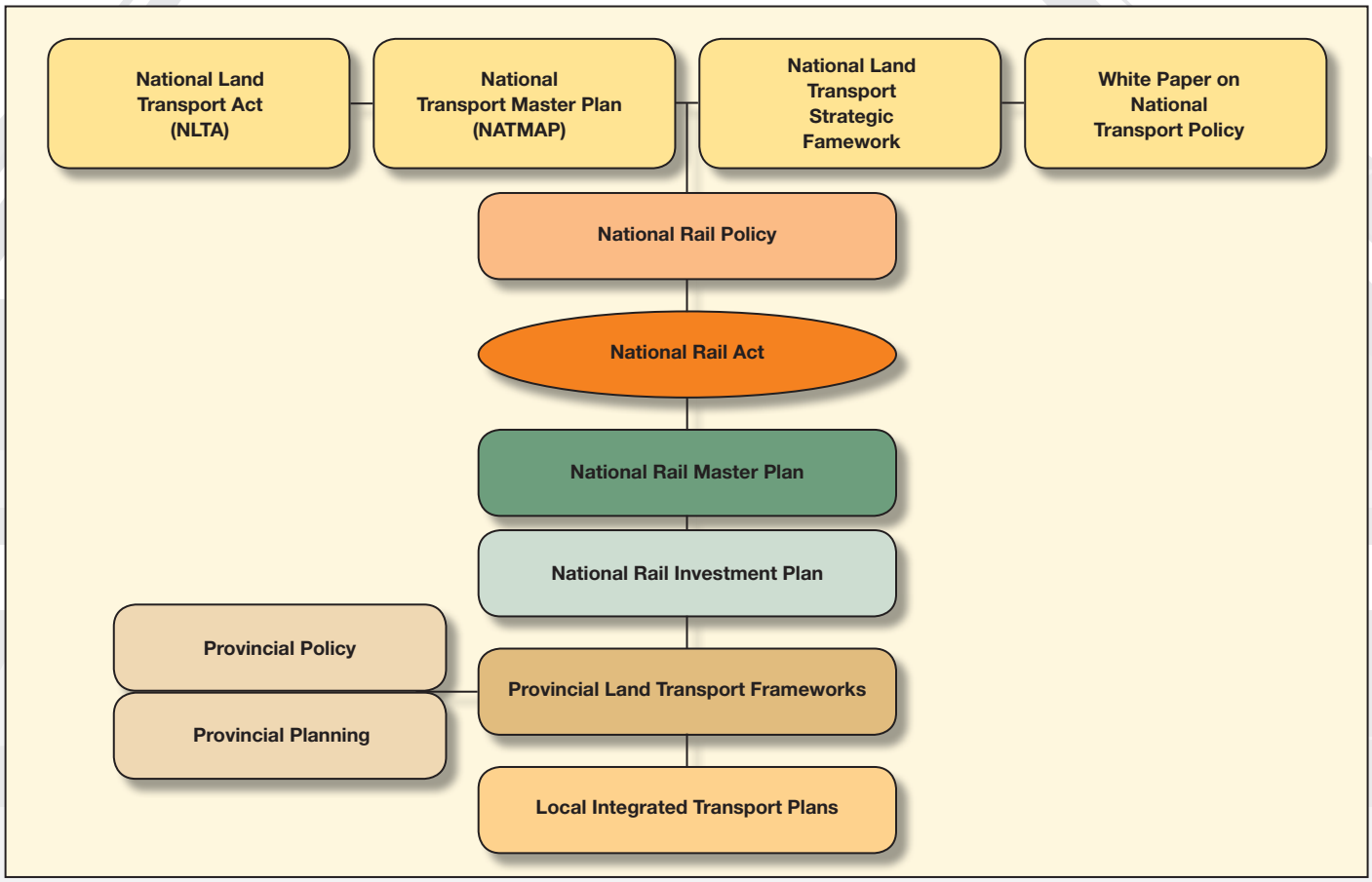
an integral part of the National Transport Master Plan. Legislation enabling the National Rail Policy will give effect and direction to these plans ensuring that the objectives and interventions prescribed in the National Rail Policy form the foundations for rail planning.

Due to the integrated nature of transport planning and the relatively complex nature of rail's institutional structure, submissions and inputs to the planning process from relevant rail stakeholders will form an essential part of the planning process. Planning and communication between the relevant bodies, principally DoT, DPE, Provincial Government, Local Government, Transnet, PRASA and key private sector participants will be co-ordinated by the DoT. Government is committed to optimum integrated transport planning. For that reason all role-players responsible for providing information and submissions for the planning process will be required by the DoT to make the information available. The three spheres of Government will provide directives regarding the exact information that will be required and the intervals at which it must be provided and to whom.

At its core, the NRMP must be a mechanism for the implementation of the revitalisation interventions outlined in the National Rail Policy. Because the basis for revitalisation that is proposed is an investment-led intervention, a key subset of the NRMP will be the National Rail Investment Plan which will define the investment strategy required to revitalise rail and determine the amount of funding required, the sources of that funding and its application, to build a re-gauged new network for general freight as well as regional and long-distance passenger services. The proposed industry structure outlined in the NRMP will inform the strategy to be followed in the prioritisation of both freight and passenger/commuter rail structures, the levels of private and public participation, and consequently the requirements and sources of funding. A co-ordinated approach to infrastructure investment will be a prerequisite for integrated transport infrastructure delivery.

A summary of the proposed planning structure across the spheres of Government is presented in Figure 2 below.

Figure 2: Proposed planning structure across the spheres of Government



The National Rail Policy and by extension the NRMP will support Government's vision of integrated transport systems. All future transport planning efforts will be combined with land use planning. Integrated planning approaches will optimise the application of each mode's inherent competitive advantages in providing the best transport solution for freight and passengers. It is recognised that rail will not be appropriate for all locations. Consideration will be given to the needs of the relevant market and/or community. In each case, the relative competitive advantages of the applicable modes will be considered. The National Rail Policy will recognise that the inherent competitiveness of participating modes, in particular rail in the present context, is an essential driver of intermodalism to ensure that it will be fostered by incentives and not by regulation, as envisaged by the White Paper on National Transport Policy. Freight transport customers typically have multiple modal choices. Intermodal movements will only occur if the constituent hauls plus the cost of transhipment can undercut the cost of a single haul on a mode that offers door-to-door capability.

The National Rail Policy will also recognise the natural pipeline-rail interface to maximise the rail distribution of products beyond pipeline terminals.

3.5.6. Recommended Policy Position - Skills Development and Job Creation

An estimated 750 000 jobs will be created during the construction of the re-gauged new network. Investment in development and job creation should be guided to provide for rail employment and rail skills development. A competitive, revitalised rail industry will set the stage to attract potential job seekers. The need for skilled personnel and expertise will increase exponentially and many opportunities for job seekers will become available. The required employment drive and skills development programme, which will include initiatives to attract and retain new talent and more competitive incentive packages, will require massive funding.

The National Rail Investment Plan will provide for investment in skills development and job creation within the rail sector, driven by the following:

a) The actual skills required;

b) Principles underlying Government's BBBEE and HDI policies;

c) Opportunities for disabled persons;

d) Principles preventing job discrimination against people facing certain health conditions; and

e) The employment drive must be accompanied by an aggressive marketing effort to promote the industry as an employer of choice for the future.

Government therefore recognises that rail skills development and job creation are essential and is committed to making this an important part of the process of revitalising and developing the rail sector by meaningful investment.

The development of a local locomotive manufacturing industry has also been prioritised to support the drive for rail skills development and ultimately create employment opportunities at a scale identified within the New Growth Path and the Industrial Policy Framework. Where feasible in the construction and maintenance of the rail network, government and the industry must consider labour intensive methods to promote the creation of work opportunities through the Expanded Public Works Programme.

In support of the above investment initiative, Government recognises the requirement for revised and up-to-date training programmes that would address the requirements of the revitalised industry. To achieve this, current training techniques, curriculum material and learning aids will be reviewed to address training inadequacies. Partnerships will be established with existing training institutions to address the specific training needs of current and future rail employees.

Investment in skills will be guided towards the following:

a) Establish continuous training programmes specific to the rail industry, with updated training manuals and institutions;

b) Develop rail-specific education at existing tertiary education centres such as at Pretoria and Witwatersrand universities;

c) Introduce alternative training methods such as shadowing of existing staff, bursary grants and internships, and apprenticeships;

d) Review existing facilities and theoretical and practical training programmes, to establish a basis for revitalising apprenticeships, providing skills development opportunities, and ultimately achieving employability and employment in the railway industry;

e) Integrate and co-operate between the various role players and Government with regard to skills and training needs; and

f) Introduce more attractive employment packages, long term benefits and incentives that will encourage employees to remain within the industry.

DoT, in partnership with other stakeholders, will support the skills investment drive. The above initiatives will be funded mostly by means of existing government routes such as the SETAs, skills transfer programmes and bursaries, but also by elevating certain rail industry personnel to scarce and critical skills resources that will unlock further funding and protection for the industry. The development of tax and further skills levy incentives to stimulate private investment and partnerships in skills training, directly associated with the rail industry, will be explored.

3.5.7. Recommended Policy Position - Regulation

The DoT recognises that multiple stakeholders pursuing different interests will require economic regulation to ensure fairness and long-term sustainability of the rail sector. As interim measure, the DoT has established an Interim rail economic regulatory capacity. The Ministers of Transport and Public Enterprises have entered into a Memorandum of Understanding to establish a Ministerial Task Team as part of developing economic regulatory capacity for the rail sector. It comprises an independent Chairperson, a regulatory expert, a rail industry expert, and nominated officials from National Treasury, Department of Public Enterprises and Department of Transport. Within the limits of its mandate, the Ministerial Task Team will develop a nucleus of skills and capacity regarding rail sector economic regulation and provide necessary advice and recommendations to the Ministers of Transport and Public Enterprises on issues including price setting, access to the network and dispute resolution. Over the next two years data will be collected from rail operators and analysed regarding

structure and performance of the rail sector, and operator network use and access, to determine what economic regulatory interventions need to be made in the rail sector. As permanent measure, the forthcoming Single Transport Economic Regulator (STER) will regulate the rail sector as a subset of regulating all transport modes. The envisaged STER will play a fundamental part in the success of railway revitalisation by addressing those aspects of interventions that require interaction between multiple actors. The intention of economic regulation of the rail sector is to:

a) Ensure reasonable access and fair pricing to train operators;

b) Regulate market entry and exit, service levels, approve tariffs and resolve commercial disputes;

c) Exercise economic regulation in line with prevailing national economic policy and national strategic objectives;

d) Regulate the provision of adequate, affordable and efficient rail infrastructure and services;

e) Promote regulated competition;

f) Promote equity of access to rail infrastructure and services, as well as to investment opportunities where relevant;

g) Promote investment in rail equipment, infrastructure and services;

h) Address railway interoperability between neighbouring states.

i) Determine fair and reasonable tariffs for using rail infrastructure and services, which will inform the approval of tariff requests received from the respective entities; and

j) Investigate complaints and conduct market enquiries were necessary.

Additional responsibilities of the forthcoming STER will include research, performance monitoring and compliance activities, as well as intervening to prevent abuse of market power and to facilitate dispute resolution between operators, customers, investors and other stakeholders.

The envisaged STER functions will be executed independently of operators and/or service providers in the transport sector and will be directly accountable to the Minister of Transport, to whom the envisaged STER will report periodically on the status and performance of the railway sector.

Passenger rail fares for PRASA will be set and overseen by the National Public Transport Regulator as part of wider public transport funding policy decisions. However, the envisaged STER will be proactively involved in developing frameworks for the benchmarking and evaluation of tariffs. The existing RSR and the forthcoming STER will work closely together through a memorandum of understanding because their respective responsibilities will be separate. Environmental matters arising in respect of railways, together with associated legislative and regulatory compliance, will continue to be managed by the Department of Environmental Affairs. Regulatory bodies such as The National Public Transport Regulator are provided for specifically in the NLTA.

3.5.8. Recommended Policy Position – Safety Management

The RSR was established in terms of the National Railway Safety Regulator Act, Act 16 of 2002, and is, in terms of Section 5 of the said Act responsible to:

a) Oversee safety in the railway transport industry;
b) Promote the use of rail as a mode of transportation through improved safety performance in the railway transport industry;

c) Develop any regulations that are required in terms of the said Act;

d) Monitor and ensure compliance with the said Act; and

e) Give effect to the objectives of the said Act.

Rail safety will form an integral part of rail revitalisation. In the execution of its responsibilities, the RSR should seek to ensure that its activities and decisions impact on the industry in a way that would support and promote rail revitalisation. The RSR may develop and issue standards in order to achieve the objectives of the Act and may, in

addition, monitor and ensure compliance with the Act. In this instance, the RSR has the authority to guide the rail industry with regard to rail safety and to ensure that the industry responds accordingly.

3.5.9. Recommended Policy Position – Security Management

Rail must be a safe mode of transport for patronage to increase. Co-operation between railway network, station, and train operators; private or external security companies and the Railway Police, is critical in addressing the safety and security challenges in the rail setting. Providing protection and security for rail assets, goods and passengers at railway stations and yards, as well as on board freight and passenger trains, must be seen in the context of the need to provide reasonable security at other transport facilities, routes and public premises throughout the country.

Law enforcement on trains constitutes a challenge as trains traverse various jurisdictions en route, while the authority to enforce laws falls only within a specific jurisdiction. Nevertheless, the introduction of dedicated railway policing has contributed to containing this issue, and the SAPS Protection and Security Services Division (Railway Police) will continue to be responsible for law enforcement within the rail environment.

First line defence will be by operator owned or outsourced security services, which will be responsible mainly to protect personnel and assets, as well as manage safety and security in the rail setting. Fixed facility requirements should also be addressed, including lighting levels, CCTV coverage, placement of emergency telephones, perimeter protection and more should that be necessary.

Additional security requirements may be provided for and specified in SLAs between rail operator and infrastructure owner. Examples would include managing the number of customer service personnel and security guards on passenger trains and at stations, providing armed guards on trains conveying high value freight, requiring a security plan to outline the deployment of security staff and other initiatives on an annual basis.

Network and train operators and station managers will develop security plans to improve the safety of the public and assets in their custody on and around the railway. The network manager, with Government through its agencies, will ensure that railway infrastructure is protected from vandalism, theft and sabotage.

It should be mentioned that in South Africa, Gautrain exemplifies realisation of all the above mentioned security measures.

Chapter 4

Way Forward

The Green Paper outlined recommended policy positions that will be discussed and debated during the Green Paper and White Paper consultation phases of the National Rail Policy development process. Post stakeholder consultation, the White Paper will be submitted for approval. Once the White Paper has been approved, the Department will commence with developing the National Rail Act which will make some of the policy positions legally binding for the rail sector.

To ensure successful implementation of the National Rail Policy which will ensure the South African railway revitalisation and renaissance, some of the interventions have to be prioritised considering capacity and financial limitations in the sector. Priorities have been identified to ensure the achievement of the goals and objectives of the rail policy.

4.1. Policy Implementation Priorities

The implementation priorities for the National Rail Policy are as follows:

4.1.1. Develop of a National Rail Master Plan

The Department through its Rail Planning Unit will develop a National Rail Master Plan (NRMP) which will form part of the National Transport Master Plan (NATMAP). The Master Plan is a national strategic plan which will direct infrastructure initiatives over the next 30 years. The Master Plan will ensure centralized strategic rail planning. It will detail the vision, goals and objectives for rail going forward. The Master Plan will also identify network constraints and opportunities, as well as the required infrastructure improvements/expansions to ensure the safe and efficient movement of passengers and freight.

The Master Plan will detail the status quo in rail, particularly, provide an overview of passenger and freight trends, the requirements/ needs in the sector, challenges, and forecast the expected demand, amongst others.

The Master Plan will map a National, Provincial, and local view of the country's network, also indicating the current and future infrastructure projects, the various corridors, the capacity of each line, the characteristics, etc.

The Master plan will in essence identify infrastructure projects and prioritise the projects, which will be informed by Government priority, the needs of the country as well as the SOCs and Agencies. The Plan will recommend the sequencing of infrastructure projects, strongly influenced by efficiency considering the limited resources. The Plan will also indicate the likely timelines for the various identified infrastructure projects.

Although the development of Master Plan will be led by the Department, it will be developed in close collaboration and consultation with critical stakeholders such as the SOCs, Agencies, all three spheres of government (relevant Departments), as well as rail experts and logistics experts.

4.1.2. Define and Scope the Rail Revitalisation Programme

The Department will define and scope a rail revitalisation programme designed to direct the rail investment processes in a way that accelerates achievement of policy objectives and maximises the return on investment.

4.1.3. Develop a National Rail Investment Strategy

The National Investment Strategy will form a fundamental part of the NRMP. The Department will develop a comprehensive investment strategy that will guide both public and private sector investment in rail. Funding options and models for railway investment will be explored as part of the strategy.

4.1.4. Develop a Branch Line Strategy

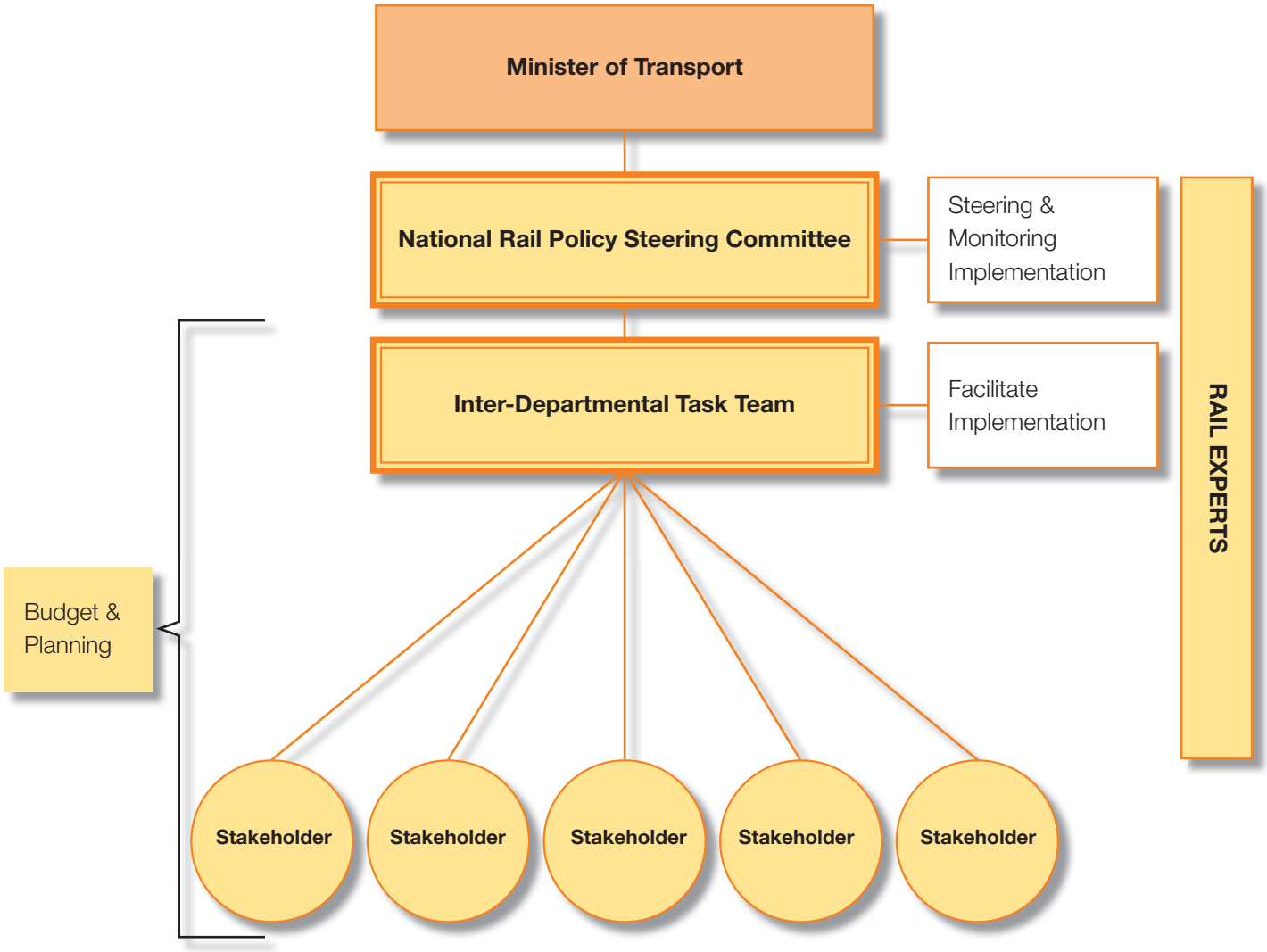
The Department, in collaboration and consultation with critical stakeholders, is in the process of developing a national strategy on the revitalisation and development of branch lines. Key to the strategy will be the identification of strategic and non-strategic branch lines which will guide interventions and investment decisions.

4.2. Policy Co-ordination Mechanisms

A National Rail Policy Steering Committee has been established, comprising the DoT and DPE. The Steering Committee is co-chaired by the DGs of Transport and Public Enterprises and reports to the Ministers respectively. The Steering Committee will steer, monitor and provide strategic direction in the implementation of the National Rail Policy.

Because policy implementation will require large-scale investment, a robust governance structure is essential, with appropriate representation mandated by public sector financial and organisational legislation. Considering that the National Rail Policy will impact on all spheres of Government and across various Departments, an Inter-Departmental Task Team will be established to drive implementation. DoT, DPE and National Treasury, Rural Development, Agriculture, COGTA, Mineral Resources, as well as PRASA and TFR will form part of the task team. The task team will report to the Steering Committee. The role-players for facilitating policy implementation and their functions are illustrated in the diagram below:

Figure 3: Role players for policy implementation and their functions



4.3. Policy Monitoring and Evaluation

The implementation of the policy will be monitored by the Department using identified indicators to measure performance and identify deviations and reasons for those deviations, thereby taking corrective action where necessary. The policy will be evaluated after a certain period (5 – 10 years) post implementation to determine the impact of the policy on the sector and establish whether there is a need for a policy change or amendment.

4.4 Conclusion

In recent years it has become patently obvious to all that railways in South Africa have lagged increasingly far behind those railways that have participated in that renaissance, in particular its BRIC peer group, until they are no longer able to compete effectively against other transport modes in delivering their rightful share of the national freight and passenger transport task, nor are they able to support South Africa's exports into the global market.

This Green Paper has shown that South Africa's colonial railway origins have embedded constraints into the fabric of its narrow gauge railways that preclude them from participating in the railway renaissance. Indeed, the substantial sustaining capital investments that have been made in South Africa's narrow gauge railways in recent years have demonstrated their ability to absorb a huge quantum of capital without increasing their competitiveness at all. In short, their generally declining performance in the face of substantial capital investment affirms their inherent unsustainability. It is however acknowledged that a change in gauge, where feasible, cannot happen at the turn of a switch, therefore the current network has to be maintained at safe operating standards and also upgraded to cater for the current and future demand.

The policy options to remedy the problem are limited. The status quo regarding the national network, urban rail conditionally excluded, has proven itself to be unsustainable; further investment therein is therefore untenable. To convert the entire network to a high performance network would be unaffordable and also unnecessary. This Green Paper therefore recommended policy positions that pragmatically follow a fine line between unsustainability and unaffordability to position railways in South Africa to participate in the railway renaissance. They promote investment in a smaller but higher performance re-gauged network that can position freight and passenger rail to be aggressively competitive in market spaces where they can exploit rail's strengths, thereby re-establish rail as the backbone of land transport in South Africa. This intervention will facilitate the desired road-to-rail shift, allow rail to lead intermodalism, and reduce congestion, fuel consumption, and harmful emissions.

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