HSRC Sector Case Studies

Article

Transport, Storage and Communication Industry

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ABSTRACT

The current infrastructure crisis in South Africa receives a lot of attention, but consideration should be given to the fact that the country's labour related production factors are in much worse shape than infrastructure. The deficiencies in transport infrastructure are also understated, especially when compared to the much more visible energy crisis. Combining these two issues means that an analysis of the transport, storage and communication industry ("TSC") is important and should be carefully considered.

Information on the industry is scarce and employment data for the industry incorrectly constructed. The various utilities of transport, telecommunications and postal services are unrelated in terms of output or utility that it provides and within transport, unrelated in terms of output as far as freight and passenger transport are concerned. In spite of this, these groups are often aggregated in reporting, which means that in-depth analysis, even based on statistics such as large sample surveys, is difficult or impossible.

Total formal employment in the industry dipped towards the end of the millennium, but has since picked up, though not yet to the same levels as 1995. Postal employment is in decline, and even telecommunication employment is lowering – probably because of automation. Transport employment grows, but passenger transport is becoming more and more inefficient, where information is the scarcest and where a sizeable portion of informal employment is noticed. In fact, the informal employment in this subsector alone is estimated to equal the total formal TSC employment. Freight transport employment is efficient, and is especially becoming more and more efficient for rail as a large mode switch over the next 20 years to rail is expected, both for freight and passengers. This switch will be challenging, as operational employees will be impacted most, with this being the category where the lowest levels of skills, the highest shortages and most employment related ancillary problems, such as work satisfaction issues, are found. New and significantly more engineering skills are required at a time when the skills are in relative decline and where new engineering integration will be needed, not only between disciplines, but also forward and backward in the value chain.

Accountability for these issues is unclear. The expected shifts are, in themselves, not managed on a national level and no integrative thinking between infrastructure owners and operators has yet been established. The creation of a national forum, with statutory participation, would at the very least, be an important first step.

INTRODUCTION

Any economy that wants to perform (usually described as aspiring towards growth, employment and a stable balance of payments) requires specific inputs or production factors. These are usually identified as infrastructure and resources, labour and training, capital and innovation and enterprise management (Samuelson and Nordhaus, 1989, p. 24, 77). South Africa's performance on these factors is often reported in various international benchmark studies, of which the Global Competitiveness Report is probably the most well known. In terms of this report the country does not perform well and recent ratings have deteriorated, especially for

labour elements. (South Africa slipped from overall 36th place to 44th place out of 122 countries over the last two years, with education and health in 56th place, labour market efficiency in 78th place and health and primary education in 117th place). The infrastructure issue has been discussed in detail in recent times as South Africa faces increasing challenges in electricity supply, transport infrastructure, sanitation, water management and telecommunication. Various investment programs have been announced to address these deficiencies. Labour and the training programs that are required to improve this production factor are not yet considered on this level and programs such as the SETA system has been less successful (Mail and Guardian, 24 April and 30 July, 2007).

This article considers the state of the labour production factor specifically in the TSC which is especially important in this context as it relates directly to amongst others, the transport infrastructure issue. In fact, many observers are concerned about the success of the investment program, in the absence of skills to drive investment and operations in this industry.

This article proposes a macro-economic framework for such an analysis, considers performance in terms of this framework, and suggests approaches for future improvements.

METHODOLOGY

In order to achieve the required objective, a data driven approach is crucial, but as is common for many studies in this regard (Department of Transport "DoT", Moving South Africa, 1998, p. 3, 5, 11, 178-179) data is scarce and in many instances unavailable. This is compounded by the fact that the statistical data available from official sources such as Statistics South Africa ("StatsSA") are constructed poorly and categorized incorrectly and is therefore not useful in its current format. It was therefore necessary to conduct interviews, specifically to obtain some of the data required to enable a critical evaluation, desktop research and modeling of the data (based on secondary test cases) in order to fill the numerous gaps that existed. Apart from constructing the data sets, interviews and surveys were performed together with further desktop analysis to inform the critical analysis of the constructed data for the various parts of the industry.

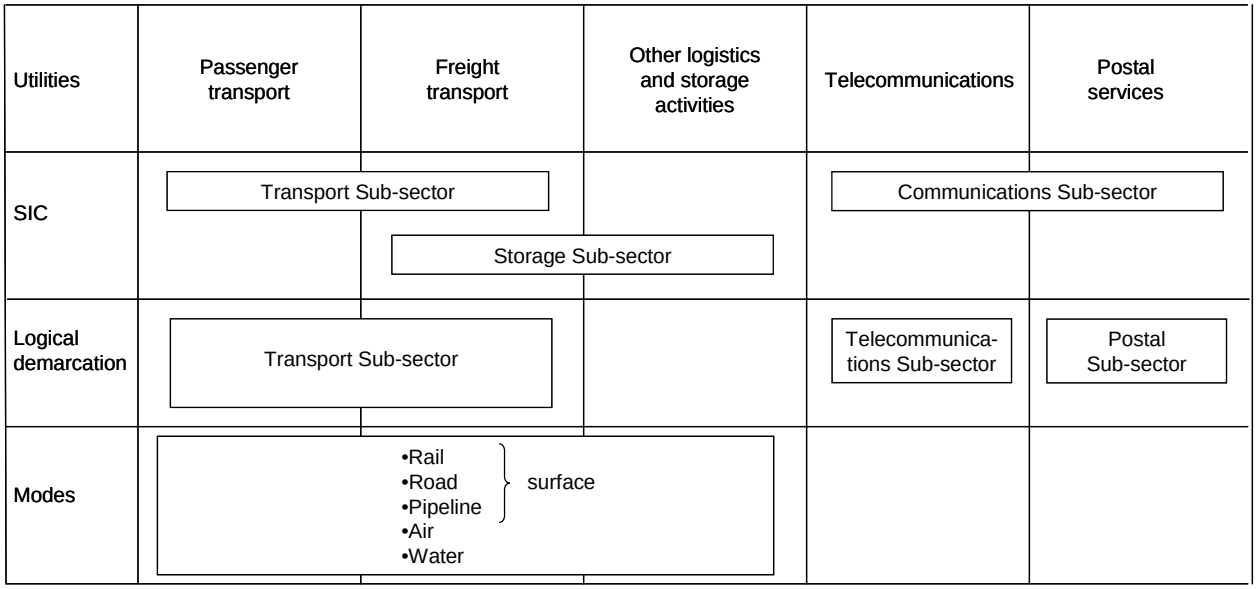
INDUSTRY UTILITIES

It will not be possible to discuss the various parts of TSC, which includes many utilities, without a thorough demarcation of these utilities. StatsSA uses the standard industrial classification ("SIC") system as a framework for data collection, which is an inherently sound approach (it facilitates comparisons with other studies), but the system has two major drawbacks. It is not new (and therefore does not reflect current realities) and each economy in the world has different accents.[2]

[2] A complete discussion on the deficiencies of the SIC system and the demarcation and analysis problems created by StatsSA's application thereof, is included in the full report.

Figure 1 compares the actual utilities provided in TSC with the SIC system on the second level and proposes a demarcation system that would be logical for discussion purposes.

Figure 1: Demarcation system



Source: Stellenbosch University

The proposed system is utility based, i.e. “needs” based, which in this case is the need for the transport of either freight or people (as far as the transport subsector is concerned). “Needs” translates into a utility that is provided by a service provider, solution, or system. Any system that is evaluated in terms of its inputs and outputs has the measurement of output productivity at heart (relating to the inputs consumed). In the transport subsector, for instance, this can only be defined as tons shipped and passenger journeys.

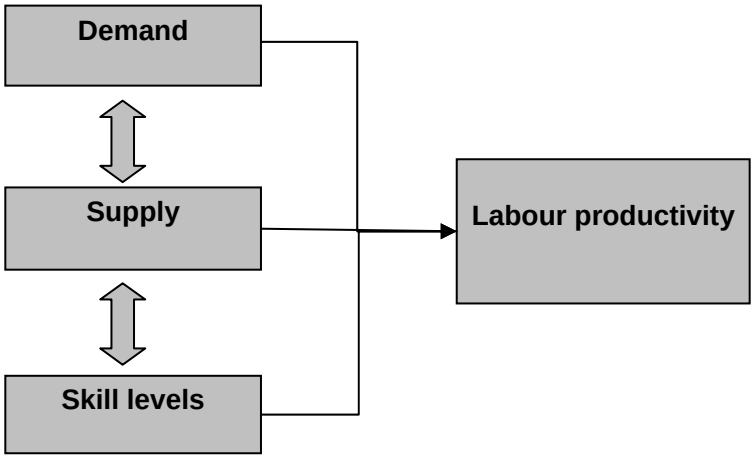
The same argument can be used to demarcate the relationship between post and telecommunications where outputs that can be used to analyze productivity are completely different between postal and telecommunications services as well as these two subsectors being completely different from the transport subsector.

On the highest level the most logical demarcation in the industry should be transport, telecommunications and postal services, followed by a high level split between passenger and freight transport.

STATUS QUO

The current performance of the TSC production factor is considered by looking at employment demand, employment supply, skills levels and labour productivity factors. (Figure 2).

Figure 2: The relationship between employment demand, employment supply, skills and labour productivity



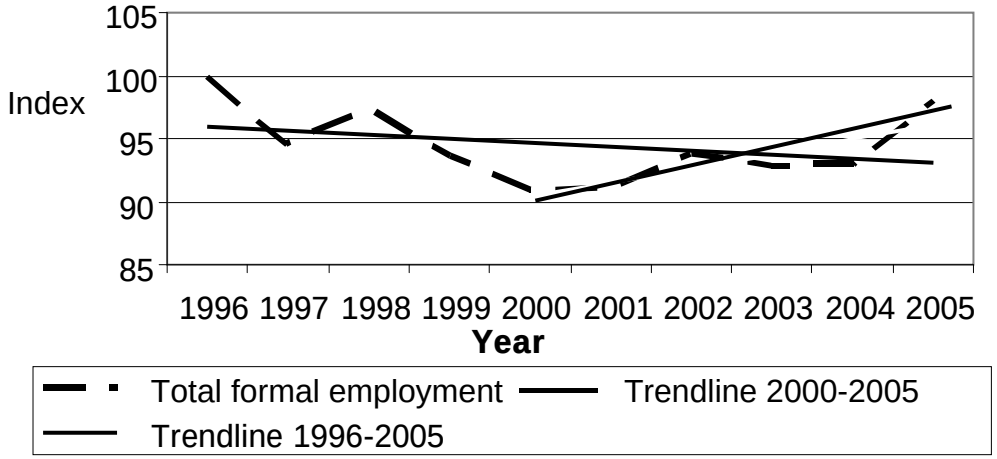
Source: Stellenbosch University

Demand describes actual current employment levels, supply considers the quality of training input and availability of skills, skill levels analyses the actual level of skills of current employment, and productivity analyses outputs to try and establish how labour productivity is performing in this sector.

Demand

Figure 3 depicts formal employment growth in TSC according to official statistics.

Figure 3: Formal employment growth for the TSC industry 1996 – 2005



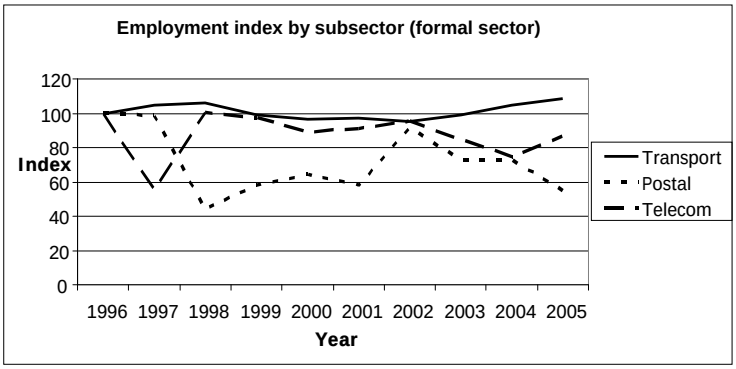
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Scale: Thousands	476.1	450.1	463.7	445.3	432.3	433.6	446.4	441.7	442.2	466.8

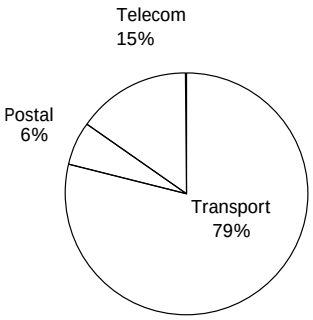
Source: StatsSA OHS (October Household Survey), LFS (Labour Force Survey)
(Index measures are used in many of the graphs. An index measure shows variance in a key variable - such as employment or tonkilometer per worker - across a number of years following the baseline year of 1996. A decline in the index implies an equivalent increase of the baseline value of 1996. The actual numbers of the variable are also provided in the tables below figures)

After an initial decline up to the year 2000, formal employment has risen steadily, but is still below 1995 levels.

Employment according to the three logical subsectors is depicted in Figure 4.

Figure 4: Formal employment comparison of transport, postal and telecommunications subsectors 1996 – 2005





2005 Distribution

Scale: Thousands	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Transport	340.0	356.3	359.9	336.9	327.1	330.3	323.3	336.3	355.4	368.8
Postal	49.4	48.5	21.6	28.5	31.8	28.5	45.1	35.8	35.8	27.1
Telecom	82.2	45.3	82.3	80.0	73.3	74.9	78.1	69.6	60.9	70.9

Source: StatsSA OHS and LFS

(As indicated earlier, the index system is widely used to enable comparison of relative growth or decline rates between variables that are related but with widely different quanta. The pie chart, which is often depicted to the right, enables the quantum comparison)

The changes in the distribution of the workforce relative to the three subsectors over the last decade show that only the transport subsector grew to levels higher than a decade ago. By 2005, 79% of formal employment in the sector was in transport which therefore requires further analysis.

The telecommunications subsector in South Africa has shown considerable growth, especially in terms of technology concomitant with global improvements in communication technology such as enhanced bandwidth and broadband, wireless technology and fixed wire/wireless and voice/data conversion. South Africa's transport subsector benefits less from global improvements and are experiencing serious congestion, cost and capacity challenges. This situation might explain why transport employment growth is faster than for the other two subsectors where automation is more prevalent.[3]

Postal employment is declining as a result of the declining nature of the original technology for postal services. Advances in postal technology are included in the telecommunications subsector and sometimes even in the business services group

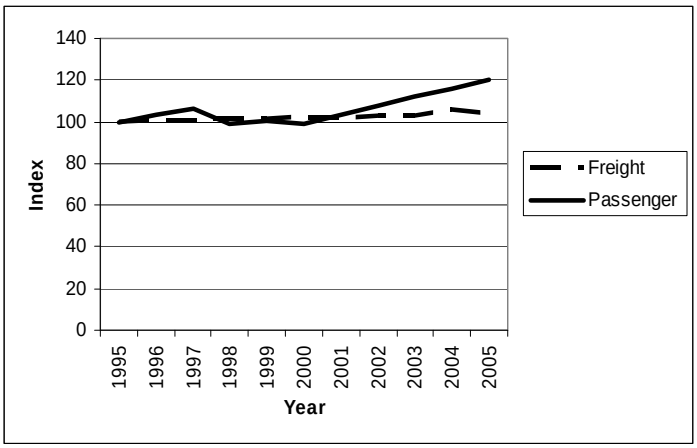
[3] For a full discussion on the ICT industry, which includes telecommunication, please refer to the relevant chapter in the book.

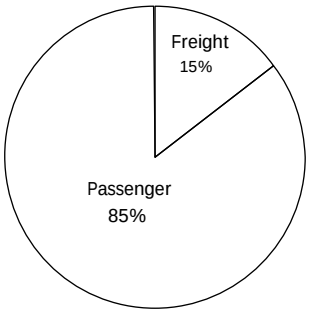
of the SIC classification system leaving the postal subsector with a declining usage base.

Many of the service components of postal services (e.g. hardware and software supplied for faxing, video conferencing, etc.) is also excluded from the SIC code and included in other groups, further explaining the declining nature of the subsector.

The transport subsector is further disaggregated in the freight and passenger utilities as depicted in Figure 5.

Figure 5: Estimated formal employment split between passenger and freight 1996-2005





2005 Distribution

Scale: Thousands	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Freight	61.4	61.6	61.8	62.0	62.3	62.5	62.7	62.9	63.2	64.9	63.5
Passenger	302.0	312.0	321.9	298.4	303.6	298.6	311.7	324.7	337.8	350.9	363.9

Source: University of Stellenbosch modeling, 2008, Statistical Release P7101, 2002, unpublished Transnet statistics, De Wet, 2003, p. 19

Passenger transport is driven by a growing second economy supported by migrant labour and porous borders. Freight transport remains constant as a result of structural problems in the freight transport market that have not yet been addressed.

Informal employment in the transport subsector is high but only a small portion of this is reported in recorded official statistics. Unrecorded statistics (such as statistics for taxis) suggest that ten times more people work in road passenger transport than what is reflected in recorded official statistics and that total informal employment for TSC is around 50% (StatsSA, P7000, 2005 and Ntuli, 2005).

Transformation strategy successes are mixed. Female employment is rising fast and an overall level of 22% was reached by 2005 (by 2005 less males worked in the industry than 10 years ago, but the number of females has grown by 60%). The employment distribution for all races has remained flat except for Indians where the number has doubled from a low base (by 2005 6% of all workers were Indian). Between 1995 and 2002 the workforce became progressively older, but this trend is reversed in the last three years.

In summary, demand side analysis indicates that employment figures remained mainly flat or even declined slightly for TSC, driven by declines in postal and telecommunication employment. Transport employment is growing slightly but mostly because of passenger transport employment growth, which is the area with the most informal employment. The informal nature of employment (around half of employment in TSC and almost all employment in passenger transportation is not measured) is disturbing and a major challenge for planning. Female and Indian employment is rising, but other transformation challenges are not met.

Supply

Supply-side challenges manifest themselves to a large extent in the mismatch of skills, in so far as the characteristics of the available pool of potential employees do not satisfy labour demand regarding specific qualifications and skills. This is the result of amongst others, the debatable quality of training institutions and teaching capital, incorrect and/or inappropriate fields of study offered by training institutions, the lack and/or incompleteness of overarching management information on the labour market (this is fragmented and incomplete), the inability of learners to make the transition from school to Further Education and Training facilities, Universities and Technicons, as well as insufficient communication and collaboration between enterprises and training institutions.

While approximately 25% of South Africa's budget is awarded to education, some schools still lack basic services, learning materials and teachers (SAPA, 2007; The Presidency, 2007). A major deficiency is teacher skills, a substantial number of South Africa's public school teachers are under-qualified and only 12% have a postgraduate degree (Skills and Vacancies project, 2006). The number of teachers has increased by 12 %, but the percentage with only grade 12 has increased by 17% and the percentage with a post-graduate qualification has decreased by 6% (Skills and Vacancies project, 2006).

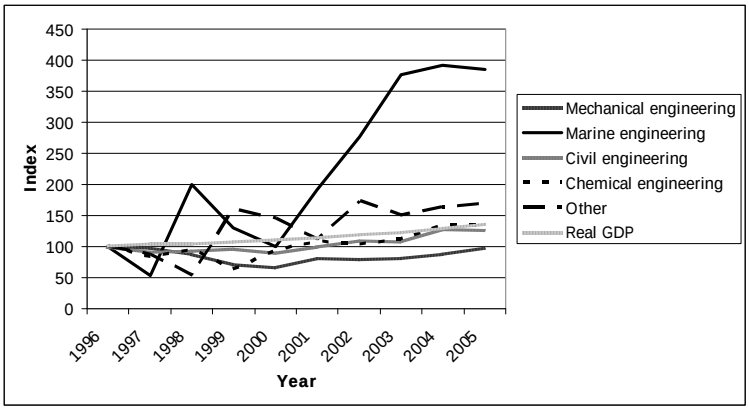
Grade 12 pass rates have been improving steadily for most of the research period, though recent decreases have been recorded. The training levels caused by poor teacher skills, is a bigger concern and the actual number of learners who passed mathematics has decreased from 1995 to 2005 to very low levels (The Presidency, 2007). Science, engineering and technology ("SET") pass rates are better and higher grade pass rates have improved from 15% to 25%, which means that the actual number of SET graduates has increased from under 4000 in 2001 to over 11000 in 2005 (Department of Labour 2006).

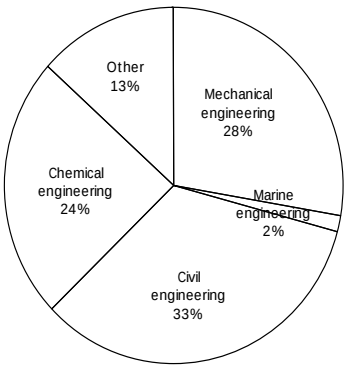
It is often argued that the quality of South Africa's grade 12's is not acceptable in a global context and could have negative effects on the economy. The low quality of grade 12 education causes unemployment of school leavers. Many school leavers do not have marketable skills or training opportunities, meaning that, while young people suffer debilitating unemployment, there are half a million job vacancies that cannot be filled (Pandor, 2005; SAPA, 2007; Skills and Vacancies project, 2006). Grade 12-level unemployment rates increased from 25% to 40% since 1995 and tertiary-level unemployment rates from 6% to 15% (JCP International, 2005).

Once grade 12's leave school the next challenge is to receive a post-graduate science and technology education. Businesses often report having to bring in skills from overseas for major projects, not because South Africa lacks the relevant skills, but because the quality of those skills is so poor that people needs to be retrained (Skills and Vacancies project, 2006).

Figure 6 reflects the fields of study that contributed to graduate output from universities and technicons over the past decade.

Figure 6: Fields of study in engineering and transportation 1996–2005





2005 Distribution

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Mechanical engineering	872	853	766	631	577	706	695	718	765	856
Marine engineering	13	7	26	17	13	25	36	49	51	50
Civil engineering	817	747	767	787	731	811	901	886	1043	1036
Chemical engineering	554	463	523	351	520	596	575	615	737	738
Other	244	210	130	392	353	272	421	364	397	413

Source: HEMIS (Higher Education Management Information System)

The growth rates for all fields (except for marine engineering growing fast from a low base) is unacceptable and for many disciplines lower than the growth rate of the economy over the same period. The percentage of students that obtained a post graduate qualification did, however, improve. The relative portion of African and female graduates are improving as well.

In summary, supply side analysis suggests that all indicators, in relationship to the economy, are declining. Grade 12 teaching inputs are poor and mathematics pass rates are still unacceptable. Engineering Higher Education and Training graduates are far below what is needed in the economy and the gap between current growth, required growth and what is actually delivered is widening. At the same time life expectancy is lowering and net migration worsening over time. TSC is, in fact, critically undersupplied in terms of skills.

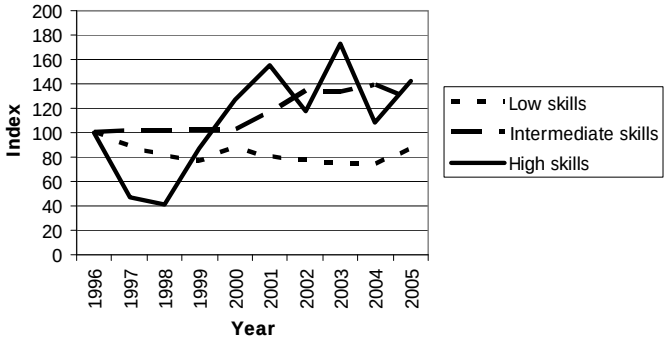
Skills levels

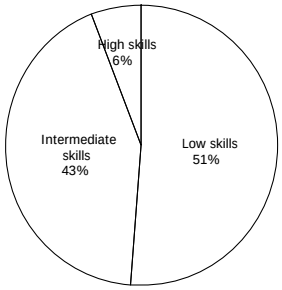
Skills levels refer to current skills of workers already in the industry. Skill bands have been identified in accordance with the NQF schema by Kraak, 2005.

The data drawn from the OHS and LFS surveys indicates that half of the collective workforce holds less than a Grade 12 certificate, whilst 44% holds a Grade 12, College and/or a Technicon National Certificate, and/or Diploma. The remaining 6% holds a higher educational qualification (i.e. a degree, honours, masters or doctorate).

Figure 7 reflects the distribution of the average skills presented over the ten year period.

Figure 7: Distribution of skills bands for the industry (formal employment) 1996-2005





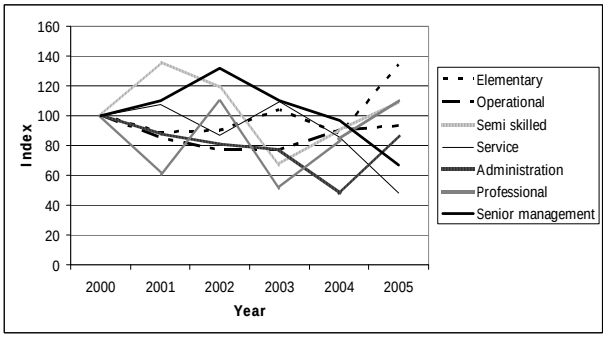
2005 Distribution

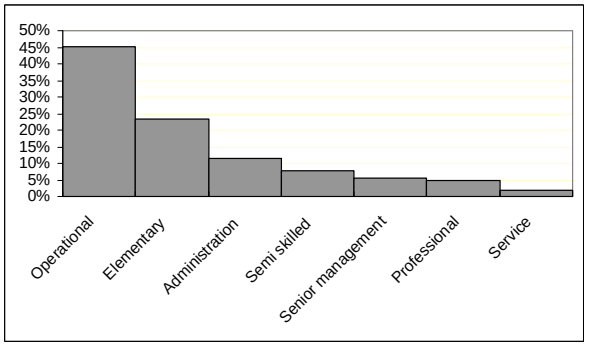
Scale: Thousands	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
low	272.8	240.0	220.0	209.7	239.0	218.1	212.6	201.2	201.2	235.4
intermediate	155.4	157.0	158.0	159.3	159.4	180.4	208.4	207.1	215.9	198.3
high	18.6	8.8	7.7	16.3	23.7	28.9	21.8	32.2	20.0	26.4

Note: values for 1997 and 1998 have been estimated for low and intermediate skills.
Source: StatsSA OHS and LFS

The relative level of high skills has been improving since 1998. The persisting number of workers with low skills is a concern and requires consideration. This is also reflected by occupational category (Figure 8).

Figure 8: Low Skills: Distribution of occupational category for the industry (formal employment) 1996–2005





2005 Distribution

Scale: Thousands	2000	2001	2002	2003	2004	2005
Elementary	40.4	35.9	36.5	42.1	35.4	54.4
Operational	112.5	95.5	86.5	86.7	101.3	104.9
Semi skilled	16.8	22.8	20.0	11.3	15.1	18.3
Service	8.3	8.9	7.2	9.1	7.1	4.0
Administration	30.9	27.0	24.9	23.8	14.6	26.9
Professional	10.2	6.2	11.1	5.3	8.5	11.2
Senior management	19.8	21.8	26.1	21.8	19.2	13.3

Source: StatsSA OHS and LFS

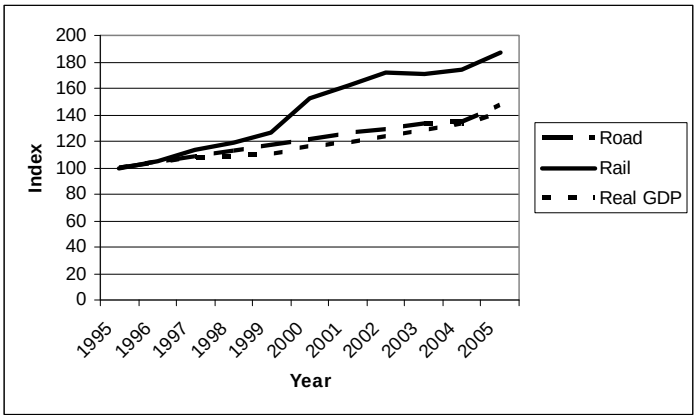
The low skills level of especially the large volume of operational employees that includes drivers, engineers, machine operators and technicians, is of great concern.

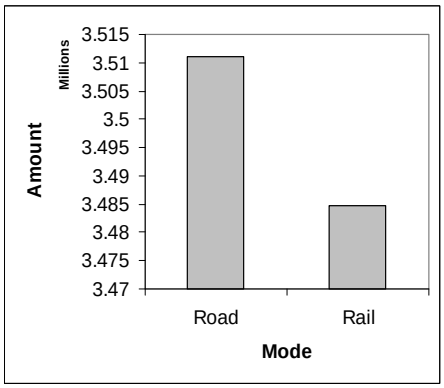
Labour productivity

Understanding labour productivity in TSC proved to be challenging in order to inform scenarios for the future. It was possible to create freight and passenger transport productivity data with statistics from different sources and some modeling which is helpful since 79% of TSC employment is in transport.

Freight transport labour productivity can be analyzed by looking at road and rail freight tonkilometer produced per employee (Figure 9). (Other freight modes are very small and statistics even more difficult to obtain).

Figure 9: Growth in tonkilometer per worker compared to growth in real GDP 1995-2005





2005 Distribution

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Road (millions)	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.2	3.5
Rail (millions)	1.9	1.9	2.1	2.2	2.4	2.8	3.0	3.2	3.2	3.2	3.5
Real GDP (billions)	725.7	756.5	776.4	781.8	802.7	838.2	862.3	894.7	923.0	967.5	1016.1

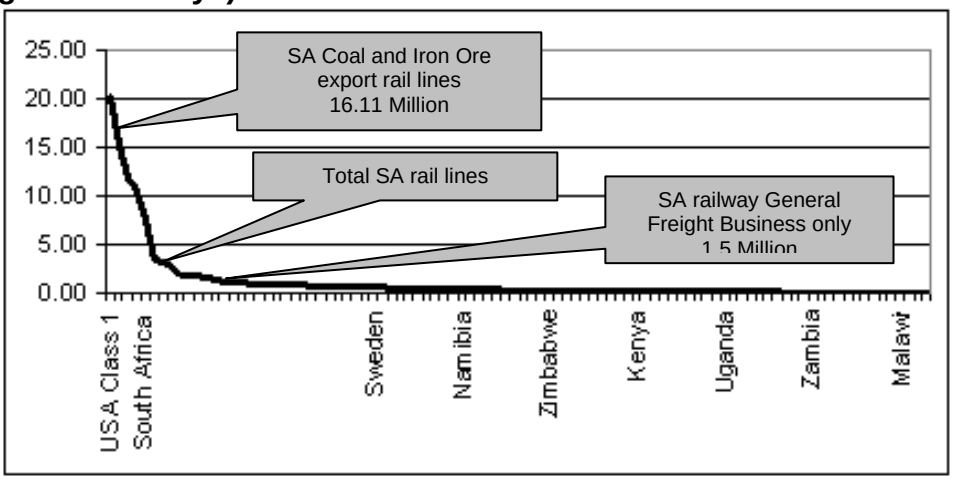
Source: University of Stellenbosch modeling, 2008 and Havenga, J.H. 2007, p. 147

The gap between rail and road freight productivity (which was half a million tonkilometers in 1995), has decreased to merely twenty thousand in 2005. When it is considered that rail freight input includes the infrastructure development and maintenance of the mode (not the case for road), rail freight employment productivity

has improved the most and is now probably much better than for road. Rail's capacity for automation is much higher than road, and as South Africa faces unique challenges in the next 50 years this could have a unique skills set challenge.

Although rail freight productivity is slightly less than that for road freight, given that rail owns and maintains its own infrastructure, it is far higher than the global average (Figure 10).

Figure 10: Tonkilometer per employee (two parts of SA Rail compared to global railways)



Source: Thompson, L. 2008 and University of Stellenbosch modeling, 2008

South Africa ranks fifth in the world in terms of rail employment productivity but unfortunately, because of our spatial challenges, probably need to improve this position to be closer to USA Class 1 railways in order to be globally competitive. (Except for perhaps Russia, South Africa is the most spatially challenged country in the world, the effects of which are discussed in the scenarios for the future). One solution proposed in the 1990's was to rationalize the railway and only retain highly densified portions of the network. As an extreme case in point the tonkilometer per employee is depicted for a scenario where the railroad is split into two parts which in this case would be highly densified coal and iron ore export lines and a less dense general freight business ("GFB") railway.

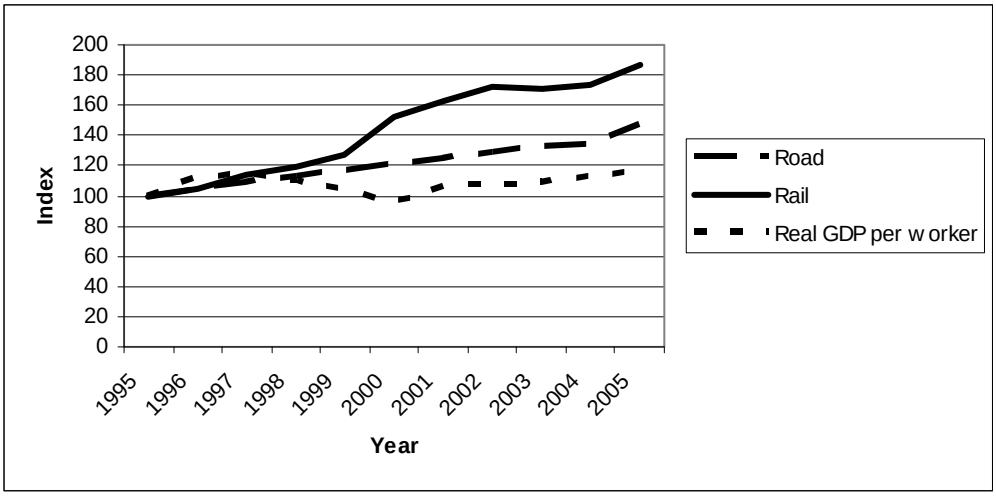
Clearly the coal and iron ore export lines are highly competitive but the challenge is to reconfigure the GFB business to achieve the same levels of employee productivity. As the railway rises to this challenge and achieve higher levels of density through regaining market share, intermodal solutions and some rationalization, profound effects in productivity will be experienced, but equally profound skills level needs will arise.

This means that South Africa's freight transport system is currently focused on a highly effective road transport system, but this is not sustainable and growth in railway traffic, eventually, would have to be engineered.

The best available benchmark for overall economic productivity would be GDP produced per formal worker in South Africa compared to tonkilometer output for

surface freight employment. In this regard surface freight employment labour productivity outstrips overall economic productivity by far (Figure 11).

Figure 11: Growth in tonkilometer per worker compared to growth in real GDP per worker 1995-2005



Scale: Millions	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Road	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.2	3.5
Rail	1.9	1.9	2.1	2.2	2.4	2.8	3.0	3.2	3.2	3.2	3.5
GDP per worker	0.08	0.08	0.09	0.08	0.08	0.07	0.08	0.08	0.08	0.08	0.09

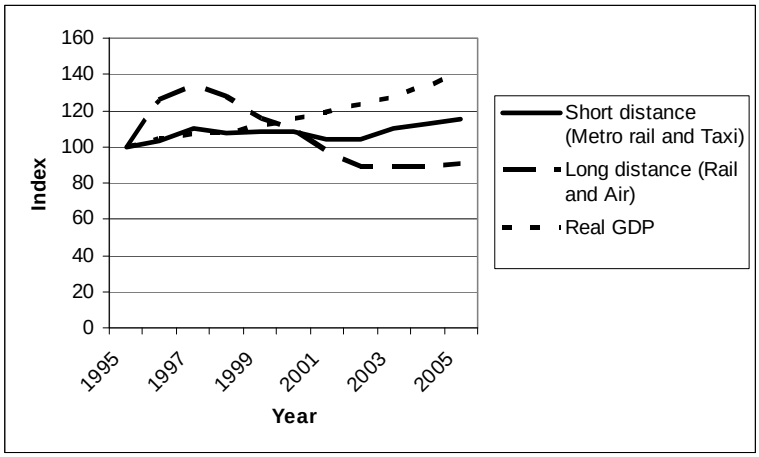
Source: University of Stellenbosch modeling, 2008, Havenga, J.H. 2007, p. 147 and Statistics South Africa, 2007.

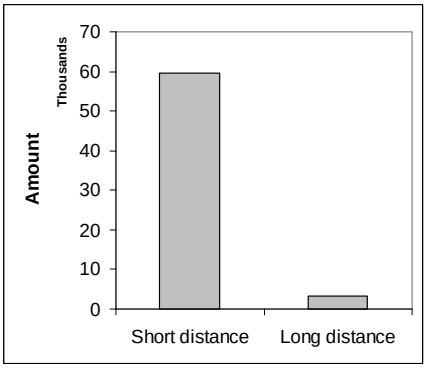
This means that whereas overall labour productivity in South Africa has declined (which in this case, unfortunately, has to be measured financially), road freight transport employment output has tracked real GDP and rail freight employment output has surpassed it, mainly as a result of labour productivity. GDP improvements for the country are generally engineered by factors other than labour productivity.

This behaviour is caused by three drivers, i.e. the capacity to improve, opportunities to rationalize labour and the drive to exploit opportunities in a spatially challenged economy.

The position for passenger transport is quite different, as depicted in Figure 12.

Figure 12: Growth in passenger journeys per worker compared to growth in real GDP 1995-2005





2005 Distribution

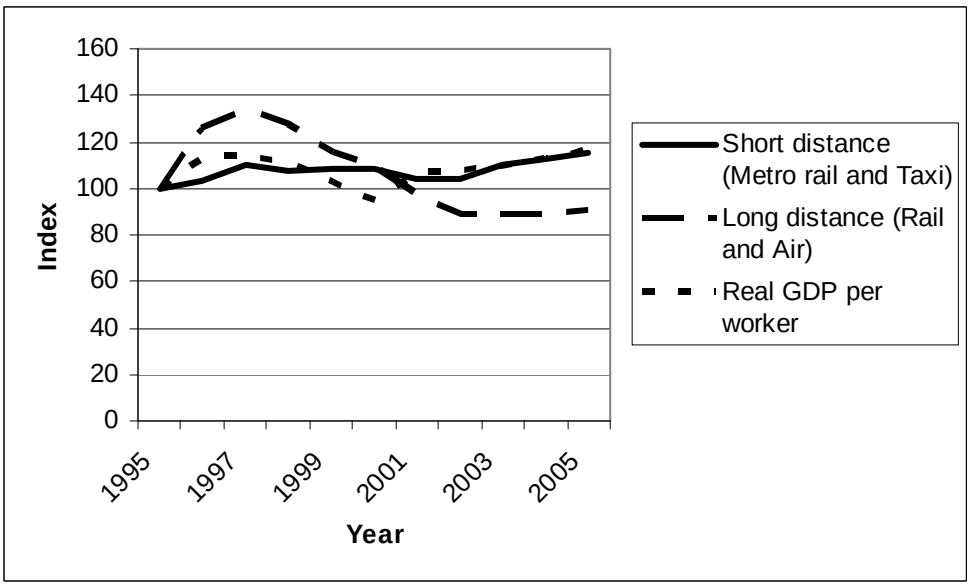
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Short (thousands)	51.6	53.1	56.7	55.6	56.1	56.0	53.8	53.6	56.7	58.1	59.6
Long (thousands)	3.5	4.4	4.7	4.4	4.0	3.8	3.4	3.1	3.1	3.1	3.2
Real GDP (Billions)	725.7	756.5	776.4	781.8	802.7	838.2	862.3	894.7	923.0	967.5	1016.1

Source: University of Stellenbosch modeling, 2008

Passenger transport in South Africa is sub-optimally configured with private car transport escalating and public transport services being underdeveloped and underutilized. The congestion problems associated with this transport behaviour is well known but the inefficiencies that it causes in the economy are not always noticeable.

Long distance passenger transport productivity is largely responsible for the negative correlation with the GDP (Figure 13).

Figure 13: Growth in passenger journeys per worker compared to growth in real GDP per worker 1995-2005

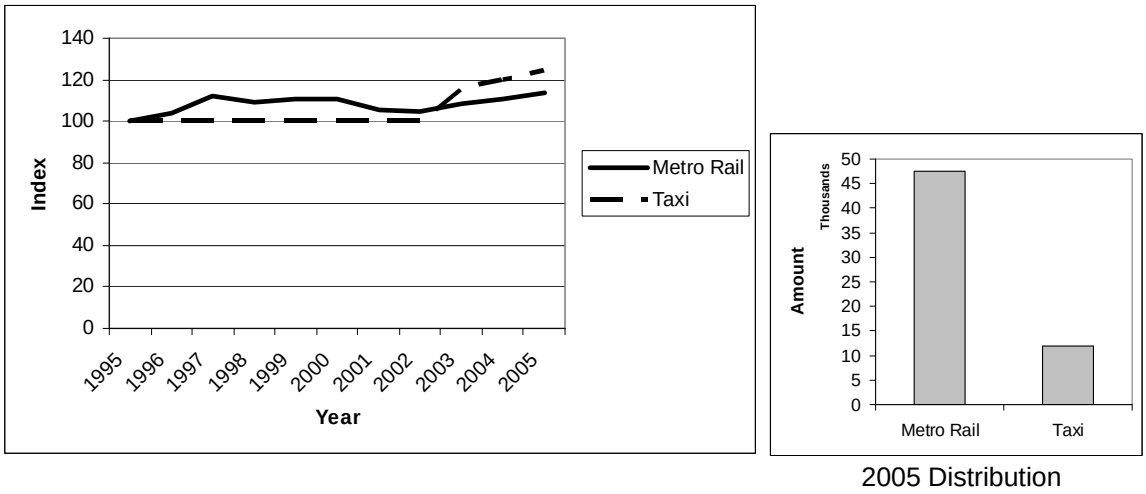


	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Short (thousands)	51.6	53.1	56.7	55.6	56.1	56.0	53.8	53.6	56.7	58.1	59.6
Long (thousands)	3.5	4.4	4.7	4.4	4.0	3.8	3.4	3.1	3.1	3.1	3.2
Real GDP (millions)	0.08	0.08	0.09	0.08	0.08	0.07	0.08	0.08	0.08	0.08	0.09

Source: University of Stellenbosch modeling, 2008

Short distance passenger transport is mostly provided by solutions such as taxis. The demand for taxi journeys will correlate well with the GDP because the shift from poor to affluent has not yet materialized in the South African economy. It is also easy to increase capacity. In addition, taxi drivers also have to work longer shifts with the obvious negative employment satisfaction and safety implications. (Figure 14).

Figure 14: Mode comparison, passenger journeys per worker, for short distance transport 1995-2005



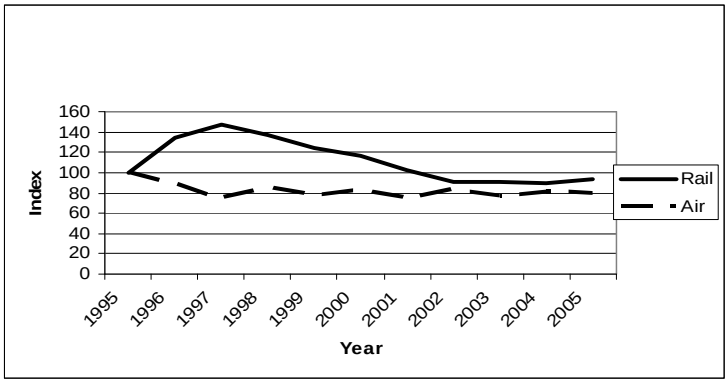
2005 Distribution

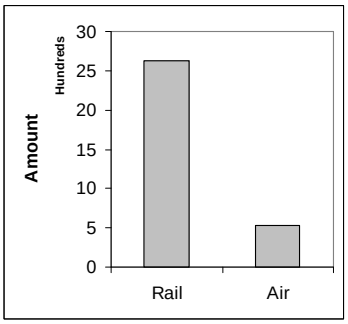
Scale: Thousands	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Metro Rail	42.0	43.4	47.0	45.9	46.4	46.3	44.1	44.0	45.5	46.5	47.6
Taxi	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	11.2	11.6	12.0

Source: University of Stellenbosch modeling, 2008, inter alia based on values for taxi fleet from DoT, 2001.

For long distance transport (Figure 15) the rail solution is close to collapse and a growing number of people use private cars for long distance travel. Air travel employment productivity as depicted by passenger journeys per worker remains constant.

Figure 15: Growth in long distance passenger journeys per worker compared 1995-2005





2005 Distribution

Scale: Thousands	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Rail	2.8	3.8	4.2	3.9	3.5	3.3	2.9	2.6	2.6	2.5	2.6
Air	0.7	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Source: University of Stellenbosch modeling, 2008

Air passenger transport productivity improvements are technologically difficult given the complexities of the industry. Aircraft sizes remain the same and the same crew size is required.

Theoretically railway productivity as depicted by long distance railway journeys per employee should improve such as for railway freight, but railway authorities made a conscious decision not to invest in this mode of transport. This means that supporting technology that could have led to productivity improvements was not installed.

In summary, productivity indicators confirm that the rail mode is more productive (given that the necessary densities exist). If a switch to rail is contemplated over the next two decades, the impact on skills demand will be significant in terms of complexity and the changing pattern of skills required.

Status quo summary

The status quo of employment in TSC indicates that employment levels for transport are rising slightly with a decline in other subsectors (driven by automation in telecommunication and the decline of the postal utility). Transport employment growth is primarily in passenger transportation, but this is also the subsector with the most informal employment. Supply is unacceptable and the gap between skills required and what can be delivered is widening. Productivity is the most challenged in passenger transportation, the area that is primarily unmeasured and where the most informal employment exists. In short, the position is worsening in all areas, and most in those areas where the least formal information exist.

SCENARIOS FOR THE FUTURE

Freight transport

Freight transport over land

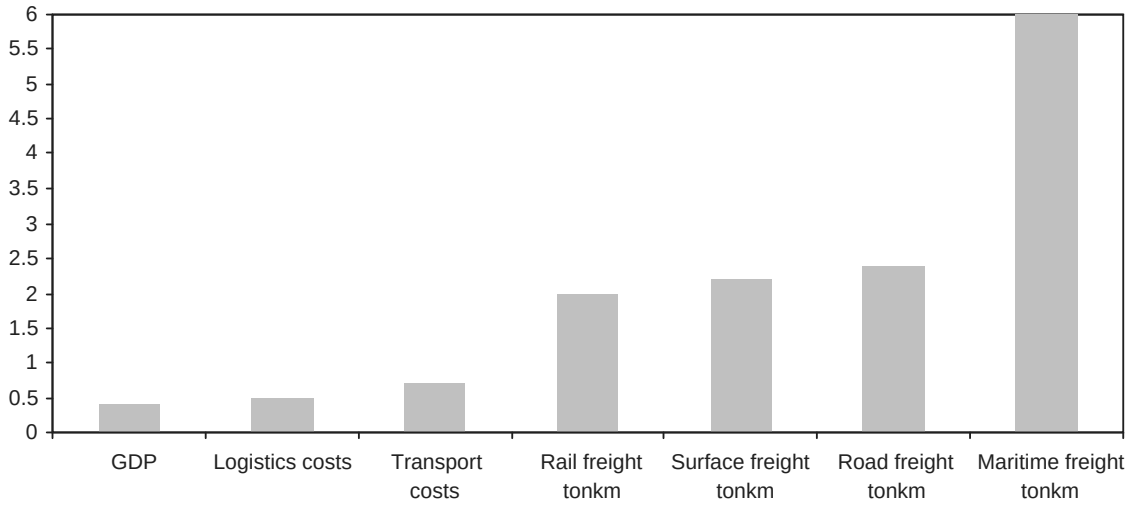
As industries in die third world mature, power in the value chain moves downstream. This means that consumer demand increasingly dictates flow through the value chain and primary producers such as mining and agriculture and even manufacturers (beneficiators of primary products) have less control over prices and delivery of products.

This trend increases complexity in the logistics system which has a significant impact on transport. It requires more reliability, higher speed and lower costs from South Africa's transport system, which is already under severe pressure because of historical imbalances.

The current structure of freight transport in South Africa together with its future challenges are informed by its history in which intrinsic geo-spatial considerations played a smaller role than in most countries in the world. Developments in most countries are aligned to natural physical characteristics of the geography where the positioning of rivers, valleys and mountains, the availability of drinking water and arable land inform such development. In South Africa, however, some harbours are not positioned in the right place, most of the population and industry is incorrectly located and major population concentrations arose far away from water sources. This situation arose because infrastructure development was driven by extrinsic factors rather than geography.

Today South Africa generates 0.4% of the global GDP, but consumes 2.2% of the world's tonkilometers and 6% of maritime tonmiles. The country is freight transport hungry and produces only $0.64 of GDP per tonkilometer, compared to the average production of $3.34 for the world in total (Figure 16).

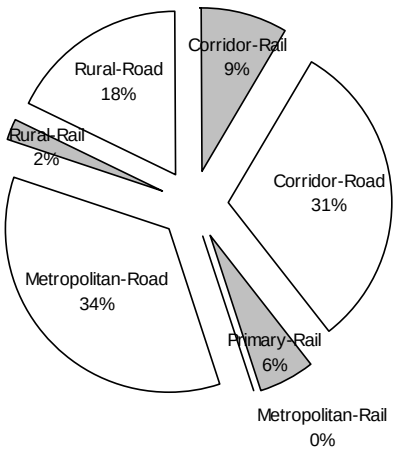
Figure 16: South African freight transport as a percentage of world figures (2004)



Source: Havenga and Pienaar, 2005, p. 9.

South Africa currently ships 1 416 million tons of freight in essentially four different network segments, i.e. rural, metropolitan, corridor and primary segments (Havenga 2007, p. 146, 152-157) (Figure 17).

Figure 17: South African freight transport network segments (with mode differentiation)



Source: University of Stellenbosch modelling, 2008
(Primary transport refers to the export of bulk low value raw materials, metropolitan short haul deliveries of high value commodities in cities, rural linkages between rural communities and between rural communities and export/metropolitan markets, whilst corridor transport includes the highly densified links between major areas such as Gauteng, Cape Town and Durban. A discussion on the challenges of these typologies is included in the full report. Primary and corridor transport will be rail bound in most economies.)

The current and expected future usage of these modes play an important role in understanding the specific skills challenges (present and future). Three modes have been excluded from this part of the analysis i.e. water, air and pipeline, but are briefly summarised later.

Freight transport by water accounts for less than a quarter percent of domestic freight transport whilst freight transport by air accounts for less than 0.1%. In addition, the country's domestic pipelines are responsible for less than 1% of freight transport, meaning that the three excluded freight transport modes together account for less than 1.5% of total freight transport and doesn't contribute much to this utility.

The current status quo of the mode structure of South Africa's freight transport market is not tenable. Forecasts done by the University of Stellenbosch for Transnet indicate that freight transport demand will grow by between 200% and 250% (Transnet, 2006, p. 27) over the next twenty years. Some corridors, such as the

corridors between Gauteng, Johannesburg and Cape Town (which amounts to 50% of all corridor transport) will densify even faster than this. Even in a low growth scenario the challenges of alleviating congestion in metropoles, providing cheap corridor transport and developing rural infrastructure cannot be met with the current configuration.

Freight transport by road over long distances is too expensive and it is clear that a shift from freight transport by road back to rail could solve some of the high-cost related problems and provide opportunities for a more competitive position for South Africa as a whole.

Long distance truck travel is, in addition, also a contributing factor to socio-economic problems within the driver population as is evidenced by the prevalence of AIDS and other social issues amongst truck drivers (Fleetwatch, 2002). The road freight transport subsector acknowledges in discussions that required future adherence to SHEQ (safety, health, environment and quality) and RTQS (Road transport quality standards) standards will put more pressure on the subsector in terms of driver education and working conditions.

The debate around how and when this step change will be facilitated is not the subject of this article, but the fact that a shift is required back to the railway corridors, the need for rail dedicated metropolitan solutions and more effective rural road infrastructure with intermodal nodes, cannot be disputed. Interestingly enough, the road transport subsector reports in interviews that the shift is possible and might become a reality as soon as in the middle of the next decade.

The above-mentioned shift will require that the industry's Sector Skills Plan (based on skills shortages and training needs identified by the Transport Education Training Authority through analyses and aggregation of company Workplace Skills Plans) will have to be aligned closely to the Transnet national infrastructure plan, DoT's national transport masterplan and the deployment of Moving South Africa as well as the National Freight Logistics Plan (an alignment which has not yet been achieved) to support a skills demand shift from long haul road to long haul rail. Although the timing is not yet clear, more certainty is expected to emerge over the next five to ten years. Presently, however, the required shift is not widely recognised (for various reasons – including a shortage of strategic planning skills at DoT, a lack of integrative master planning thinking between the two infrastructure owners, i.e. Transnet and DoT and the scarcity of market intelligence), which makes it challenging to prepare for this and deters current operators to raise the necessary alarms.

A skills demand shift from long haul road to long haul rail transport will have a specific impact on skills categories. As market demand grows and even where different skills will be required because of a supply side shift in modality it is still relatively easy to re-skill elementary, service and administrative employees. It's more difficult to re-skill operational, professional and senior management employees. Within this group, operational is the most critical problem as the current levels of skills are very low and the degree of shift expected very high. This correlates with the responses received from infrastructure owners (Transnet and SANRAL), large operators (Imperial, Unitrans, Bidvest, McDonalds and Safmarine), upstream

providers (Robhitech) and freight owners (Tiger Brands). The degree of shift is, however, not always recognized.

Interviews and analysis of questionnaires indicated that the most critical areas of concern are in the operational fields which include drivers, technical and engineering skills.

During interviews the trucking industry reported long working hours for drivers causing drivers to search alternative employment. The shortage of drivers is also reported as being the most critical skills shortage with too little investment in the proper education of drivers. The shortage could reach levels as high as one third, according to the industry, before the expected shift results in the alleviation of this problem, but leads to new challenges in the rail freight subsector. This means that the shift will then solve some problems, but at some stage requires the retraining and skills development of operational transport workers in a totally new direction. The subsector also sites mechanization as a major future trend, but interestingly enough this trend will not impact truck drivers as much as the shift from road to rail.

In addition, learnerships and apprenticeships confusion caused by new educational systems is causing skills migration and shortages amongst diesel mechanics.

Other critical skill concerns are in the area of adult education for elementary workers and the degree of competency of professionals.

The road freight subsector is also concerned about available technical and engineering expertise. Training standards and processes exist, which means that average skills levels of existing employees are reasonable, but supply is far too low.

Management and administration skills are another concern, with low levels of skills noted in especially generic areas such as computer literacy, customer service and communication. These challenges are caused by the reconfiguration of the South African workforce, which is beginning to take hold in these areas, with a certain training backlog. The most critical skills shortage in this area is in commercial contract management, for which training programs do exist, but once again the lack of numerical abilities in the feedstock remains a challenge.

Future solutions for South Africa’s surface freight transport problems will have to consider a return to rail. This means highly technical skills development in an area where the country is already behind and falling more and more behind over time.

Freight transport by water

The development of super ports around the world, such as Dubai and Singapore, and densified global maritime routes cause a reclassification of world ports into long distance connected and short distance connected transhipment ports. The port of Durban in terms of container capacity and handling ranks as the fiftieth largest port in terms of containers handled, i.e. although large in Southern African context it is quite small in a global context. The issue of super port versus feeder port development for Southern Africa has not yet been settled and could have a profound impact on skills requirements. South Africa’s port infrastructure is well-developed but various

initiatives such as Nacala and Lobito could impact the landscape in the sub-continent.

The major shift in port demand is caused by a shift in the economy from raw material export to beneficiated products. The second shift is the propensity to containerize more and more of the beneficiated products. This means that dry bulk and break-bulk exports will grow at rates slower than the economic growth but containerization growth will outstrip economic growth by far. The international shipping container business, which is currently underpinning global (and of course South African) trade is growing at approximately 10% a year. It is estimated that container volumes will double in the next eight years and that the global container shipping fleet will grow by 60% over the next decade. One of the fundamental obstacles inhibiting growth and efficiency is the lack (worldwide) of port infrastructure capacity. Most major ports in Asia, the US and Europe as well as South Africa are experiencing bottlenecks owing to a lack of infrastructure capacity and in South Africa also intermodal system efficiency. Both Safmarine and Maersk Line indicated in responses that significantly more skills in intermodal system development and management will be required in the future. These skills are mostly lacking (nearly non-existing) in South Africa at present. In addition, closer working partnerships are required between carriers, suppliers and customers to increase efficiency.

Productivity in a port is, amongst others, measured by the average number of containers handled per gantry crane per hour. The present number of containers handled varies between 17 and 23 containers (Van Dyk, 2004, p. 21 and 26), whilst the international benchmark is a minimum of 23 containers and sometimes cited to be as high as 40 (Wong, 2007, p. 3) . Productivity in ports therefore seems to be below the international norm. Inefficient cargo handling seriously impacts on South Africa's ability to compete internationally. It is expected that these problems will multiply exponentially in the next fifteen years if solutions are not found and the necessary skills not developed.

In summary it will be easy to re-skill elementary and administrative employees, but more difficult to re-skill service, semi-skilled, operational, professional and senior management employees. Re-skilling operational employees as well as training professionals and senior management is the most critical problem as the current levels of skill is very low and/or non-existent. If South Africa wants to play a significant maritime role in the future, skills will have to be developed to achieve the correct positioning. Some growth in maritime technical expertise has been recorded, but more impetus is required.

Passenger transport

South Africa's millennium goals to reduce poverty and unemployment by 50% and create a larger middleclass will have a profound effect on passenger transport. The current solution of choice is for middle class South Africans to use private transport (i.e. private motor cars). Previously disadvantaged citizens use public transport systems which are mostly unregulated (i.e. taxis) and poorly maintained whereas a small group of wealthy citizens make use of air public transportation.

Domestic flights used for mostly business reasons, but including tourism applications, amount to more than 9 million flights per annum and international flights with the same application to more than 3.4 million flights per annum. Long distance rail and bus journeys used mostly for family and tourism amounts to close to 6 million journeys per annum. More than 6 billion commuter journeys take place every year, which means that more than 20% of the population, on average, make use of public transport to commute. (In fact, the average South African will do 70 public commuter journeys per annum and do one public long haul domestic trip every third year).

The same spatial challenges that exist in freight transport in South Africa exist in passenger transportation with added dimensions of spatial imbalance that is external to normal geographical characteristics. The long distance Gauteng to Cape Town and Gauteng to Durban routes are highly densified and abnormal, given the size of the South African economy, and for the same reason as the unnatural freight demand, caused by the location of industries and mining activities in Gauteng.

In metropolitan areas large numbers of workers who have no choice, use public transport, because they are displaced far away from places of work as a result of the previous government's policies.

Long haul by air

The passenger air transport dimension is described by the number of domestic and international flights per annum i.e. 12.9 million flights originate or depart from a South African airport each year. 0.2% of all international passenger journeys originates or departs from South Africa, with 0.4% of domestic air passenger journeys in the world taking place within the borders of South Africa.

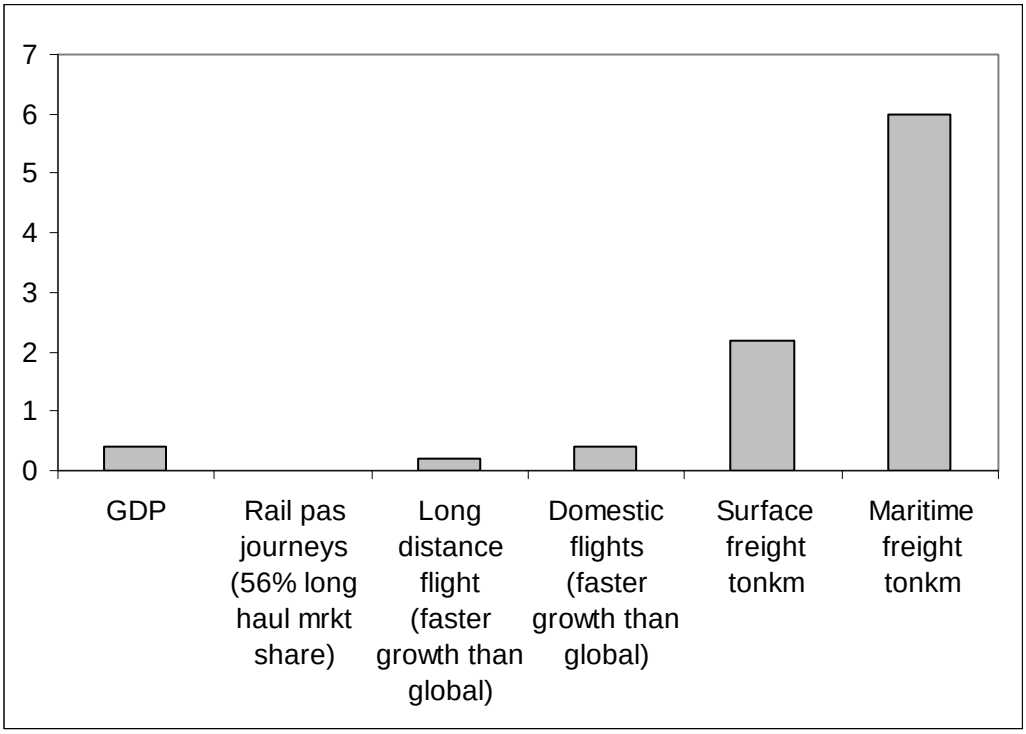
The growth curve for domestic flights is high, and future demand growth for Africa and especially South Africa will outstrip world growth. Domestic passengers have more than doubled in the ten year report period, in fact has grown by 130% compared to world growth of 40% (measured for the 1998-2007 period; ICAO News Release, PIO 13/07)

This state of affairs will place huge pressures on air transport orientated skills, especially in air traffic control and aircraft maintenance (both professions reporting extremely high emigration trends in recent years). As far as the upgrading of airports is concerned civil engineering and technical building skills will also be put under pressure in the foreseeable future.

Surface long haul

Long haul surface public passenger journeys are unnaturally low. In a comparison with rail and bus journeys, rail has a 56% market share, but only 0.01% of long haul rail journeys in the world take place in South Africa. This is an incredibly low figure and needs to be put into perspective (Figure 18).

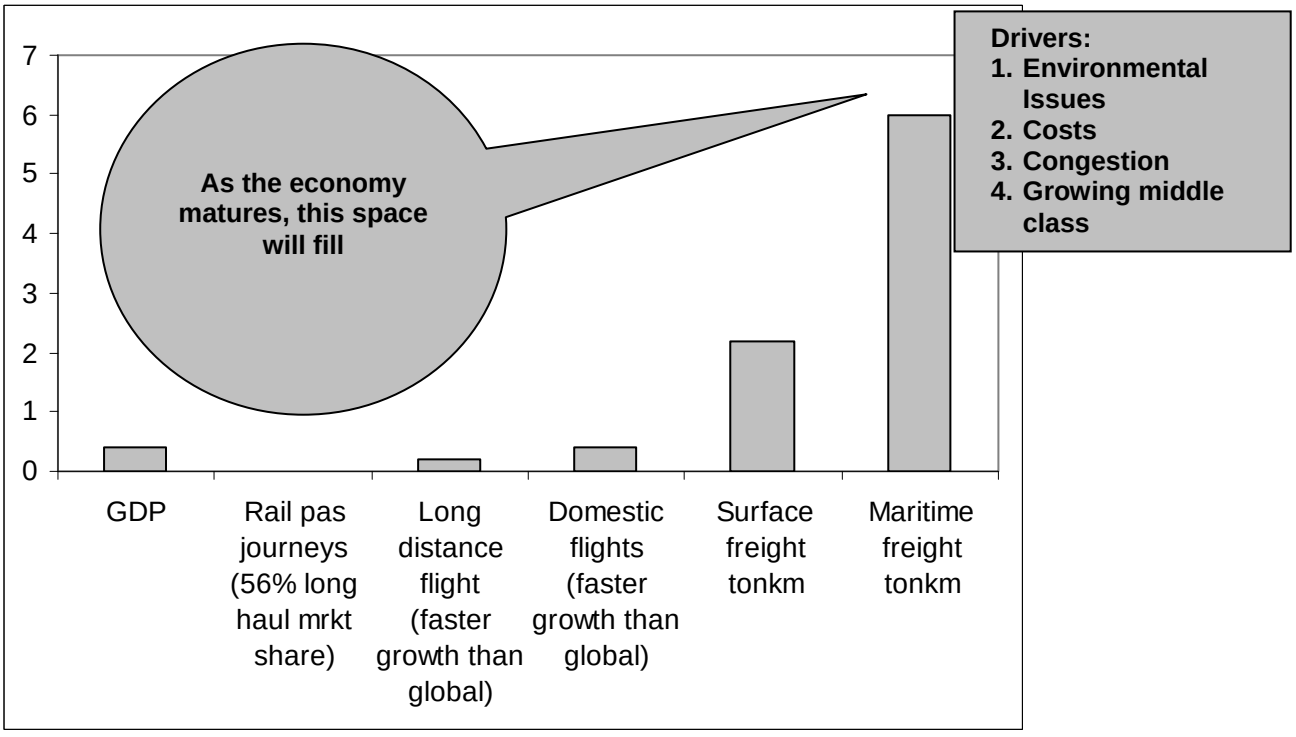
Figure 18: Long haul journeys compared to other modes of transport as a percentage of world figures



Source: Thompson, 2008 and Stellenbosch University modelling, 2008

Most South Africans still do long haul passenger journeys by private car (although the percentage of taxi journeys is unknown). If the economy matures such as AsgiSA/GEAR is aspiring to do, and poverty and unemployment is halved, this picture could change dramatically (Figure 19).

Figure 19: Expected shift in long haul journeys if economy matures



Source: Stellenbosch University modelling, 2008

The critical argument in this regard is that demand will grow much faster than economic growth (much more than for freight) as a growth in personal wealth for the middle class is expected, plus the mode switch from private to public transport for long haul from a much lower base as for freight. This means that an extreme growth of long haul public transport could take place in 10 to 20 years' time, which is mostly not foreseen, though some service providers to the industry already report a backlog in rail capacity, even with the current unnaturally low rail demand. At the same time the current solution mostly cited is to extend working hours, one of the major reasons why employees leave the industry, therefore creating a classic viscous circle.

Approximately 1 200 employees work in the dedicated service portion of rail long haul. As new rail solutions are developed in the next decade the country will have to deal with the fact that even with the current configuration an extreme shortage of railway orientated engineering disciplines are experienced. At the same time, and also with the current configuration, providers report that unnaturally high salary expectations are created by this shortage and at the hint of new projects. Fact is that the country cannot afford the shortage, which will stunt growth as with electricity, and the exorbitant salaries expected cannot be afforded, even with the shortage.

Short Haul

Short haul public journeys are mostly commuter orientated with two thirds taking place on taxis, a quarter by bus and only one-twelfth by rail. This trend need to be reversed, however, as congestion debilitates all the major metropolitan areas in South Africa. This means that skills requirements will have to consider two complex issues, i.e. the formalisation of taxi industry employment and the extreme engineering/operating skills gap in various disciplines, such as those that will be required once the Gautrain is implemented.

Massive structural changes are necessary in this subsector. Where-as growth in the country's economy is difficult without engineering, technical and management expertise, no growth is possible without infrastructure and the expertise to do just that, i.e. building and maintaining the necessary infrastructure for the first half of this century, is dangerously depleted.

The expected skills shift for passenger transport is even higher than for freight and in an area where productivity is declining and statistics are unrecorded. A major challenge would be to better understand future needs in terms of the timing of certain shifts and to prepare for these changes.

SUMMARY

The skills challenges facing TSC in South Africa is not immediately apparent, because of a lack of data, the absence of a logical macro-economic framework in which to analyze the data and the inordinately high level of informal labour in the industry. Employment has remained flat, but telecommunication employment, due to high levels of automation, has declined. Transport employment rises, but mostly in the informal sector and mostly in passenger transportation where it is inefficient and

unproductive. Transport is one of South Africa's biggest challenges, but the debilitating effect of the country's current configuration is not always known or understood. Major changes will have to be contemplated over the next two decades which will require a step change in skills requirements in exactly those areas where the country is lagging and where the gap between what is required and what can be supplied is widening.

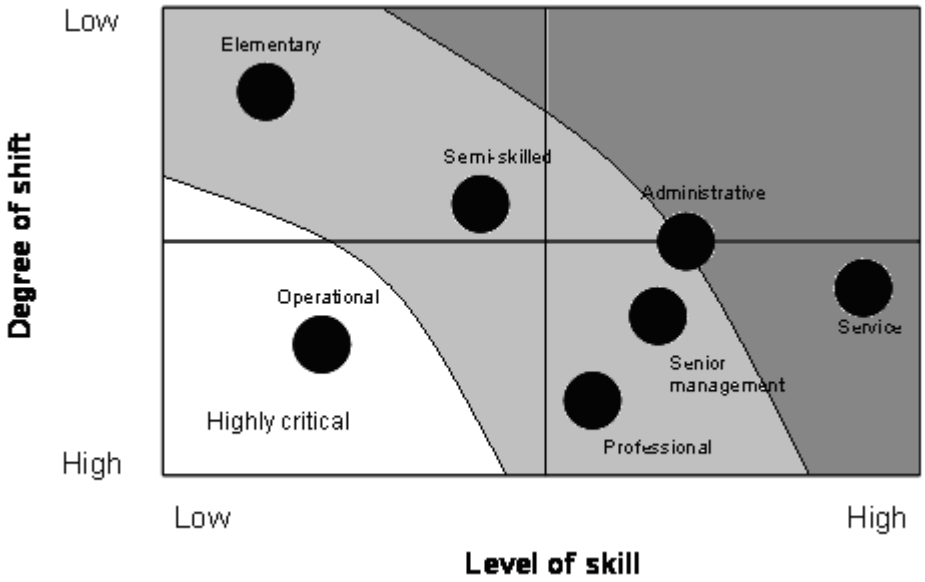
An important deduction that follows from this work is the difference in employment supply and demand issues for various industries, especially when the future is considered. In many cases supply challenges are the same for most industries, i.e. in South Africa a large gap is opening up between the demand and supply for technical/operational skills for all industries in general. In some cases, however, industries change because of external factors, and sudden demands for some skills will grow exponentially (not merely in line with GDP) and significant shortages could be expected.

The systemic effect of such a skills shortage can be described by the following cumulative effect and a comparison between electricity shortages and possible future passenger transport employment skills shortages:

a) The first level of shortage arises when inadequate investments are made for a low growth scenario (This is especially true in South Africa for energy and transport infrastructure).
b) The shortage compounds by higher than expected growth (true for both).
c) This is further compounded by structural changes on the demand side which causes most infrastructure types to outgrow GDP (also true for both). Examples are a growing black middle class, lowering of the gini coefficient, specialisation in the economy, etc.
d) This is further compounded by structural changes in the supply side. For energy this would also be required eventually, driven by environmental concerns, causing skills demand changes, but this trend is much longer in the future. For transport this change is critical, driven by corridor densification, metropolitan congestion, rural backlogs, export competitiveness concerns, and obviously, also environmental concerns.
e) This cumulative effect is at its worst for passenger transport in South Africa (even more than freight) where a propensity to outsource will grow suddenly as most South Africans will not be able to use private car transport in cities any more.
f) And in the final case of major change, industries will need to reconfigure themselves, such as for railways, where the various engineering disciplines (which are already quite complex) will need to integrate amongst each other as well as with the value chains of customers (Le Roux, 2008, p. 4).

The overarching effect of this step change on employment categories is illustrated in Figure 21.

Figure 21: Degree of skills shift required to enable step change from long haul road to long haul rail freight transport



Source: University of Stellenbosch modelling, 2008

The x-axis of figure 21 depicts current skills levels in the industry which were analyzed as very low for elementary and operational employees. The y-axis depicts the degree of change that will occur if industry modalities should change. This means that, for instance, although elementary employees are poorly skilled, they will be the least affected, in terms of job content, if the shift occurred. At the same time, although service employee job content will change with such a shift, the current skills levels are high, which means that changes could be more easily accommodated. The major area of concern is therefore operational employees, with poor current skills and large shifts expected. Professional employees, on the other hand, are well-trained but too few and will lack sufficient skills in especially integrative disciplines of engineering and logistics.

Policy recommendations are difficult to formalize due to the unique structure of the industry. Infrastructure is owned by various entities, i.e. the government directly through agencies such as ACSA and SANRAL and indirectly through Transnet. In road and air transport only private undertakings operate on this infrastructure, but for rail, pipeline and harbours, operations are mostly effected by the infrastructure owner. The National Freight Logistics strategy calls for a separation of these responsibilities, but there is no clear cut agreement on this issue and many obstacles exist that could make vertical separation and open access difficult. The DoT's ability to strategically manage the various utilities of transport is varied with some successes in certain areas, but poor performance in others. This will have a profound effect in strategy formulation as statistics and market intelligence remain scattered and unorganized, strategies unfocussed and entities taking accountability for the industry.

Central control will be difficult and probably unsuccessful, but policies could enforce central participation, harmonized statistics and combined planning systems. These should seek solutions for both the utilities and for the inputs required, such as labour.

Solutions will only be found through a credible central planning agency to manage the many transitions that will be required.

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ACRONYMS

Acronym	Description
ACSA	Airports Company of South Africa
AsgiSA	Accelerated and Shared Growth initiative for South Africa
DoT	Department of Transport
GDP	Gross Domestic Product
GFB	General Freight Business
HEMIS	Higher Education Management Information System
ICT	Information, communications and technology
LFS	Labour Force Survey
NQF	National Qualifications Framework
OHS	October Household Survey
SET	Science, Engineering and Technology
SETA	Sector Education and Training Authority
SHEQ	Safety, Health, Environment and Quality
SIC	Standard Industrial Classification
StatsSA	Statistics South Africa