

**THE FIRST  
STATE OF LOGISTICS SURVEY  
FOR SOUTH AFRICA  
2004**

Sponsored by  
CSIR Centre for Logistics and Decision Support  
and Spoornet

**“The case for measurement and  
revitalisation of basic logistics  
infrastructure in our dual economy”**

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## Executive Summary

In this publication we share the results of the first State of Logistics Survey for South Africa.

The results are structured in terms of various perspectives, as illustrated in Figure 1 below:

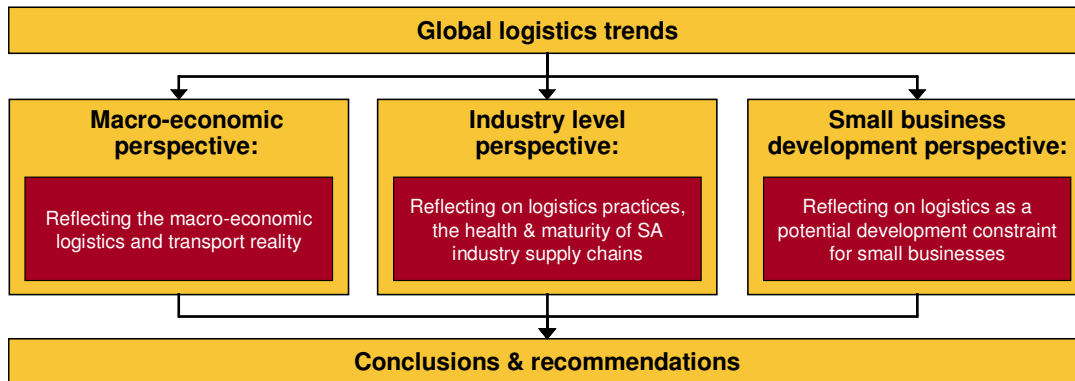


Figure 1: Research approach

The analysis on global trends provides important input to South Africa's macro-economic logistics environment.

Over the last five decades, first world economies achieved a reduction in the cost of transportation as a percentage of GDP of  $\pm 5\%$  per decade and three times as much in inventory costs. This phenomenon resulted in structural problems with core transportation issues, to the extent that some economies are experiencing a flattening of the transport cost saving trend and even a rise in costs in some cases.

This trend is forcing a move towards the configuration and reconfiguration of basic economic infrastructure to address core structural problems and enable efficient access from which collaboration can be driven. This however presupposes the availability of both intrinsic and extrinsic data on national logistics costs. We believe that there is a growing international trend to measure logistics costs, and manage it as a lead and lag indicator. This survey was the first attempt to measure intrinsic logistics cost for the South African economy.

This survey highlights that South Africa's core structural problems are far worse than expected:

- Logistics cost represents a considerable percentage of the GDP (14.7% or R180bn). We spend more on transport than generally expected and much more than we should;
- The "normal" macro economic model is to transport long-distance corridor freight on rail, with feeder and distribution services provided by road. Structural investment myopia caused an unhealthy situation in South Africa, with three quarters of long-haul tonnage on road;
- Our dense long-haul road corridors are intrinsically more expensive than a possible intermodal solution (even more so if extrinsic costs are considered). An overarching investment strategy should therefore consider that greater efficiency in one mode is a "second prize" compared to greater efficiency BETWEEN road & rail.

We believe that only a structural change based on an efficient intermodal solution (win-win) will solve South Africa's long term freight corridor dilemma, and make sufficient funds available to address current and future metropolitan congestion, as well as rural development.

The industry level perspective considers selected industries, and highlights that there are unique pressures on different industries which necessitate their supply chains to respond accordingly. Logistics service providers need to cater for the differentiated needs of these supply chains in order to enable competitiveness. While some logistics service providers are adapting to these and related global pressures, experience seems to indicate that this is not true across the board.

Given the socio-economic conditions and current spread of economic activity in South Africa, the small business development perspective is critical. The question is how to balance the national corridor competitiveness focus with sustainable SMME development (implying a need for access to the national logistics system). Information on these issues is very limited. We provide an initial overview, and hope to be able to analyse this in more detail in future surveys.

These core structural problems can *inter alia* be attributed to the fact that we neglected to measure the state of logistics in our economy in the past – making macro logistics issues invisible and disabling any attempt to develop policy and make optimal infrastructure investment decisions.

We therefore petition for this survey to become an annual institution in South Africa. It will assist the country to develop strategically relevant policies, and to make strategic infrastructure investment and maintenance decisions, which will in turn facilitate sustainable industry and small business development. Time series data will also enable us to monitor the success of these interventions over time.

## TABLE OF CONTENTS

1	Introduction.....	6
2	Why measure .....	6
3	The South African situation.....	7
4	Research approach .....	8
5	Global logistics trends.....	18
6	Macro-economic perspective .....	25
7	Industry level perspective .....	31
8	Small business development perspective.....	37
9	Conclusions and recommendations.....	44
10	Bibliography.....	45

## 1 Introduction

This State of Logistics Survey is the first of a planned annual initiative to evolve a comprehensive picture of the state of logistics in South Africa, incorporating a macro-economic viewpoint (top-down), an industry-level perspective (bottom-up), and a small business development perspective, dealing with logistics as a developmental constraint for small, medium and micro enterprises (SMMEs) in urban and isolated rural environments.

The Transport White Paper of 1996 and the fourteen-month Moving South Africa (MSA) research project that followed were designed to articulate strategies for the long term development of South Africa's transport and logistics infrastructure. The vision, in terms of the White Paper, was for "efficient and fully integrated transport operations and infrastructure". MSA was "designed to produce a data-driven program for strategic action" in realising this vision. Specific problems that were highlighted during these studies are the following:

- Old priorities were still reflected in operational planning,
- The overall system has been systematically under-investing,
- Broad prioritisation avoided focussing resources on specific customers,
- Highly concentrated corridors have to carry freight from and to dense industrial locations, and
- High prices, poor service levels and low reliability indicated a lack of support for export competitiveness and system sustainability on these corridors.

Specific policy guidelines were developed to address these issues, but now, six years later, very little actual results have been realised. We hypothesize that this is mainly due to the dilemma that very little data, interpretation and frameworks exist to provide a foundation for these strategies and discussions.

The inability to measure logistics costs on a regular basis hampers a continuous macro understanding of the state of logistics in South Africa, and also renders it impossible to gauge the impact of various public and private sector initiatives to reduce South Africa's logistics cost. In addition, to develop a more complete picture of the drivers of logistics costs, a comprehensive picture of the state of logistics in South Africa is required.

## 2 Why measure

The case for understanding the cost and impact of global logistics is regarded as a non-issue with prominent researchers and authors of the discipline. It simply must be measured.

"The distribution of products and services from the point of origin to point of consumption is a very important part of any country's gross national product, and indicates how much 'money' the country has produced or made. Logistics activities thus mean money to a country." (Voortman, 2004, p.13).

"As the logistics functions become more integrated, they are able to achieve many efficiencies. But, a barrier to fully implementing an integrated logistics function is the lack of accurate information about costs." (Fredendall and Hill, 2001, p. 213)

We believe that the CONTINUOUS understanding, modelling, measuring and reporting of logistics costs on a MACRO-ECONOMIC level is a key indicator of the competitive advantage of nations, and is therefore important for South Africa.

Logistics cost measurement could serve as both a lead indicator (support the future planning) and a lag indicator (measurement of past interventions). As a lead indicator, logistics cost measurement would support national policy-making, and the targeted deployment of operational and capital resources (transport infrastructure investment). As a lag indicator, it would enable measurement of performance and prepare the way for corrective action.

As South Africa grapples with new investment requirements in rail, highway, ports and other logistics infrastructure, policy makers are experiencing an ever-increasing shortage of useful measurement tools to guide decision-making and measure performance. The State of Logistics Survey intends to fill this void specifically.

### 3 The South African situation

Various events over the last two decades have highlighted core structural issues, problems and competitive disadvantages in South Africa's logistics system. These include:

- The results of the commercialisation, corporatisation and legal succession of the then South African Railways and Harbours (in 1990), which led to critical underinvestment in important areas and the illogical fragmentation of assets, processes and systems;
- The RDP (in 1994), which indicated the social shortcomings of logistics assets; and
- MSA (in 1998, the most fundamental research project so far), which highlighted the possible future shortcomings of the system.

Recently, transport minister Jeff Radebe called South Africa's transport system's performance "poor" and of great "concern". He said that "it was necessary to restructure the transport system generally to make sure that logistics, or the lack of it, did not act as a restraint on economic growth, employment and sustainable development" (Star Business Report, 13 July 2004, p. 5).

At the official opening of the first session of the third democratic, President Thabo Mbeki said government planned to implement strategies to improve the national logistics system. Parliament's commitment to logistical reform is part of the process to lower the cost of doing business in South Africa (Engineering News Online, 24 May 2004).

Our President talks about "a government of the left" that "includes a reduction in inequality, the provision of public services, the principle that workers should be treated as assets, rather than commodities, regulation of enterprise....." (Cape Times, 1 July 2004, p. 6). But such ideals should be **measured, tracked and the performance monitored**.

## 4 Research approach

The project approach of the research was threefold, i.e. the modelling of logistics costs in South Africa, the detailed modelling of transport costs as a sub segment of these and the development of strategic themes to support these two models into the future. The strategic themes will have to consider the results of the two models (historically, now and forecasted), the history that led to South Africa's current position and possible lack of "consciousness" on these issues, the views of top experts and policy makers in this regard and the various strategies that could be adopted to rectify the situation. The research approach is summarised in Figure 2.

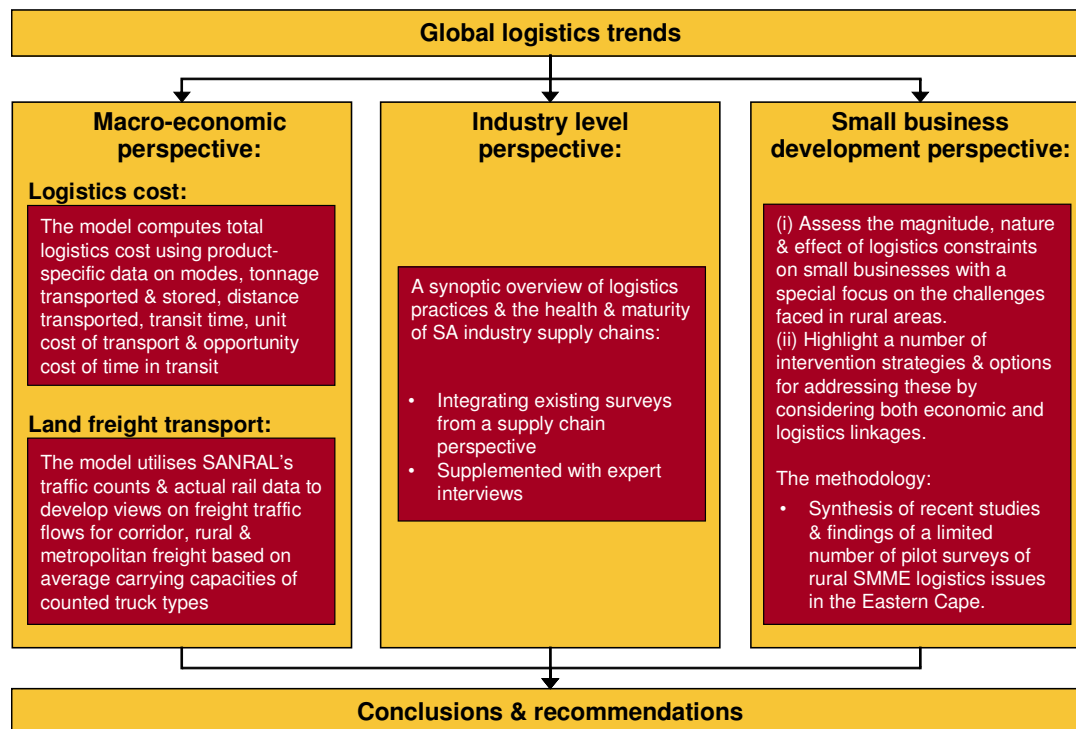


Figure 2: Research approach<sup>1</sup>

### 4.1 The costs of logistics model

The cost of logistics model was developed by the Department of Logistics at the University of Stellenbosch.

The following definitions are relevant in this cost of logistics model:

- a) **“Logistics”** is considered to be that part of the supply chain process that deals with the transportation, warehousing, inventory carrying and administration & management of physical products between the point of production and the point of delivery to the final

<sup>1</sup> SANRAL = The South African National Roads Agency Limited



consumer. Per definition this excludes the cost of passenger transport and the cost of transport, storage, packaging, handling etc. of mail and luggage, as well as the storage and transport tasks which occurs during the production process.

The extent of logistics within the supply chain process can be explained by means of the following example: once iron ore enters the smelter it exits the logistics chain and enters the production process. After the hot rolled steel is produced, it again enters the logistics chain as an altogether different product, but exits again when it enters the body pressing plant of a motor manufacturer. The entire process ends when a consumer finally takes delivery of the product, which may consist of many individual products that are dealt with separately until they are finally assembled into one and delivered to the consumer.

- b) "Cost" means the direct financial cost of performing logistics tasks that will be reflected in national accounts, up to the point where the final consumer purchases the product.
- c) "Goods" are all physical inputs and outputs of fully or partly completed physical products ensuing from the production (construction, processing assembling and manufacturing) process, as well as waste, defective products and scrap.
- d) "Within the borders of South Africa" include imported and exported goods movement, storage, etc. from the point where it passes through a border control point. It also includes the activities in a seaport or airport up to the point where it is loaded onto a vessel for export.
- e) "Gross domestic product" (GDP) figures are published by the SA Reserve Bank for the 2003 calendar year.
- f) Data are presented per mode, per cost component and per industry/sector. Modes include road (collection/distribution), road (long haul), rail, air, coastal sea and pipeline. Cost components are transportation, warehousing, inventory carrying cost, as well as administration and management. Sectors are defined in terms of the standard industrial classification and include the primary (agriculture and mining) and secondary (manufacturing) sector.

#### **4.1.1 Study methodology and approach**

Practices described in the literature to calculate logistics cost proved to be unsuitable for application in this study. For this reason an entirely new approach was developed, based on two independent approaches. The top-down and bottom-up approaches were used in parallel to calculate the logistics cost.

The top-down approach disaggregates data published in national accounts to a level that reflects transport and storage cost as defined above. This method of calculating logistic cost is referred to as the disaggregate approach.

The bottom-up approach computes logistics cost by aggregating detailed transport and warehousing data and relating it to the specific products. This method is referred to as the aggregate approach.

The parallel approach followed in this study has the following advantages over other commonly applied methods:

- a) Aggregate and disaggregate approaches are entirely independent in their method of analysis and source data. This not only allows for logical checks, but it also allows the assessment of the propensity to outsource logistics tasks.
- b) The aggregate approach builds up the cost of logistics from its most detailed input elements. Census data form the basis for input and each data element is sourced from primary sources. This is in contrast to the methods commonly used to extrapolate cost data based on sample surveys. Validity of data could be verified at the primary source before any aggregation takes place.
- c) The fact that the aggregate approach is underpinned by a model that runs off a MS Excel spreadsheet platform means not only that different sensitivity analyses can be easily performed, but also easy updating of data if more reliable figures are obtained. It would even be possible to construct a historical record of costs by retrofitting data of past years to the model, although this falls outside the scope of this study.
- d) The model focuses research on the refinement of individual input elements. It would even be possible to add more layers for the analysis of a particular industry in more detail.

#### **4.1.2 Description of the disaggregate approach (top-down)**

The following national accounts information formed the basis of the logistics cost analysis by means of the disaggregate approach:

- a) The SARB does not separate the cost of logistics from that of communications in their official publications. Transport and storage costs are aggregated with that of communications under the tertiary sector in the Bank's Quarterly Report. The combined Transport, Storage and Communication amount was R111bn in 2003.
- b) A more accurate assessment of the cost of logistics would only be possible if the base data from which the total amount mentioned in (a) above was calculated, was available. Unfortunately, the SARB has a strict policy to not divulge detail information on the compilation of the national accounts. However, sources in the Bank revealed that transport and storage combined accounts for 53% (R 59bn) of the total cost of the sub-sector and that storage alone amounts to 8% (R 5bn) of the transport and storage component thereof.
- c) Passenger transport operators are also included under transport. It proved impossible to separate passenger services from that of goods transport as data that is aggregated to this level of detail could not be obtained from the SARB. Even if source data were made

available it might not have been possible to extract the required information as companies who provide both passenger and goods transport (e.g. Unitrans operate the Greyhound bus service and SAA operates both passenger and cargo services) do not separate the cost of the individual divisions in the data that they supply to the Bank.

- d) A cursory estimate indicated that the cost of passenger services accounts for 15% of total transport cost. Therefore the cost of goods transport amounts to R41bn.
  
- e) Companies who are not primarily focussed on goods storage and handling, such as the Airports Company of South Africa (ACSA), makes a considerable contribution towards the cost of storage, data disaggregated to this level of detail could however not be obtained. The cost of such operations is included in the storage amount, which means that the presented figure is higher than the actual.
  
- f) According to the SARB definition, transport and storage include only the cost of services rendered for reward, i.e. by third parties. It consequently excludes services that are provided in-house by companies as part of their day-to-day operations. The main purpose of the disaggregate approach is that it would be used in the calculation of the propensity to outsource logistics tasks. However, it also provides a rough check of the logistics cost calculated by means of the aggregate approach.

#### **4.1.3 Description of the aggregate approach (bottom-up)**

The basis of the aggregate approach was the development of a model to calculate the logistics cost. Running off an MS Excel spreadsheet platform, the model computes the total logistics cost using detailed product-specific data on the amount transported and stored, the distance that it is being transported, the transit time and the unit cost of transport.

The model outputs were validated against the “top-down” cost data as reflected in the national accounts and other aggregated statistical data published by the South African Reserve Bank and Statistics South Africa, as well as other independent sources, such as the amount of fuel that was consumed in 2003.

The development of the model is a lasting product of the study that, enabling relatively easy updating of the data to reflect logistics cost in future years, as well as time series comparisons by retrofitting historical data to the model. It also enables updating of the results with improved data during the next phases, as well as the performance of sensitivity analysis of key input parameters.

Following is a brief description of the input requirements of the model and the primary input data sources used for compiling each of the parameters.

## a) Throughput:

Throughput is the term used to describe the total amount of goods that are transported and stored and is expressed in terms of physical units (tonnage or volume). In cases where the amount of goods produced are published in units other than tonnage (volume, number of units etc.) these were converted to ton-equivalent, e.g. one litre of fuel is equal to 0.8 kg. Throughput consists of local production plus imports. A detailed list of products has been compiled and is provided in

Table 1.

PRIMARY SECTOR		SECONDARY (MANUFACTURED/PROCESSED)
<b>MINING</b>	<b>AGRICULTURE</b>	
PRECIOUS METALS AND MINERALS	HORTICULTURE	IRON AND STEEL BASED PRODUCTS
	Apples	Basic iron and steel products
ENERGY MINERALS	Apricots	Basic non-ferrous metal products
Coal	Grapes (domestic market)	Fabricated metal products
Hydrocarbon Fuels	Grapes (export)	Machinery and equipment
Uranium	Grapes (process)	Electrical machinery and apparatus
	Grapes (dried)	Motor vehicles, parts and accessories
NONFERROUS METALS AND MINERALS	Grapes (pressed)	Miscellaneous products
Aluminium (metal)	Pears	
Aluminium (concentrate)	Peaches	CHEMICALS AND PETROLEUM BASED PRODUCTS
Aluminium (refined)	Plums	Industrial chemicals
Antimony	Prunes, cherries, quinces	Other chemical products
Antimony (processed)	Figs	Petroleum products
Cobalt	Strawberries, berries	Rubber products
Copper	Watermelon, melon, other summerfruit	Plastic products
Lead	Avocados, bananas	Non-metallic mineral products
Lead (refined)	Granadillas, litchis	
Nickel	Guavas, liguarts	PROCESSED FOODS AND BEVERAGES
Titanium	Mangos, paw paw	Canned and prepared meats
Zinc	Naartjies	Dairy products
Zirconium	Pineapples	Canned fruit and vegetables
Tungsten	Oranges	Fish products and similar foods
Magnesium	Lemons	Vegetable and animal oils and fats
Tin	Grapefruit	Grain mill products
	Fruit dried	Bakery products
FERROUS MINERALS	Vegetables	Sugar
Chromium		Chocolates, sugar confectionery and cocoa
Iron Ore	FIELD CROPS	Roasted peanuts and other nuts
Manganese	Maize	Coffee roasting, tea blending and packaging
Silicon	Wheat	Food products, not elsewhere classified
Vanadium	Grain sorghum	Animal feeds
	Groundnuts	Distilleries and wineries
INDUSTRIAL MINERALS	Sunflower seed	Soft drinks and carbonated water industries
Aggregate & sand	Soya beans	
Alumino-silicates	Oats	TEXTILE, LEATHER AND WOOD BASED PRODUCTS
Dimension Stone	Barley	Wool scouring and combing
Fluorspar	Rye	Spinning, weaving and finishing of textiles
Limestone and Dolomite	Dry beans	Soft furnishings
Magnetite	Cowpeas, dry peas, lentils	Tents, tarpaulins and other canvas goods
Phosphate Rock	Sugar cane	Knitted garments, hosiery and knitted cloth
Processed phosphates	Chicory	Carpets and rugs
Special Clays	Cotton (lint)	Other textiles
Sulphur	Cotton (seed)	Men's and boys' clothing
Vermiculite	Cotton (seed-cotton)	Women's and girls' clothing
Other	Wattle bark	Tanneries and leather finishing
	Lucerne, hay	Footwear
	Tobacco	Sawmilling – from the round log
		Board – laminated, plywood, particle, etc.
	LIVESTOCK	Carpentry and joinery
	Red meat	Furniture
	White meat	Packaging
	Butter	Stationery
	Cheese	Printing, publishing and allied industries
	Condensed milk, powder milk	
	Fresh milk	

Table 1: List of products included in logistics cost study

Products are listed in three main categories. The two primary sector categories are mining and agriculture whereas the secondary sector includes all manufactured and processed products. Further product-breakdowns are in accordance with that of officially published data. In the case of “minerals” the Department of Minerals and Energy classification was used, for “agriculture” the classification of the Department of Agriculture (national) was used, and for “manufacturing” the Standard Industrial Classification (SIC) as applied by Statistics South Africa was used.

The throughput for each product type has been determined from the above official sources. Some adjustments were necessary in order not to double-count products, as more than one source sometimes list the same product line. For example, the Department of Agriculture include butter and cheese in their classification of dairy production, whereas these products are listed by Statistics South Africa as manufactured products.

In cases where 2003 data were not available, amounts were based on 2002 data. However, the manner in which the model has been set up it will require relatively limited effort to update the model once all 2003 data become available.

## **b) Transport Cost**

Transport cost is a function of throughput, mode usage, transport distance and the unit cost of transport throughput.

### ⇒ **Mode Usage**

The following six modes were identified:

- Road, collection and distribution;
- Road, line haul;
- Rail;
- Air;
- Water, coastal shipping from point where goods enter or leave the country; and
- Pipeline.

The extent to which each product type use each of the identified modes was determined in terms of tonnage carried.

It should be borne in mind that the total tonnage transported by all modes combined exceeds the total throughput, as the same product could make use of more than one mode. For example, products transported by rail for the line-haul leg of a journey could be delivered to its final destination by road.

### ⇒ **Transport Distance**

The average distance that each product is transported by each of the modes was determined from reports and discussions with practitioners. In the case of the primary sector (mining and agriculture), fairly detailed information was available. The recent study by the CSIR on logistics practices in the fruit industry formed the basis for input in that sector. It should also be recognised that production and consumption (including exports) of primary products are very localised, whereas production and consumption of

manufactured goods occur throughout the country. However, very little accurate data could be obtained for the manufactured and processed goods. A detailed freight distribution model is required to model movements of manufactured and processed goods accurately. The modelling of transport distances for the secondary sector is of vital importance to enhance the accuracy of the model in future, particularly because this sector has a major impact on total transport cost. It should also be borne in mind that the distances reflect averages for the different sectors and may vary considerably from product to product within a particular sector.

#### ⇒ **Transport Unit Cost**

Unit cost of transport per mode was entered in terms of Rand per ton-km. The aim was to determine a typical cost per ton-kilometre for each mode and product category, as the unit cost per unit of one product could differ substantially from that of another, even if they are transported by the same mode. The accuracy of this input data varied between modes and products for the following reasons:

- Some industries were more forthcoming with costs than others. Transport costs of entities owned by Transnet were reluctant to divulge cost of air and pipeline transport for commercial reasons. As opposed to this, the organised road freight industry publishes details of the operating cost of different vehicle classes in the Vehicle Cost Schedule (March 2003).
- The cost of coastal shipping fluctuates substantially depending on the demand for transport at a particular time.

#### **c) Warehousing cost**

Warehousing cost is a function of the duration and volume of storage, unit cost of storage and the handling cost of goods.

#### ⇒ **Duration of storage**

Two sources for the need for storage in the logistics chain were recognised in this study namely, storage for freight consolidation purposes and intra-seasonal storage.

**Freight consolidation** takes place where commodities are accumulated at a certain location for onward transport in order to optimise the utilisation of the transport modes delivering to and collecting from the accumulation point. Distinction is also made between consolidation for collection as opposed to consolidation for distribution. An example of consolidation for collection is farmers delivering bananas with a five-ton truck to a cooperative that consolidates loads for collection by 28-ton refrigeration trucks line-hauling the bananas to major centres. An example of consolidation for distribution is several 28-ton refrigeration trucks, each with a different commodity on board, delivering to a cross-dock centre where their loads are broken up and commodities re-sorted and combined for delivery to retail outlets with non-refrigerated 8-ton trucks.

Certain commodities are harvested during a specific season while it is consumed at a constant rate throughout the year, for example, maize. Other commodities are harvested during a specific season but have only a limited storage life, for example, prunes. This seasonality of production of certain commodities and the delayed consumption thereof necessitates **intra-seasonal storage**.

The duration of intra-seasonal storage for products that are evenly produced and evenly consumed throughout the year is zero. The duration of storage of all products that have a

non-zero intra-seasonal storage duration is calculated by finding the difference between the weighted mean-time of production and the weighted mean-time of consumption.

#### ⇒ **Unit Cost of Storage**

Unit cost of storage in terms of R/ton/day was collected for each individual product line. The following six main types of storage were identified for the purpose of this study:

- Hardstanding outside (dry products)
- Bulk warehouse (dry products)
- Silo (dry products)
- Shelved warehouse (dry products)
- Cold storage (dry products)
- Bulk tankyard (liquids)
- Specialised tanks (liquids)
- General storage inside (dry products)
- Cold storage (dry products)
- Storage tanks (liquids)
- Cold storage tanks (liquids)

Storage cost was allocated for each product type according to the type of storage associated with the product.

Storage unit cost refers to the combination of storage and handling costs expressed in rand per ton. Storage cost is fixed in nature and is the cost of establishing and maintaining the storage facility, spread over the expected throughput of the facility. Handling cost is variable in nature and reflects the marginal cost of handling each unit of throughput.

Storage cost, in rand per ton, is derived by multiplying the duration of storage of a specific commodity with the storage type-specific storage cost per ton-month. Handling cost accrues to the commodity as it is handled. The sum of this storage cost and handling cost forms the storage unit cost.

#### **d) Inventory Cost**

Inventory cost is a function of the value of products, the amount of goods transported and stored, the time in transit and the time value of money. Primary goods are valued at R290 per ton and secondary goods at R671 per ton. These values were obtained by dividing total production by the total value of goods produced as reflected in the national accounts.

#### ⇒ **Time in Transit**

Transit time consist of the duration of storage (see Section 4.3.1) and the transport time. Transport time is based on the amount transported and the speed of travel for each mode and product type.

⇒ **Time Value of Money**

The time value of money is the average prime bank lending rate for 2003 (12.5%).

**e) Management and Administration**

The cost of management and administration was taken as a percentage of the unit cost of transport and warehousing. These amounts were provided by sources within the logistics industry.

**4.2 The transport model**

The transport model utilises the South African National Roads Agency's (SANRAL) Comprehensive Traffic Observation (CTO) Yearbooks as basis to develop a current, historical and future forecast of all freight traffic flows in South Africa. The model accounts for the differences between corridor, rural and metropolitan freight, the various net and average carrying capacities of the types of trucks that are used, compared to weigh-bridge data, to develop measurements for 1990, 1993, 1997 and 2003. This is then be collated and compared to actual Spoornet data for the same time periods to develop views on market shares, corridor densities and overall investment strategies for South Africa.

**4.2.1 Calculation of road tonnages**

The CTO yearbooks are compendiums of traffic information obtained at CTO stations on primary roads, highlighting traffic characteristics. The CTO stations are placed on selected links of the national and primary road network. To obtain trends since deregulation, data for 1990, 1993, 1997 and 2003 was analysed – the number of CTO stations per year is shown in Table 2.

<b>Year</b>	<b>Number of stations</b>
1990	344
1993	367
1997	236
2003	622

*Table 2: Number of CTO stations per year analysed*

The approach to calculate road tonnage from traffic observations was as follows:

- ⇒ The average daily truck traffic (ADTT) and the percentage split of trucks between short, medium and long trucks (SMLT) were captured per counting station;
- ⇒ These percentages were multiplied with the ADTT to obtain actual numbers of SMLT per counting station;
- ⇒ The average total mass per SMLT is published by SANRAL. The total truck mass per SMLT was calculated by multiplying the truck mass with the number of trucks. The total mass had to be split between tare and freight weight. The tare for SMLT was calculated



based on the average tare per vehicle type as published by the Road Freight Association. The freight weight was calculated by subtracting the tare from the total mass;

- ⇒ This freight weight depicts the daily weight per SMLT per counting station. This was multiplied by 365 to obtain annual weight;
- ⇒ For the national routes, CTO stations were depicted graphically to determine the split between metropolitan peaks, rural traffic and long distance (corridor) traffic. The assumption was that corridor traffic is evidenced by the “flattening” of traffic counts, while other stations are either metropolitan or rural, depending on their count size and location;
  - Corridor traffic: The stations where flattening occurred were allocated to national routes. The average of the annual weight for all the counting stations per corridor was calculated to reflect the tonnage per corridor;
  - Metropolitan traffic: The key metropolitan areas were identified (through severe peaks in traffic counts). Different routes lead into these metropolitan areas. For each route, the annual average was calculated. The annual totals per route were then added together to obtain total metropolitan traffic;
  - The remaining stations were allocated to rural traffic. Similar to metropolitan traffic, each province has a number of rural routes. For each route, the annual average was calculated. The annual totals per route were then added together to obtain total rural traffic.

#### **4.2.2 Calculation of rail tonnages**

Spoornet made their data available in calendar years per forwarding-destination station pair. Each pair was allocated to a corridor, metropolitan area or rural route. The following points should be borne in mind when perusing the Spoornet data:

- ⇒ Rail income was deflated with PPI to obtain trends in real income;
- ⇒ Detailed Spoornet data is only available from 1991 onwards;
- ⇒ Most cross-border rail data is not available for 1991;
- ⇒ Rail data contains double-counting for the four years analysed:
  - The double counting is inevitable as some rail traffic is transported over two corridors e.g. traffic from Durban to Beitbridge travels from Durban to Gauteng and then from Gauteng to Beitbridge. This is necessary to enable comparison with road traffic counts which will be counted on both corridors;
  - The double counting percentages ranged as follows for the four years analysed: Income 12.5%-14.6%, Tonnage 5.5%-6.5%, Tonkm 8.1%-9.9%.

## 5 Global logistics trends

### 5.1 An underlying model

A discussion on global logistics trends can best start with an overall view of economic platform development and the underlying physical support infrastructure of each phase. The development phases of economic platforms (in highly summarised form) are depicted in Figure 3.

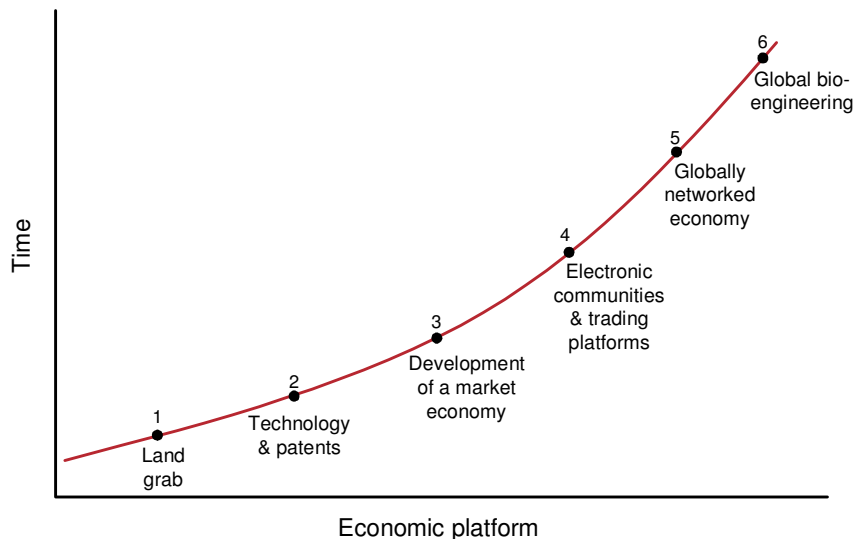


Figure 3: Summarised illustration of the growth in economic platforms

The six phases developed here is reasonably standard and refers to the development of local, national, regional and global economies over time. Mineral exploitation (characterised by land grab) is usually followed by a manufacturing economy (characterised by development of technology and registering of patents), which in turn develops into a more market orientated economy (demand driven and service orientated). With the development of electronic communities and electronic trading platforms economies become more globally networked and, we expect, that we are entering a global bio-engineering phase on the back of these developments.

A few important dimensions of this construct should be considered:

- ⇒ Movement along the axis differs for various parts of the world. In the last five decades the triad (USA, Germany, Japan) and their immediate “relations” (North America, Europe and the Pacific Rim) developed faster along the curve, although “catch-up” by new entrants such as China is a specific feature of the last two decades;
- ⇒ Movement along the axis is fundamentally one-directional. It is difficult to “catapult” an economy into advanced phases without solid groundwork in earlier phases;
- ⇒ “Entropy” sets in, in earlier stages, as in all evolutionary systems. This requires continual revisiting of earlier building blocks; and

⇒ Economies compete from different national and regional platforms, which create development disparities. Attempts to address these disparities through world trade agreements, such as GATT, are unfortunately often deficient.

Against this background the physical support architectures of the various economic platforms could be considered and is depicted in Figure 4.

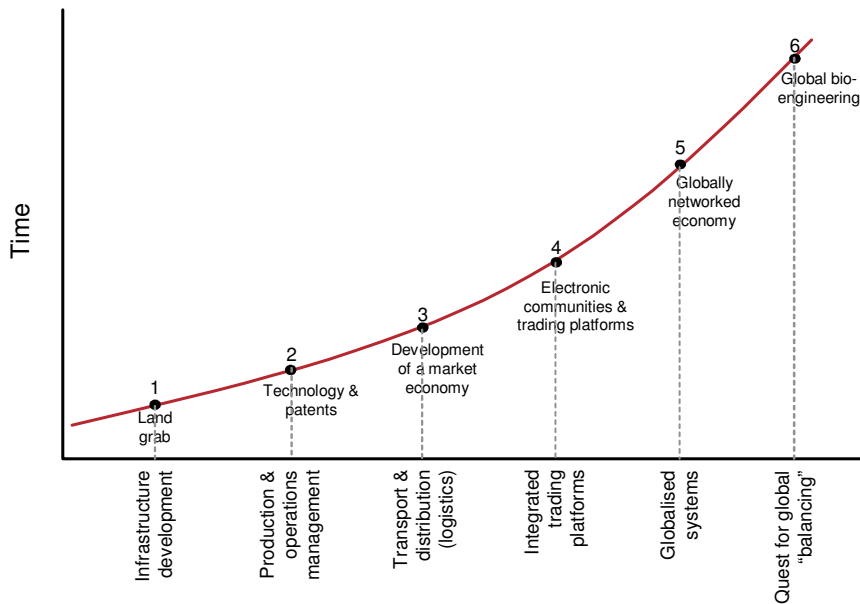


Figure 4: Physical support architecture of economic platforms

The various physical support architectures describe various phases of “support” for the underlying economic model:

- ⇒ In the “land grab” era communities required infrastructure to reach new regions, often to exploit the mineral and agricultural wealth to be found in these new regions. Within defined boundaries, such as South Africa, the era became known as “hinterland development”. Infrastructure development to provide access to these areas, through roads, railroads and harbours, played an important part in development and investment decisions. In some first world economies, such as Europe, this was preceded by maritime shipping technology and “hinterland development” achieved much earlier than in South Africa;
- ⇒ In the industrial revolution era communities required manufacturing support systems usually supported by efficiency of production lines. The growth in the manufacturing economy made more products available, but a prevailing “push” mindset often put the onus on the consumer to “find” suitable products. Power was in the hands of industrialists;
- ⇒ In the market economy era, power shifted from production to consumption and most systems began a transformation process from “push” to “pull”. Transport and distribution became a function of the production process in that consumers demanded final products closer to the point and time of consumption;
- ⇒ In the electronic community and trading platform era, communities of consumers became more accessible through mega-portals (both virtual and bricks & mortar) and often

enabled in both directions, i.e. virtual trading platforms required bricks and mortar logistics support infrastructure, but physical mega-portals required information systems enablement, through scheduling, demand forecasting, etc. Suppliers in these areas saw the need to work closer together and even make use of third parties to engineer seamless delivery options;

- ⇒ In the globally networked economy these support systems becomes global and as a specific feature certain new global blocks are “catching up” to the initial triad. Remaining global imbalances restrain systems through renewed security concerns and the rerouting of basic commodities for food aid and primary health-care; and
- ⇒ In the global bio-engineering era we will have to “balance” the earth’s resources for all world communities. The anti-globalisation forum will gain support and the “fringe” demand for overall balancing of resources should become a mainstream phenomenon.

## 5.2 Global trends based on the underlying model

Global trends can be related back to the underlying model and is depicted in Figure 5.

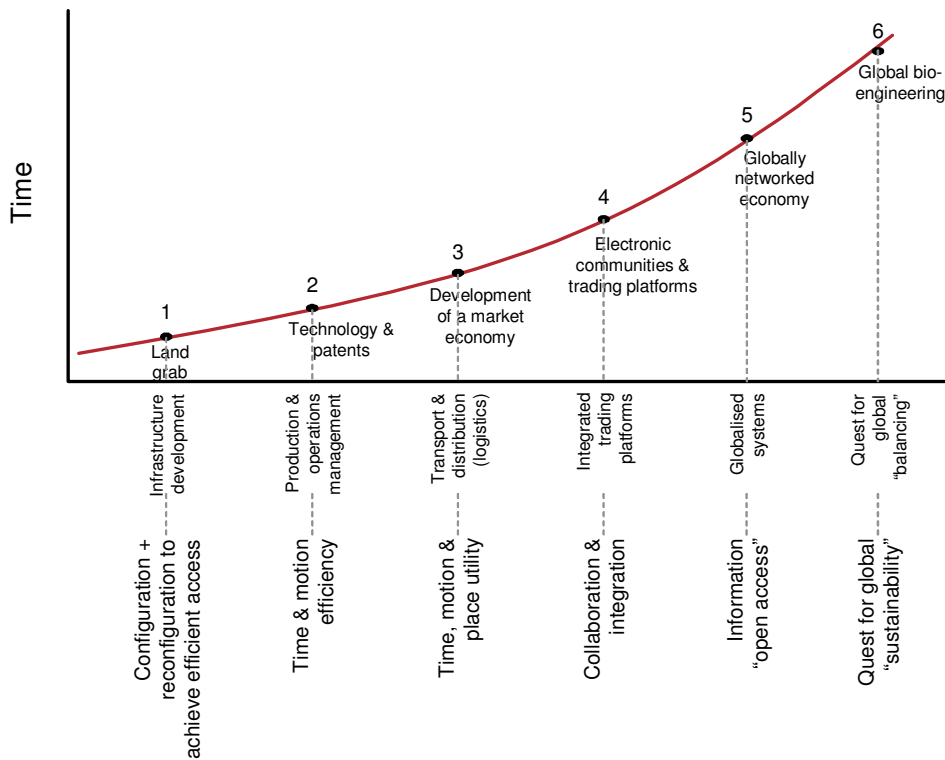


Figure 5: Global trends relating to the underlying model

- ⇒ **Configuration and reconfiguration.** The issue of configuration and reconfiguration relates to the “basics” of logistics issues. Yet, because of disparities in global development and entropy, this remains an issue and often requires new attention. The late Robert Delaney’s final words in his final speech when he presented the fourteenth state of logistics report is nearly prophetic in this regard:

*“Let’s get our people right, our products right, and our production and distribution facilities network right and get our own house in order. Let’s RECONFIGURE our businesses operationally as a first step before we consider the benefits and risk of collaboration. In our experience, you should collaborate from a position of strength, not weakness. We have to operate our way out of this challenge. We have to resist complaining about level playing fields. This is globalisation. There are no levelling playing fields. Recalling my favourite line from the award winning film Forrest Gump, ‘That’s all I’m going to say about that.’” (Delaney, 2003, p. 20-21).*

When Delaney reverts back to reconfiguration he obviously accentuates core structural problems that crept into systems within companies. But this is also true of national and regional economies where the efficient development position that we believe was achieved, is often lacking in some areas or has deteriorated over time. This could refer to people and processes on a micro level, but on a macro level we often talk about infrastructure development and investment and how to achieve a “perfect” balance for global competitiveness.

**Key trend: Core structural problems are more and more identified in national logistics systems. Cases for reconfiguration on a global scale will emerge over the next ten years.**

⇒ **Time and motion efficiency.** Time and motion efficiency was the initial stamping ground of experts such as Galbraith (the famous American with twelve children that exported household issues of surviving in a household of 14 members to the field of time and motion study). The initial idea of time and motion study led to production line improvements, but quickly spread to materials management and inventory control improvements. These improvements received a further boost in the last three decades with “Just in Time” management and companies such as Fedex, DHL, etc. built entire business models and value propositions around the concepts:

*“One of the most tangible impacts of Fedex on business is the lowering of inventories and their associated carrying costs. In the United States it is widely established that the inventory-to-sales ratio has experienced a steady decline in the past two decades as a result of advances in information technology and better logistics management. The overall U.S. inventory-sales ratio has fallen by over 20 percent over the past 18 years.” (SRI International, 2004, p. 33)*

The double edged sword of these improvements is the concomitant decrease in real interest rates, which accentuated improvements in materials handling, inventory management and the overall costs in the carrying of inventory. This also brought the rising cost of transport and transport inefficiencies in sharper focus.

**Key trend: “Value chain efficiency” will in the next decade become a standard hygiene factor such as “Production line efficiency” has become over the last five decades.**

⇒ **Time, motion and place utility.** Time, motion and place utility refers to the era when transport and distribution systems became more sophisticated and the world started referring to the field as “logistics” More sophisticated customer demands led to a certain demise of fixed, long-haul, heavy infrastructure, but at a cost that is still not understood in its widest context.

*“...freight transport is likely to consume an increasing amount of energy and land, and it contributes to a wide range of problems such as air and noise emissions, congestion, traffic fatalities, etc. Social costs associated with road and air freight transport are reportedly much higher than those of rail and waterway freight modes.” (Hesse and Rodrigue, 2003, p. 12).*

The utility relating to transport has not been solved in its basic sense and will therefore continue to hamper downstream collaboration, integration and network efforts. The intrinsic costs are high and rising and in most cases extrinsic costs (like the above reference from Hesse and Rodrigue) are not even yet measured. The problem is usually addressed in a reactionary way as reported by the Environment Directorate of the OECD Environment Policy Committee:

- Large scale investments in highway systems,
- Liberalisation of road freight over rail freight,
- Vertical separation and open access on rail in some cases,
- Lower real fuel prices, and
- Increased purchasing power for private motor vehicles. (Caid, 2003, p. 4-5)

All of the configuration developments in basic transport infrastructure are therefore driven by factors *outside* the normal national cost consideration issues. Looking back at these developments over the last two decades we realise that the overall costs of logistics is declining, but that this decline is driven by factors other than basic transport infrastructure and the cost of transport. It seems, in fact, as if the costs of freight transport as a percentage of GDP might be *rising* and a case for national reconfiguration might be necessary.

Some initial savings were realised in the US economy as deregulation improved the speed of inventory in transport, but most of the savings came from the reduction in inventory (Sutherland, 2003, p. 1). The costs of transport's contribution to GDP has declined over the last two decades (20%), but the decline in inventory carrying costs was triple that (60%) (Cooke, 2004, p. 2). Even as long ago as in the early 1960's, Heskett, Ivie and Glaskowsky reports that in the decade between 1950 and 1960 transportation's contribution declined by 6%, but inventory carrying cost by 14% (Heskett, et. al. 1964, p. 15). In the last decade transport and storage's contribution to the Australian GDP has risen from 4.7% to 5.1% (a rise of nearly 10%) (Australian Government, Transport Statistics, 2004, p. 1-2).

***Key trend: The extrinsic costs of transport and distribution systems will become more transparent and will lead to new policy and regulatory constructs.***

⇒ **Collaboration and integration.** As the power in value chains moved steadily down the chains towards final consumers, upstream players experienced margin “squeezes”. This is also true for supply chain practices. Dong et. al. reports that buyers often transfer inventory costs to sellers and that relationships need to be formed to support both buyers and sellers:

*“In order to build a long term supply relationship, it is likely that all members of the supply chain need to profit. Our exploratory research shows that JIT purchasing produces direct positive logistics results only for buyers, suggesting that long term JIT purchasing relationships may not necessarily be stable. In order to implement a successful JIT purchasing program from a supply chain perspective, managers in both the supplier and buyer organizations must act to produce the conditions*

*conducive to JIT adoption and success for both buyers and sellers.” (Dong, et. al. p. 479.)*

Collaboration and integration were pervasive themes over the last decade, as we progressed from logistics to supply chain perspectives. Collaboration refers to the propensity to share common objectives, plan together and measure from the same platform. Integration refers to the propensity to integrate assets, processes and systems seamlessly. There is however a marked difference between what was intended and what was achieved. This should change over the next decade.

**Key trend: Collaboration and integration will move from JIT purchasing strategies to shared information and infrastructure, between buyers, sellers and logistics support service providers.**

⇒ **Information “open access”.** Ayers describes this trend as a “cultural” rather than a technical trend (Ayers, p. 2. 2004). He believes that supply chain information sharing will be progressive as global relationships develop. In a sidebar on “A meeting of networked minds” he claims:

*“In a networked economy, the company that has a distinct competitive advantage is the one whose supply chain has the largest span or presence – all the way from suppliers to the end consumers.”*

The “answer” or competitive advantage is clearly not related to “hiding” information, but rather sharing from a platform of strength to achieve the greatest visibility **through** the chain.

Whilst we are entering the global networked economy new imperatives arise:

*“While the fundamentals of logistics service are frequently addressed, understanding the application of logistics service strategies in a global context is still in the early stages of development. It is the role of future research to continue to investigate the influence of LSQ (Logistics Service Quality) in a global context, particularly addressing the research propositions presented in this article” (Mentzer, 2003, p. 18) (and in*

*Figure 6):*

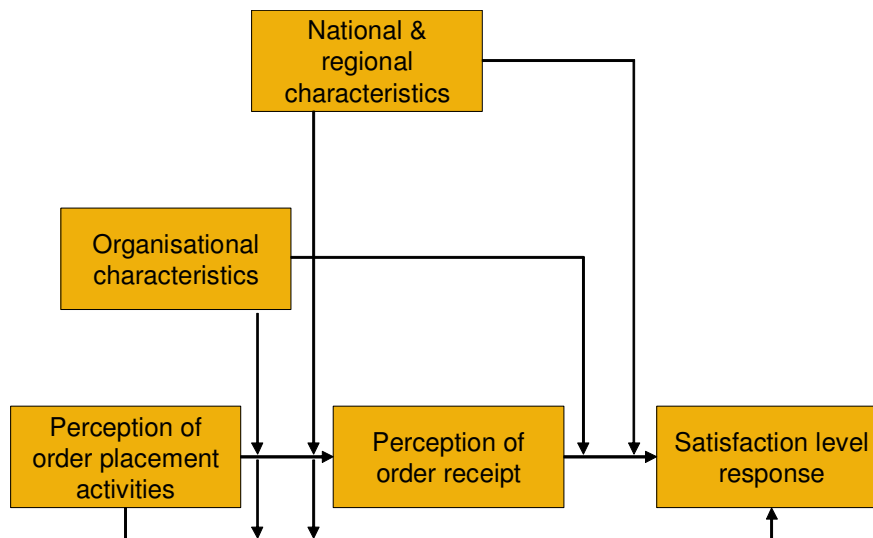


Figure 6: Factors influencing customers' preferences for global logistics services (Mentzer, 2003, p. 18)

These imperatives will go beyond customer satisfaction to the understanding of value and costs relating to national and regional characteristics. Value and perceived value is always a product of costs and service rating (Gale, 1994). It is therefore inevitable that a specific trend for the next decade will be the measurement of national and regional logistics costs as a percentage of GDP. The OECD has already estimated global logistics costs between 11-16% of world GDP (Australian Government, 2004, Transport Directions, p. 3). This figure will probably become firmer over the next few years and national benchmarks against this figure should emerge.

**Key trend: Logistics information “through the chain” will become more transparent and the real winners will be supply chain “captains” with more transparent and visible information systems from beginning to end.**

**Key trend: National logistics costs will be measured in more economies and managed as a lead and lag indicator.**

⇒ **Quest for global sustainability.** Global sustainability relates to the way in which global communities interact, the differences between these communities and the arising new world order. Not the least of the derived issues from this trend is security threats and natural disasters and the impact of these phenomena on logistics (Sutherland, 2003, p. 2).

A decrease in transport costs, globally, can also contribute to global upliftment. In a highly technical study to determine the quantitative role of transport in international business cycles, Ravin and Mazzenga found statistical proof for an interesting phenomenon:

*“The welfare effects of changes in costs of transportation are more intriguing. We find large welfare effects: A drop in the costs of transportation from 20 percent to 15 percent is equivalent to a permanent increase in consumption of just above 1.5 percent” (Ravin and Mazzenga, 2004, p. 657).*

**Key trend: Global sustainability issues will drive logistics input cost decisions by the second decade of the 21<sup>st</sup> century.**

**Key trend: Global security will play an important role in the logistics decisions over the next decade.**



## 6 Macro-economic perspective

The production element of South Africa's GDP requires the movement of about 745 million tons, which can be divided between sectors as depicted in Figure 7.

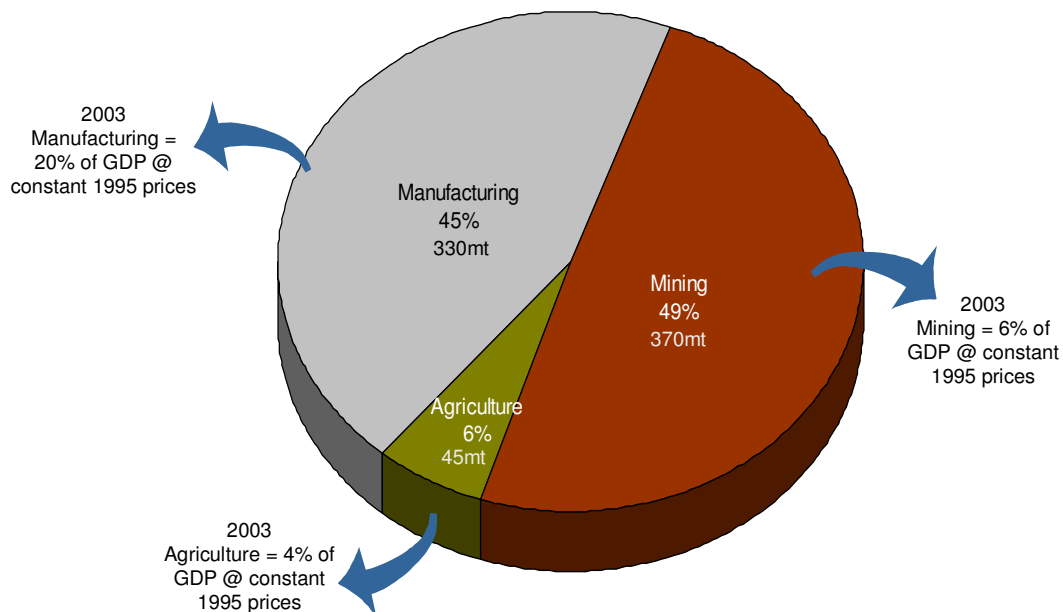


Figure 7: Throughput (imports and production) (2003)

### 6.1 Logistics cost

It costs the South African economy R134 billion to transport this tonnage. The biggest portion of this cost is attributable to intrinsic road transport, R111 billion (83%), as indicated in Figure 8. (The road transport costs would be higher if externalities could be accounted for and added.)

The mining sector (contributing only 6% of GDP by value) generates nearly half of our logistics requirements **by weight** (Figure 7). This is the arena of heavy haul traffic, which should, by definition, be the stamping ground of rail-bound, lower cost logistics types of solutions. The overriding question is, however, in the light of South Africa's predominance as a heavy haul exporter, how much did we learn? Could we learn more, and are these learnings *transferable* to the manufacturing sector?

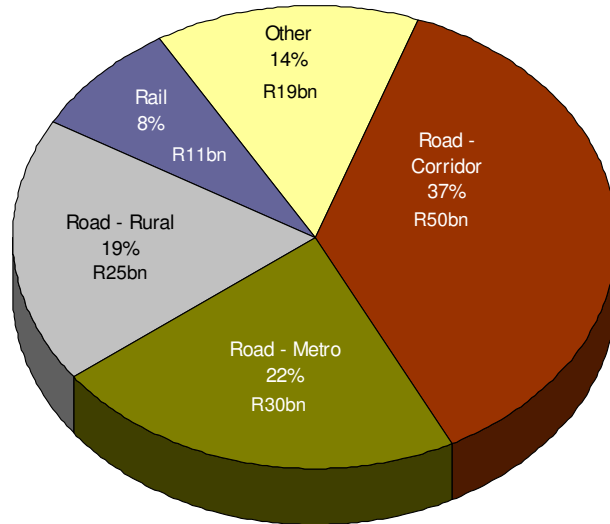


Figure 8: Cost of transporting production and imports

An overarching investment strategy should consider the hypothesis that road transport costs the economy more than rail transport. Greater efficiency in rail is therefore a “second prize” compared to greater efficiency **between** road and rail.

The South African economy consumes another R45 billion in associated logistics costs, amounting to a total logistics cost of R180 billion – **14.7% of GDP** (Figure 9).

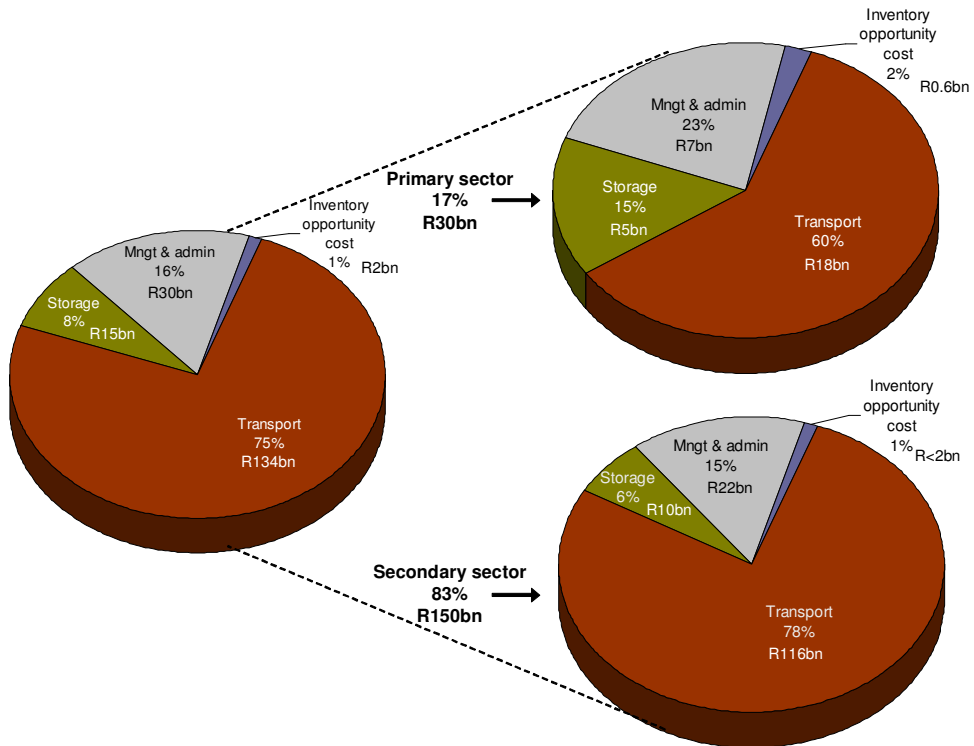


Figure 9: Logistics cost in South Africa

Most of the total costs are consumed in the secondary sector. Did we learn enough from the primary sector of the economy? Transport costs amount to 75% of the total logistics costs. This figure is high, and disturbing. This could be because we have, in the words of the late Robert Delaney (2003), overemphasised collaboration and integration (which often leads to lower carrying costs) to the detriment of reconfiguration (which could contribute to lower transportation costs). The *relative* transportation costs in the primary sector are lower than in the secondary sector (Figure 9). Is this because we succeeded in the transportation part of basic industrial logistics, but not the “higher” end of logistics management? And is this observation reversed for manufacturing?

A more clear understanding of transport (being 75% of the total costs) is obviously necessary. This is discussed below.

## 6.2 Land freight transport

The tonnages produced and imported (which is transported by surface freight – maritime, air and pipeline is excluded in this specific analysis) is shipped an average of 1.4 times in the South African economy (this is a normal phenomenon, where some goods are shipped more than once), translating into shipments of 1040 million tons (based on the production and imports of 745mt). These shipments are considered as movements *within* certain metropolitan areas, *within* certain rural areas and *on* certain corridors. Some goods will be shipped on some *combinations* of these categories in which freight shipments are observed. These combinations mean that shipped goods are observed 1.06 times per shipment (a double counting of around 6%) in terms of relative position (i.e. metropolitan, rural or corridor). These observations are depicted in Figure 10.

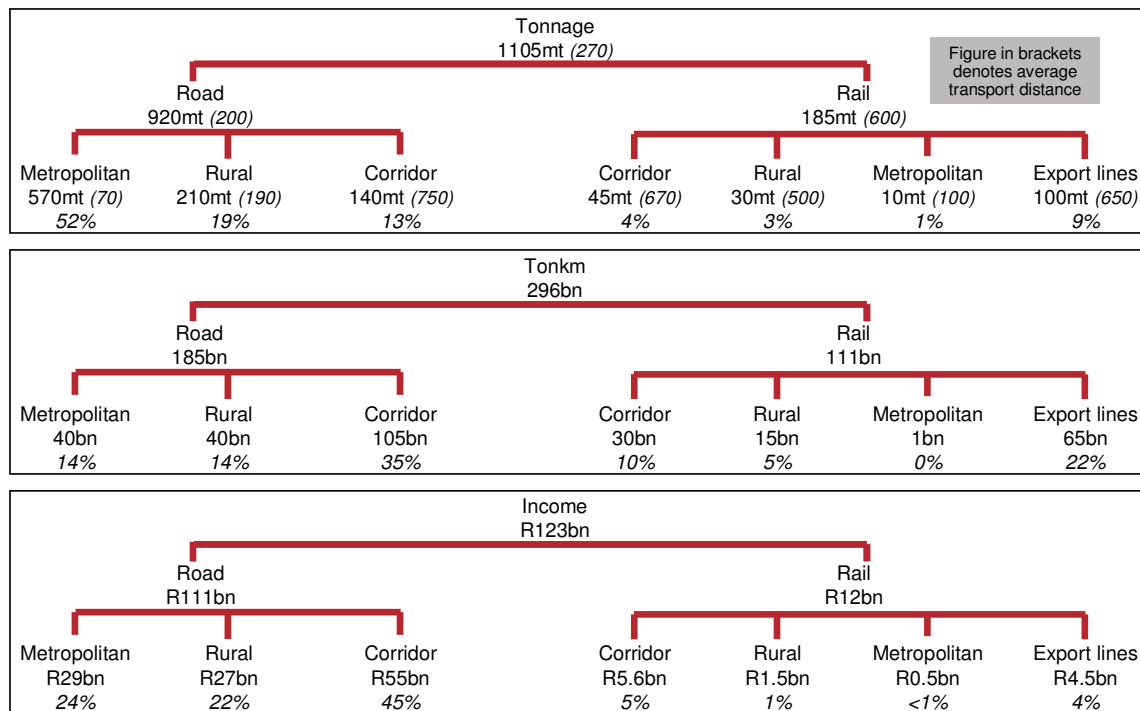


Figure 10: Land freight transport in South Africa (Percentage denotes share of total)

Rail's specialist export lines are responsible for 9% of shipments by weight. Combined surface freight transport (road and rail) by weight is observed as 53% for metropolitan traffic, rural traffic 22% and corridor traffic 17%, **but** corridor traffic amounts to 45% of traffic by basic unit measurement (ton kilometres) and 50% of costs. Is this where the most structural changes occurred and the most costs could be saved? The nature of these structural changes is depicted in Figure 8.

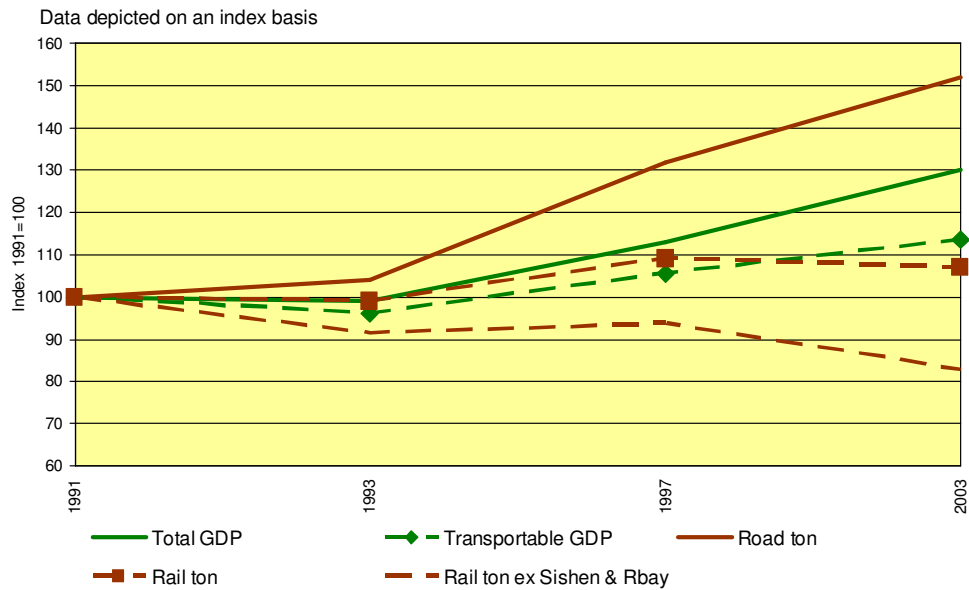


Figure 11: Structural changes in freight transportation

This is compounded by the fact that the majority of corridor traffic is concentrated on two corridors – Gauteng-Durban and Gauteng-Cape Town, as depicted in Figure 12.

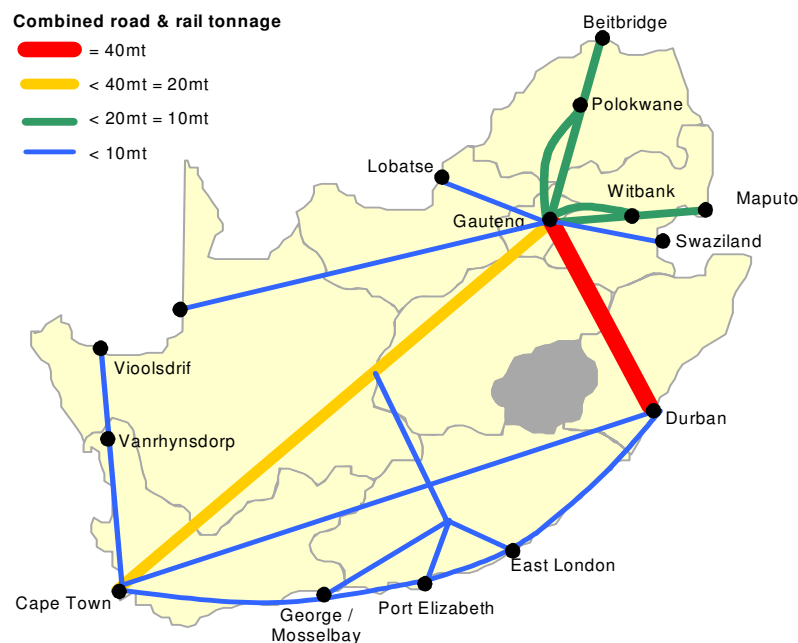


Figure 12: Freight flows per corridor (tonnage 2003)

If the specialist rail export lines are excluded, the tonnage transported by rail has declined by nearly 20% over the past decade. In contrast, road transport increased by more than 50% over the same period.

The growth in road freight transport could be a feature of freight liberalisation, just-in-time, speed, etc., but this needs to be confirmed by detailed analysis. In order to understand this picture better, freight traffic was analysed according to the three areas mentioned earlier, i.e. corridor, rural and metropolitan.

In each of these traffic types rail's share declined (Figure 13). This is especially disconcerting if one takes into account that the compound annual growth rate (CAGR) for total GDP was 2% from 1991-2003, the CAGR for transportable GDP by value (i.e. agriculture, mining, manufacturing and construction) was 0.8%, and the estimated CAGR for tonnage production and imports was 1.5% over the same period.

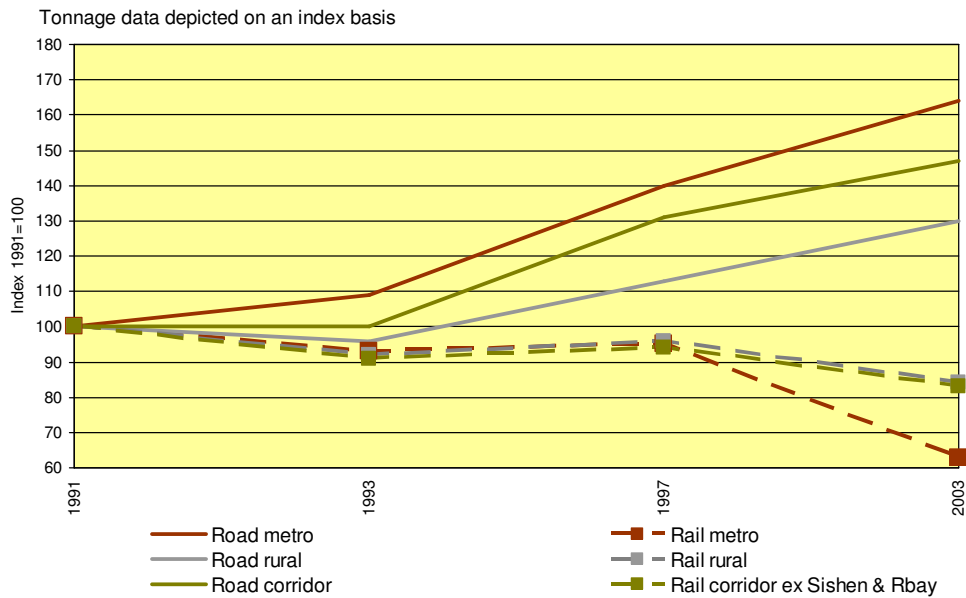


Figure 13: Road/rail trends for the three traffic types

It is especially the widening gap in corridor traffic, where more and more tonnages are shipped over long-haul densely populated road corridors that is disconcerting. Road's increasing market share is depicted in Figure 14.

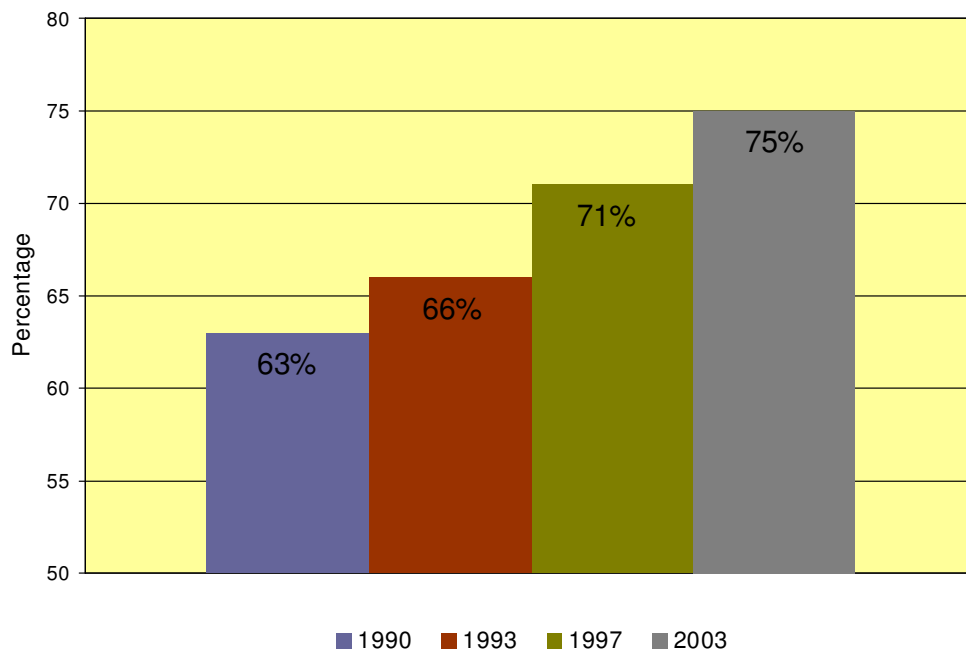


Figure 14: Corridors: Road's market share

## **7 Industry level perspective**

### **7.1 An overview of the logistics issues in industry**

This discussion is based on desktop research, supplemented with expert opinions obtained through interviews with South African logisticians.

The market reality is that consumerism demands, and will continue to demand, faster and more flexible supply chains.

#### **7.1.1 International trends**

Desktop research revealed that, even internationally, long term planning seems to be lacking within the logistics environment – the studies tend to look at the immediate and short-term trends. There is also more emphasis on optimising logistics functions as such and less emphasis on optimising the supply chain as a whole - *interaction* between functions is disregarded. There does however seem to be a clear understanding of the need to integrate and manage the various parts of the supply chain within an individual business.

#### **7.1.2 A summary of South African issues**

The research indicated that South African companies:

- Currently focus more on functional than strategic optimisation of the supply chain;
- Have a limited focus on collaboration with other industry players and logistics service providers;
- Understand, on a theoretical level, what needs to be done and what the logistics trends are globally, but does not carry it through to organisational practice;
- Are not yet focused as much on customer satisfaction as, for instance, in the USA, Europe, Canada or Australia;
- Still has transport as the major focus area, with links from South Africa to global markets posing specific problems;
- Believe there is a small and competitive internal market, not a great deal of opportunity for global expansion and not a great deal of emphasis on service delivery within the logistics service provider industry;
- Experience the main causes of supply-chain bottlenecks to be the lack of adequate rail capacity and efficiency, port congestion, border post delays and customs clearance; and
- Have insufficient performance management systems to enable logistics integration internally and externally.

#### **7.1.3 The maturity level of South African companies**

The overall picture gained from the interviews was that the supply chain management of most companies is not very mature. The different phases which SA companies are moving through are:

1. Controlling logistics costs. A focus to drive costs out in each functional area, e.g. transport, distribution, warehousing.
2. Controlling overall costs by looking across the internal functions. This leads to functional integration, and strategies such as flexible manufacturing to meet the

needs of the market place. Logistics starts to be outsourced and pressure is placed on 3PLs<sup>2</sup> to reduce logistics costs.

3. Strategic assessment of the entire supply chain and its different role players. This leads to the development of strategic relationships for long-term joint benefit. 4PLs<sup>3</sup> can now be used to add value.

In South Africa, experts are of the opinion that most companies are in phase 2 and there is huge scope for improvement. In general the logistics costs could be reduced by 15 to 20%. The typical CEO knows that there is scope for improvement but the creative input to re-think and re-engineer the supply chains is lacking. The companies that are innovating are the ones that are forced by their competitors or by changes in the business environment such as deregulation. The sugar and the cement industries were mentioned as examples of the impact of deregulation. The impact of a complete re-engineering of the supply chains of a company is of the order of a 20% decrease in the base cost of local distribution. This impact can only be achieved if sufficient effort is put in, such as a year long audit and re-design process. In another example the distribution costs were decreased by 26% while average delivery times were reduced by 60%. These figures are an indication of the value that a 4PL can deliver.

#### **7.1.4 The 3PL/4PL debate**

The value addition of 3PLs and 4PLs seem to be a controversial topic with an ongoing debate. Some people contend that 3PLs do not actually reduce overall costs since their margin is on par with the savings. The use of 3PLs has been dangerous in certain instances since companies have become lazy and have fobbed off issues to 3PLs (e.g. the cutting of costs – leading to undesirable side-effects - poor truck maintenance, lack of driver training). There are instances where collaboration between a 3PL and manufacturers does not exist since they do not see the 3PL as being part of their business. According to some experts, there are no true 4PLs in SA and all the current 4PLs have some link to a transporter. If the 4PL has a large asset base the problem is that they cannot deliver an unbiased "pure" 4PL service since they are fundamentally driven by the need to make returns on their asset base. "Pure play" 4PLs with no asset base can strive towards an optimum solution where the best combination of service providers is used. A pure 4PL can play the supply chain management role and be totally solution oriented. The long-term viability of this model is problematic requiring innovative strategies such as buying assets from customers on a contractual basis in order to efficiently manage the customer's supply chain.

The overarching question is about the merits of and the rationale behind outsourcing. One view is that outsourcing of all of your logistics is not a sustainable trend since you do need to retain a certain level of assets and expertise. In some cases outsourcing simply happens just to reduce labour issues. However, it is true that logistics is not a core business for many companies and hence outsourcing will occur. There are also many examples of 4PLs and 3PLs that add huge value through their in-depth understanding of their customers businesses. The local industry dynamics are interesting and the trend seems to be that the distinction between 3PLs and 4PLs is becoming increasingly vague. There are interesting nuances developing in the service offerings. The use of 3PL and 4PL services are driven by increases in the level of supply chain maturity. In the international arena global freight forwarders are actually playing a 4PL role for their large multi-national customers.

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<sup>2</sup> A 3PL, a third-party logistics service provider, is an outside party that is used to take care of company's distribution of its products fully or partly.

<sup>3</sup> A 4PL, a fourth-party logistics service provider or organization that integrates its own resources and that of other organizations (such as 3PLs) to design, build and run comprehensive supply chain solutions (4PL is an Accenture trademark).



### 7.1.5 **Logistics research and training**

The study highlighted the following issues with respect to logistics research in South Africa:

- The lack of continuity in surveys limits trend development;
- Current surveys are too complex;
- Data collection efforts are fragmented;
- No qualitative benchmarking information exists;
- Surveys are in many instances not conducted by unbiased institutions;
- Companies are unwilling to contribute information since it is regarded as a threat to their competitiveness; and
- Relevant government departments do not commission joint research to address national logistics imperatives.

Existing studies seem to agree that there is scope for expansion of service provider companies, and that they should play a larger role in supply chain collaboration. There also seems to be a need for better demand forecasting, better supply chain planning and general information management (with specific emphasis on introduction of new technology) as areas for future improvement.

Addressing these issues is *inter alia* hampered by the fragmentation of logistics training in South Africa. There is no comprehensive skills survey within the logistics discipline to inform skills development and learnerships and promote logistics as an attractive career choice.

## 7.2 **Industry supply chain overview**

An analysis of selected industries were undertaken, the aim of which was to understand the market challenges that these industries face, and to identify areas on which the industry and its service providers should focus to shape supply chain responses that enable competitiveness.

### 7.2.1 **Steel**

The **key challenge for the steel industry** is to be amongst the lowest-cost international steel producers – this translates into *inter alia* low input costs. Inbound logistics costs comprise a significant portion of these input costs. Given this industry reality, the **key supply chain challenge** is to manage the risk and cost of ensuring a constant flow of raw material to the plant.

The customer requirements, corresponding supply chain needs and current supply chain issues for the steel industry are summarised in Figure 15.

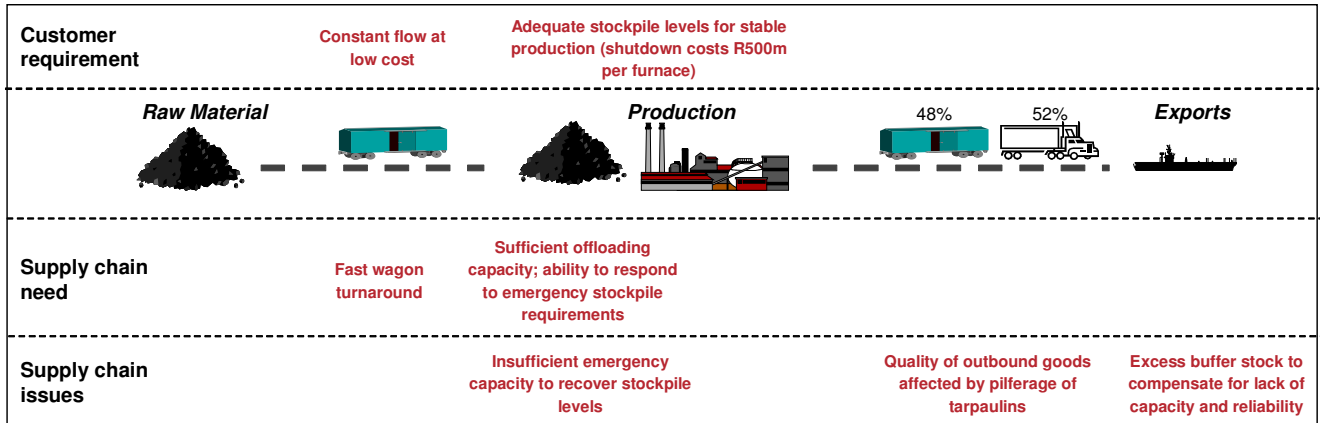


Figure 15: Steel industry supply chain analysis

The national impact of the shift from rail to road to address supply chain problems is that the corridor has to carry an additional 2.2mt from a single steel producer by road. It also requires Durban harbour to deal with more truck-based freight.

### 7.2.2 Automotive

The **key challenges for the automotive industry** are to produce at a competitive cost and have the ability to respond timeously and reliably to sophisticated first-world market demands. Given this industry reality, the **key supply chain challenges** are high reliability and high responsiveness to match the demands of the customer-driven production process.

The supply chain issues, as well as some current resolves to address these issues, are summarised in Figure 16:

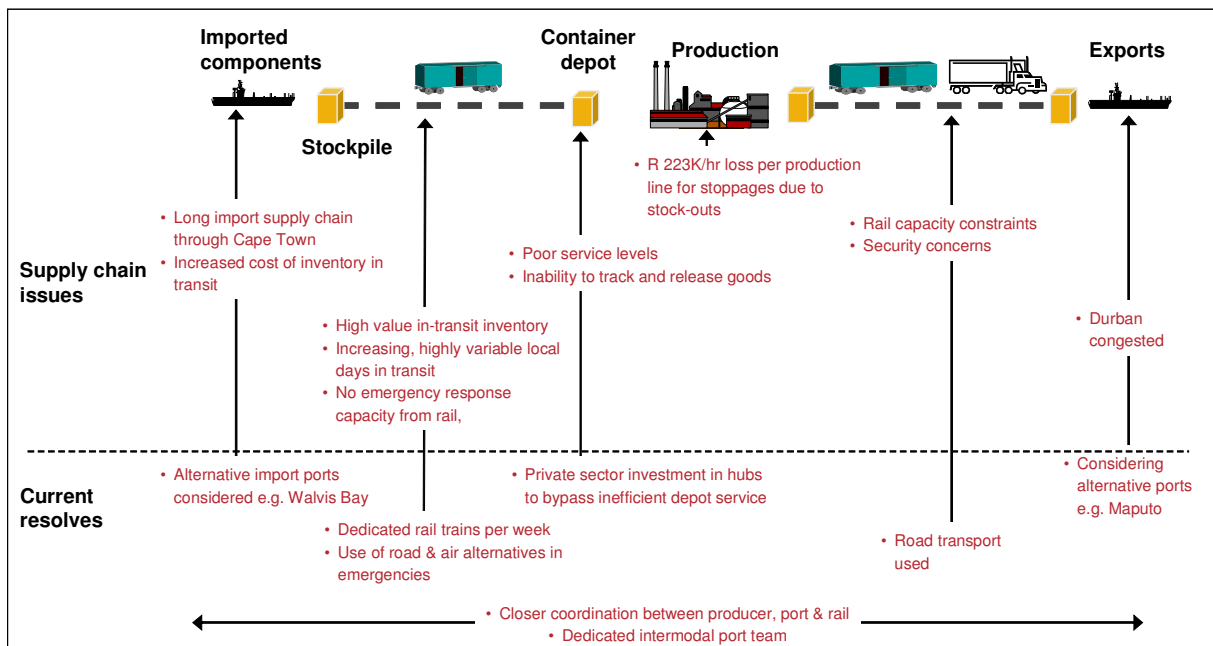


Figure 16: Automotive industry supply chain analysis

### 7.2.3 Grain

The **key challenge for the agricultural industry** is the cost-efficient distribution of a low-value, low-density product that is produced at geographically dispersed locations. The industry has to be able to provide domestic food security, respond to regional food emergencies and compete in a heavily subsidised global market.

Given this reality, **the key challenge for this supply chain** is the consolidation of demand in such a way that operational inefficiencies are eliminated, and translated into cost-savings that will enable the rail service provider to deliver a financially viable service to the industry.

The supply chain issues are summarised in Figure 17.

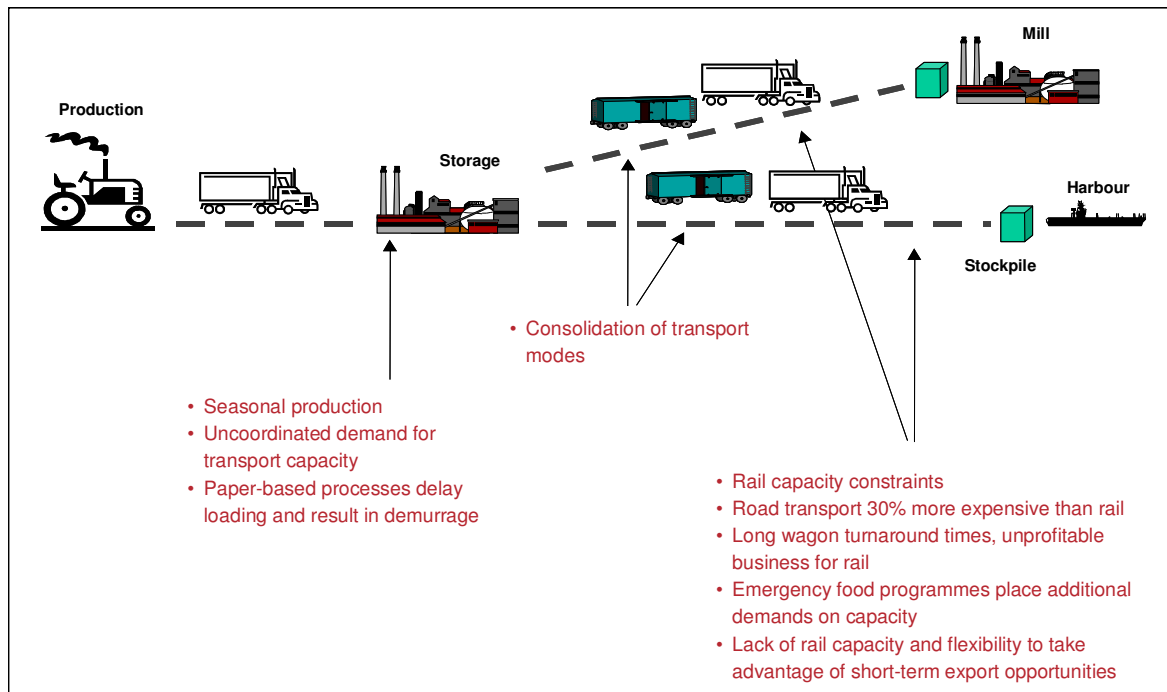


Figure 17: Grain industry supply chain analysis

The grain industry has proposed a **solution**: the development of a Grain Clearing House that will consolidate all grain movement and management, and that will lead to load consolidation and return loads for both rail and road transport. Wagon utilisation would improve to three times a month with the potential to achieve four times a month. The estimated transport and storage cost savings is R30 per ton. The consortium could move 7.3 million tons via this system and thus realise a total saving of R219m per annum. The current rail/road split is approximately 50/50 and the use of the Clearing House could lead to a 80/20 split if the rail capacity was available due to the inherent advantages of rail (30% lower costs compared to road transport).

### 7.2.4 Summary

In attempting to understand the needs of the various industry sectors in South Africa, both the nature of the industry and the relative maturity of its supply chains need to be considered.

Industries comprising of a number of smaller producers (such as grain) typically have challenges with respect to demand consolidation, the resolution of which would give them bargaining power with suppliers and service providers.

In the case of industries with fewer, larger producers such as steel and automotive, challenges revolve around the ability of the industry to negotiate agreements with logistics service providers that will meet the demands of their specific supply chains as driven by their market demands and production processes.

## 8 Small business development perspective

### 8.1 Introduction

South Africa's unemployment issue will not only be solved by intervention from big business – the mainstream economy is limited in its reach. In addition, people outside the mainstream economy will always be forced to engage in entrepreneurial business activities to sustain some form of livelihood. It is therefore imperative to create a conducive environment for entrepreneurship to enable the unemployed to become economically active citizens in a small business environment.

There is however a significant logistics divide between medium to large industries located within major industrial-logistical hubs and small and emerging businesses located within resource-poor environments with poor access to the major logistical hubs and corridors.

At the risk of over-generalisation, most SMMEs are characterised by low supply volumes, low (internal) scale economies, and limited logistics management skills. For those SMMEs operating in a resource-rich environment in close proximity to specialised logistics service providers (such as in the CBDs or prime industrial areas of major cities), the rational response is simply to outsource to these providers. In recent years, advances in ICT, connectivity and e-business protocols have made this even easier. At the same time, the global shift to knowledge-based work has meant that the costs of freight movements and related logistics activities have declined significantly – especially for those small or medium-sized firms that can now be classed as knowledge-based SMMEs<sup>4</sup>.

There are, nevertheless, many SMMEs that continue to operate outside the knowledge economy, and whose very survival depend on improved logistics efficiency and competitiveness – either as individual firms or as groups of firms that might form part of the same supply chain or production cluster.

Then there are also – at the other end of the spectrum – those SMMEs (or rather “household-enterprises”) that have effectively opted out of the need to compete in mainstream or industrialised supply chains. These are typically rural or agricultural SMMEs, for which the core priorities are usually to: a) address food security and other basic livelihood needs, and b) deliver surpluses to local markets along so-called “short supply chains”. In these cases, the importance of, and requirements for improved logistics efficiency varies widely, depending on local circumstances (for example, whether or not the distribution of food aid is a regular occurrence).

The low-scale, low volume nature of SMMEs and their supply chains pose logistics challenges that are different from those of large-scale operations, and that require different solutions. However, logistics challenges of all SMMEs are not the same. To facilitate the analysis of this varying range of SMME types and environments, we classify SMMEs based on the following two broad distinctions (see Figure 18):

- A distinction between resource rich and resource poor conditions, where richness is deemed to be a product both of a firm's own capital resources and access to credit, as well as its connectivity to networks that provide access to the critical resources that are required for business growth. Such resources would include information, knowledge, capital, market access, etc.

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<sup>4</sup> Some of these firms have taken advantage of their reduced dependence on freight transport by relocating to relatively isolated, but high-quality peri-urban or rural environments.

- A distinction between urban and rural conditions, where “urban” is assumed to define a situation characterised by high agglomeration economies<sup>5</sup> and proximity to markets, mainstream supply chains and specialised services, and “rural” is the opposite (i.e. a situation characterised by low agglomeration economies and long distances).

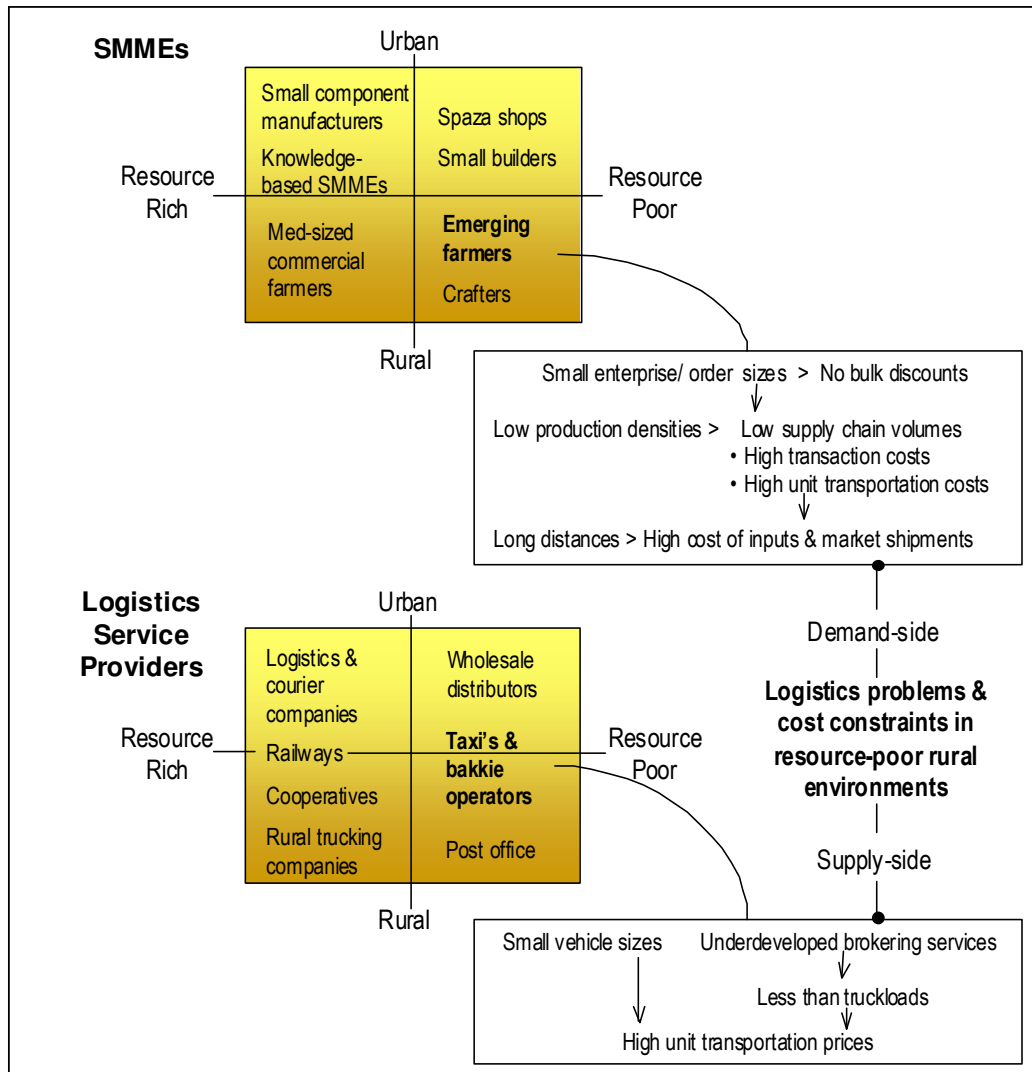


Figure 18: Classification of SMMEs and related logistics service providers

Figure 18 also indicates the logistics service providers that are mostly associated with the SMMEs in each of the four quadrants of the two-by-two matrix (some of these serve the SMMEs on both sides). Finally it highlights the logistics problems and cost constraints that are typical of resource-poor, rural environments (classified into demand-side factors and supply-side factors).

In the sections that follow we firstly establish the relationship between total entrepreneurial activity, location, SMME growth and rural logistics, and then provide a preliminary overview

<sup>5</sup> Benefits, savings or (average) cost reductions resulting from the clustering of activities – also see extended definition in The Economic Geography Glossary - <http://faculty.washington.edu/krumme/gloss/a.html>

of the logistics challenges facing resource poor SMMEs located in rural areas. In future surveys, the focus will widen to include SMMEs in the remaining categories.

## 8.2 Entrepreneurship and small business logistics

Entrepreneurship and entrepreneurial ability is closely linked to small business success, and dictates the ability of businesses to overcome constraints in deprived environments. Entrepreneurial ability varies in resource-rich and resource-poor urban and rural areas. The following observations from the 2003 GEM survey<sup>6</sup> are relevant:

- Total entrepreneurial activity varies considerably across South Africa's provinces. This is measured as the percentage of the economically active population that takes part in entrepreneurial activity. It ranges from 9.9% in Gauteng to 3.0% in the Northern Cape and North West, as depicted in Figure 19. The more rural provinces clearly exhibit less entrepreneurial behaviour.

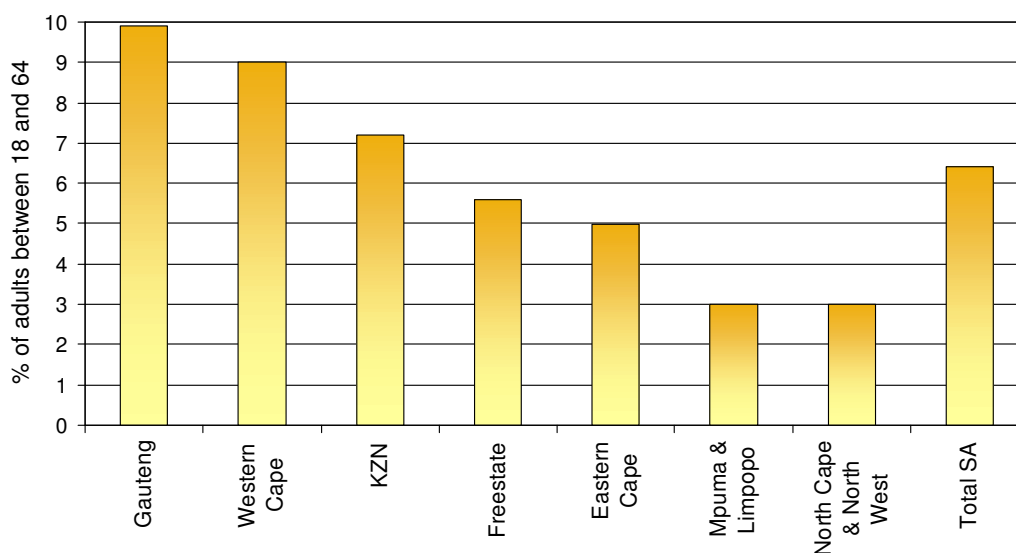


Figure 19: Total entrepreneurial activity by province

- Models of supporting entrepreneurship in rural and urban areas are likely to be very different.
  - » In rural areas, individual-focused models of entrepreneurial support are unlikely to prove cost-effective or sustainable.
  - » Rural entrepreneurial support programmes need to develop community-based models that address the key limiting factors associated with rural locations. Programmes aimed at alleviating constraints associated with rural or “poorer” SMMEs could result in higher entrepreneurial and hence higher economic activity in the more deprived regions.

This regional inequity in entrepreneurial activity leads us to explore regionally-based logistics constraints and solutions to SMME development. The location of the poverty nodes relative to the primary national logistics infrastructure is outlined in Figure 20 below, and provides a departure point for further discussion.

<sup>6</sup> UCT Graduate School of Business, Global Entrepreneurship Monitor, South African Executive Report, 2003

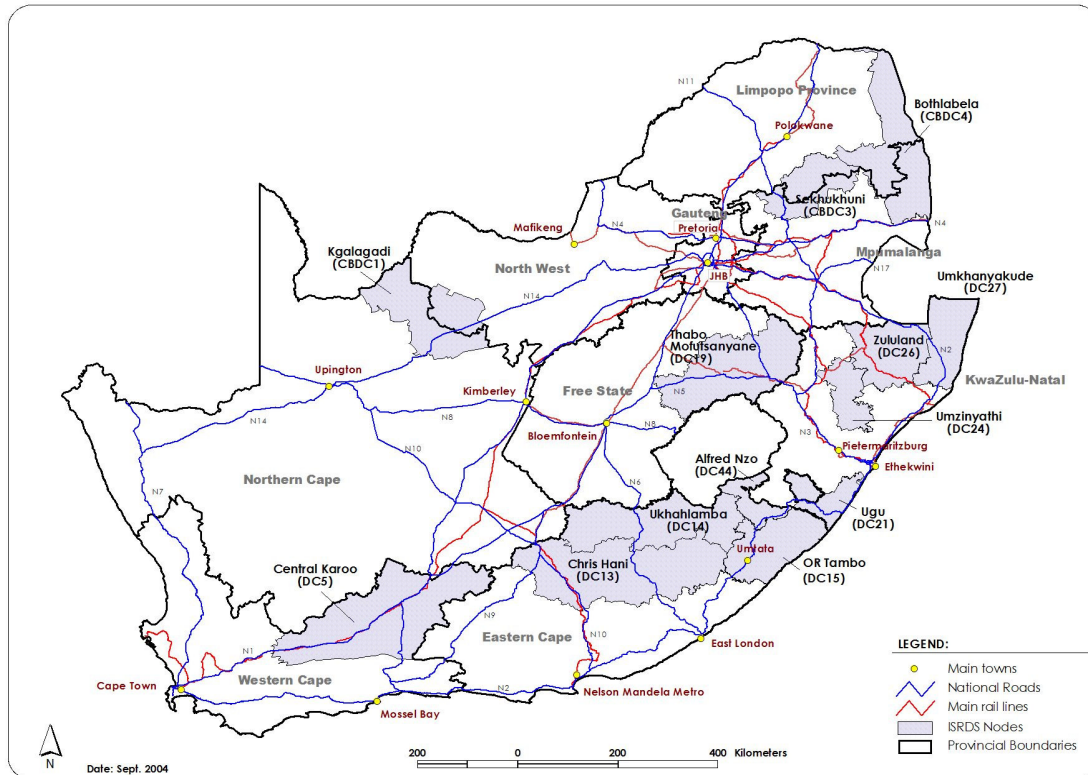


Figure 20: Location of the poverty nodes relative to the primary national logistics infrastructure<sup>7</sup>

### 8.3 Logistics issues in South Africa's resource poor rural environments

#### 8.3.1 Current SMME constraints

The problems and constraints faced by SMMEs in resource-poor rural environments have severe and extensive economic and social implications.

The root causes of these problems are complex and interwoven. Part of the underlying causes simply has to do with the sheer physical remoteness and low economic activity densities of the typical resource-poor rural area. In many of the *deep rural or former homeland areas*, these difficulties are compounded by poorly developed road networks, and under-developed market facilities, storage and other logistical infrastructure and services. At the same time, the general economic environment in many of these areas are characterised by a fragile, narrow and vulnerable economic base, caused *inter alia* by the collapse of labour migrancy as source of income and capital, diminishing village resource bases and associated livelihood opportunities, and erratic public works employment.

For many emerging farmers and rural SMMEs, the implications are that most logistical, marketing and related services (e.g. procuring critical inputs such as seed and spare parts, or transporting produce to markets,) are unreliable, ineffective and/or very expensive, thereby marginalising and excluding most from "mainstream" supply chains.

<sup>7</sup> ISRDS = Integrated Sustainable Rural Development Strategy



Against this background, there is a *prima facie* case for focusing on the various logistical, marketing and related constraints that are continuing to marginalise rural SMMEs, and inhibit the establishment of viable agro-economic activities, tourism and other local resource-based economic activities in deep rural areas.

A second reason for this focus is the availability of information on SMME logistical issues. Very little of the SMME-related research in South Africa has – until recently – explicitly addressed these issues. The only exceptions are:

- general research and investigations into agro-logistics, albeit focusing mainly on medium to large enterprises in commercial, resource-rich contexts ;
- a number of recent pilot studies and analyses of intervention options which were undertaken by CSIR staff, most of which focussed on SMMEs in the resource-poor, rural parts of the Eastern Cape.

### **8.3.2 Pilot studies of rural SMME issues in the Eastern Cape**

Most of this work was undertaken in 2002 as part of a DFID-funded project for the Department of Provincial and Local Government<sup>8</sup>. The main aim of this project was to undertake case studies and provide guidelines for economic linkage development and logistics management interventions within the context of rural LED strategies. Part of the deliverables was an audit methodology referred to as Economic Linkage and Logistics Analysis (ELLA), which can be applied both at a strategic area-wide level and for selected micro-regional, cluster or enterprise-focused appraisals.

Working together with the Centre for Integrated Rural Development (CIRD) for parts of this project, CSIR Transportek also developed questionnaires and used them as a basis for assessing the logistical issues and constraints of a number of rural SMME projects in the Eastern Cape. These included:

- the Cala Seedling Nursery, established by Siyavuselela Agricultural Association;
- the Masithembe Beadwork Project, also situated in Cala;
- A number of emerging farmers and agricultural development projects in the Port St Johns municipal area.

As part of the Port St Johns investigation, local transport service providers – bakkie and taxi owners that all belonged to the Port St Johns Taxi Association – were also interviewed and information was obtained about the freight and small-parcel services that they provide.

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<sup>8</sup> Economic Linkage and Logistics Analysis (ELLA), a project funded by the UK Department for International Development, undertaken by the CSIR, in conjunction with the Centre for Integrated Rural Development.

The following table provides a summary of some of the main findings:

General issue category	Prevalence / root causes	Examples & manifestations
Small farm sizes & low production densities & uncoordinated supply chain volumes	More prevalent in resource poor/ former homeland areas than in more commercially oriented farming areas	<ul style="list-style-type: none"> <li>Limited bulk purchasing possibilities &amp; discounts</li> <li>Inefficiently small vehicle or shipment sizes</li> <li>High transport costs</li> </ul>
Poor information on, & access to, major markets & specialised services	A structural condition of most rural areas	<ul style="list-style-type: none"> <li>Long distances</li> <li>High transport costs</li> <li>Mainstream market access barriers</li> </ul>
Lack of accessible or scale-efficient support services & infrastructure	An endemic, structural condition of most rural areas, characterised by dispersed demand for services, & the difficulty of providing & maintaining vast networks of low volume roads.	<ul style="list-style-type: none"> <li>Poor roads</li> <li>Poor communications &amp; high transaction costs</li> <li>Lack of accessible storage facilities</li> <li>Lack of marketing &amp; general business support services</li> <li>Logistics service providers are themselves SMMEs with small vehicle sizes, underdeveloped brokering services and less than truckloads resulting in high transportation costs</li> </ul>
Poor organisation & general business management, including logistics management	Most small enterprises cannot contain the full range of skills & resources for effective business & logistics management, branding, quality control & packaging. Since outsourcing is generally not a viable option for most rural SMMEs, the solution seems to lie mainly with bigger enterprise sizes, cooperatives & other forms of cooperation.	<ul style="list-style-type: none"> <li>Education level of emerging farmers</li> <li>Underdeveloped or poorly functioning farmer organisations &amp; cooperatives</li> </ul>
Insufficient branding, quality control, packaging & general value addition		<ul style="list-style-type: none"> <li>Insufficient technical know-how &amp; the non-availability of equipment</li> <li>Underdeveloped or poorly functioning cooperative ventures.</li> </ul>

### 8.3.3 Mainstreaming of rural SMMEs

Mainstreaming of rural SMMEs would mean a fundamental transformation from the typical low-risk, low-productivity rural subsistence enterprise into an enterprise (or cluster of enterprises) that:

- produces a much higher level of marketable output (for local consumption and export),
- is able to bargain and reduce the (often exorbitant) price mark-ups on virtually all inputs, and
- generally increases the degree of local value-addition and value capture.

The interventions suggested are comprehensive and systemic, aimed at improving the general level of cooperation, organisation and communication between suppliers and users of logistics services.

The central objectives of these systemic interventions are to consolidate loads, increase average shipment sizes and reduce the average costs of freight or parcel shipments to and from SMMEs. Suggested interventions include promotion of rural freight / logistical services, or incorporation of logistics management in SMME training and enterprise support programmes.

A secondary objective is to create new business and/or “upscaling” opportunities for existing small scale or informal transport operators. By possibly establishing interchange facilities and arrangements where they can link up with the larger, nationwide operators, these operators can perform an important feeder-distribution role, and therefore generally contribute to the creation of viable supply chains and economic linkages across the divide between South Africa’s so-called first and second economies.

#### **8.4 Research priorities for small business logistics**

It is clear that a need for further research, case studies and pilot projects to explore feasible combinations of interventions and appropriate institutional models for addressing SMME logistical and related “upscaling” requirements exist. This research should:

- Enhance the understanding of challenges faced in all SMME categories (as depicted in Figure 18);
- Develop a more differentiated, spatially specific understanding of the logistics costs and constraints in the different geographic regions and types of rural areas of South Africa, and how this impacts on entrepreneurial activity and business growth;
- Enhance the general understanding of the “logistics divide” between mainstream supply chains and the local or informal supply chains where emerging or rural SMMEs tend to be involved;
- Provide a basis for pro-SMME and pro-rural modifications of, or supplements to, mainstream logistics management strategies. This includes the exploration of feasible combinations of interventions and appropriate institutional models for addressing SMME entrepreneurial, logistical and related “upscaling” requirements.

## 9 Conclusions and recommendations

This State of Logistics Survey provides the first ever quantified view of the macro economic state of South Africa's transport and logistics industry. Although the picture seems bleak, it refers to what really matters and what needs to be focussed on to ensure South Africa's future competitiveness. It also means that large improvements are possible over the medium term - easier than in the US where there is pressure to keep reducing already very low costs.

The survey results highlight that South Africa has a serious and pervasive basic configuration problem. Similar issues were highlighted by Moving South Africa. The MSA imperatives of lowering cost, improving reliability and offering choice to achieve competitiveness and sustainability, enabling the vision of:

- a limited number of highly developed multimodal corridors;
- connected to highly specialised ports; and
- with effective feeder mechanisms and efficiently integrated transfers.

This vision **is still valid** because none of these have been achieved.

We believe the following actions are critical to address the current problems:

- Assigning national accountability and responsibility for supply chain, investment and maintenance policy and strategies;
- Continuous and visible measurement of South Africa's macro-economic state of transport and logistics for lead and lag purposes (including calculation of real costs for all modes);
- Investment in multimodality;
- Information sharing and strategic collaboration, between both freight owners and service providers;
- Focus on the strategic, macro management of supply chains; and
- Enabling economic and logistics access to SMMEs and smaller industries.

These actions will facilitate a structural change based on an efficient intermodal solution (win-win), alleviating South Africa's long term freight corridor dilemma. In addition, this will make sufficient government funds available to balance the issue of national logistics competitiveness with addressing current and future metropolitan congestion, as well as SMME and rural development.

Some remaining key areas have not been addressed in the current study. These include:

- International benchmarking to enable relevant comparison of logistics in South Africa, taking into account the state of economic development as well as the geographical location and size of the country and its industries;
- Development of a robust supply, demand and flow model for South Africa;
- Development of appropriate targets for South Africa's logistics cost as percentage of GDP;
- Development of appropriate logistics solutions per industry to support each industry's unique requirements, while taking the different levels of supply chain maturity into account.
- Audit and benchmark of supply chain skills, and development of a plan to address the gaps;
- Development of an adequate understanding of small business logistics challenges;
- Addressing the fragmentation of the transport and logistics industry through e.g.

- Role of government or a regulator to create an enabling logistics environment in South Africa (e.g. creation of Free Trade Zones, development of common user facilities to reduce duplication and increase efficiency);
- Establishment of a central body representing the logistics industry, to allow for closer collaboration and improved negotiations with various stakeholders (including government)
- Role of partnerships between government and the private sector (e.g. the use of retail distribution networks to support government service delivery in rural areas.)

Our first priority should however at least be to conduct this macro survey on an annual basis – to start building a national freight and logistics database. Data collection efforts must be consolidated and incentives should be provided to all stakeholders to standardise and share data that can be turned into useful information for freight planners, researchers and policy-makers.

**Notes:**

1. Companies interested in co-sponsoring the Annual State of Logistics Survey from 2005 onwards please contact Hans Iltmann ([hiltmann@csir.co.za](mailto:hiltmann@csir.co.za)). Co-sponsoring could include monetary support, information sharing or research support.

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