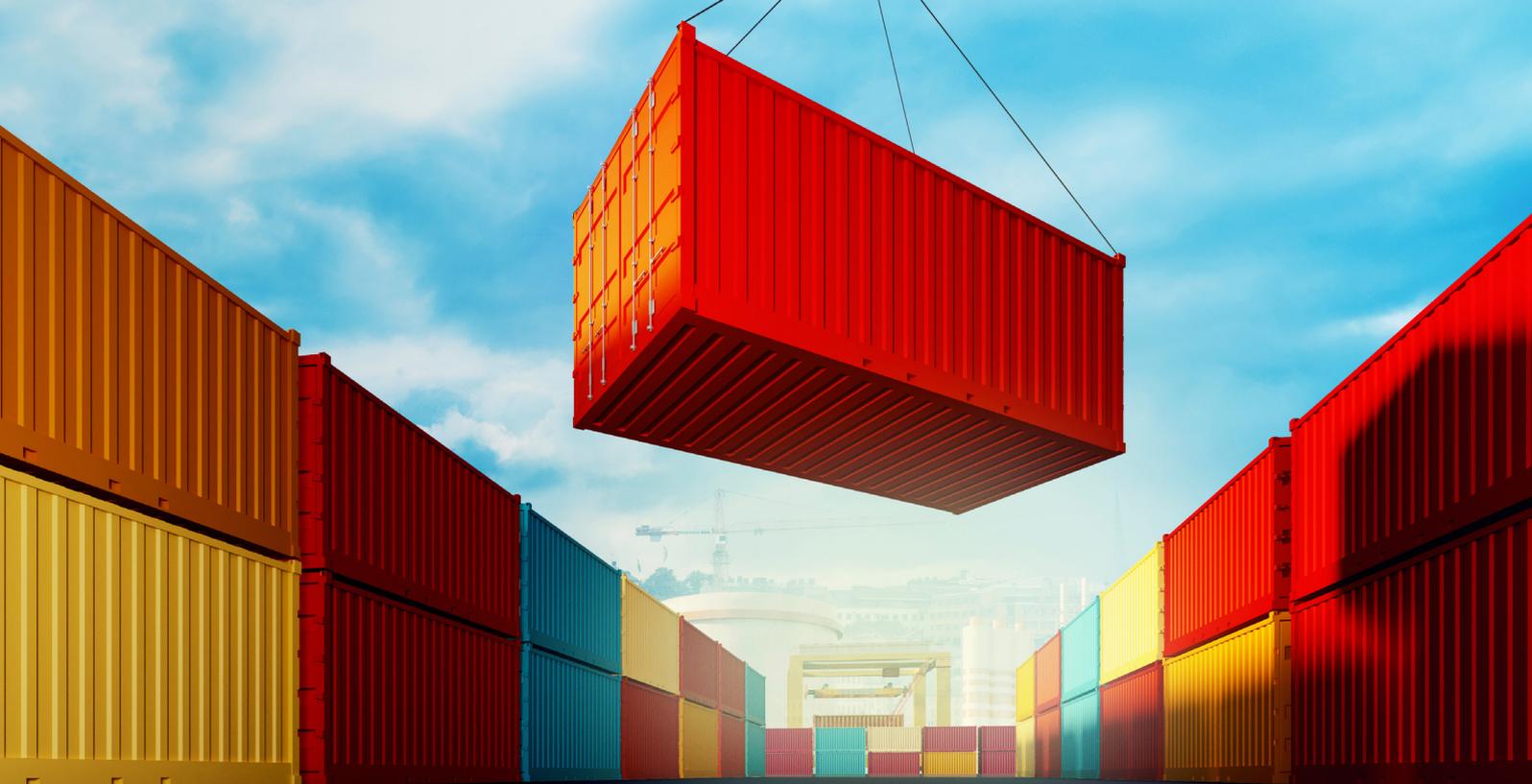




LOGISTICS BAROMETER 2015

South Africa





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ISBN number: 978-0-620-65997-0 (e-book)

PROFILE OF STELLENBOSCH UNIVERSITY: DEPARTMENT OF LOGISTICS

The Department was founded in 1960. It is the oldest tertiary academic department in South Africa to offer training in Transportation and Logistics. The Department is the home department for the following focus areas: Logistics Management, Quantitative Management, Operations Research and Transport Economics.

In common parlance, logistics often refers to the smooth execution of a complex or problematic operation. In a business context, it refers to the processes involved in transporting resources from their place of origin, supporting the processing of these resources, and delivering the finished products on the intended time at a designated place at acceptable cost for consumption or use. In view of the fact that logistics adds value through the most profitable application of available means, adequate logistics competency gives firms and practitioners a competitive advantage.

The focus areas that are offered by the Department of Logistics can be taken in any of the four broad undergraduate programmes of the Faculty of Economic and Management Sciences. Operations Research can also be taken as part of the B.Sc. (Mathematical Sciences) programme.

THE TEAM

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Design and layout: Designwave (www.designwave.co.za)

The latest edition of the Logistics Barometer and its accompanying figures can be downloaded at www.sun.ac.za/logisticsbarometer

This publication should be cited as: Stellenbosch University. 2015. Logistics Barometer South Africa 2015. ISBN: 978-0-620-65997-0 (e-book). Available at: www.sun.ac.za/logisticsbarometer

PREFACE

With the launch of South Africa's Logistics Barometer Stellenbosch University is proud to contribute to a wider understanding of South Africa's logistics system from a quantitative perspective.

Providing grounded insight, the Logistics Barometer will empower statutory regulators, infrastructure owners, policy makers, economic planners and industry players to come together and deal with the issues raised by the analysis.

The Stellenbosch research team are currently involved in a Global Knowledge Network (sponsored by the World Bank) to develop common themes relating specifically to the measurement of logistics costs and performance for countries worldwide. This interaction contributes to the innovations in this first edition and editions to come.

*Through the launch of the **Logistics Barometer** we are excited to contribute further to the extensive knowledge base that has been created during the past 10 years with the CSIR's State of Logistics™ survey.*

*The **Logistics Barometer** is a new platform to report national logistics costs and the cost drivers and industry trends that shape them.*

– Professor Jan Havenga (Stellenbosch University)

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HITTING HOME

Logistics is a strategic resource for the South African economy and key to providing a global competitive advantage.

Logistics costs make up just over half of the landed cost of agriculture, mining and manufactured goods.

Logistics costs as a % of the GDP has dropped by 0.5 percentage points between 2012 and 2013.

Industry has responded to input cost changes by adapting the transport – inventory trade-off in 2013 to lower overall costs.

Going forward, industry is increasingly cautious in adapting behaviour amidst continued volatility.

Rising input costs and the energy crisis are expected to increase logistics costs as % of GDP by 0.6 percentage points from 2013 – 2015.

LEVERAGING LOGISTICS AS A STRATEGIC RESOURCE REQUIRES MORE THAN JUST A FOCUS ON INPUT COSTS – THE STRUCTURE OF THE INDUSTRY MUST BE ADDRESSED. THE DEMAND FOR LOGISTICS SERVICES MUST BE PROACTIVELY MANAGED AND THE SUPPLY OF THESE SERVICES MADE MORE EFFECTIVE TO ENSURE SUSTAINABLE GROWTH.

SOUTH AFRICAN LOGISTICS – STRATEGIC AND DELIBERATE

A vibrant country at the furthest tip of a continent that brims with lip-smacking opportunity amidst bewildering uncertainties. Globally ranked 33rd in terms of GDP, some may consider it small. That may be so, but South Africa is a small economy that plays the role of regional connector and powerhouse – with an appetite for logistics.

In 2013 the economic engine churned out a GDP that constitutes only 0.44% of the global GDP. Take away the services-related sectors and one is left with 32% of the South African GDP that emanates from agriculture, mining, manufacturing and utilities. Globally, this figure is 30% of the total GDP – making South Africa comparable in terms of its sector contributions¹. The economic activity reflected by the GDP produced 781.7 million tonnes of commodities that had to be conveyed across a surface logistics system that represents 0.6% and 2.0% of the global road and rail networks, respectively. In fact, the tonne-kilometres incurred in moving this freight across the 19th largest road and 11th largest rail networks in the world measured more than 1% of global tonne-kilometres.

South Africa's contribution to global surface transport intensity is thus more than double its contribution to global GDP. Much of this freight also had to move over the quay walls as imports and exports and even there South Africa punches above its weight, handling 1.3% of the world's liquid bulk trade, 1.7% of containers and 5.1% of dry bulk.

South Africa is indeed transport-hungry, making logistics not only a strategic resource requiring national attention, but a core competence that is deliberate and invaluable given the country's regional position.

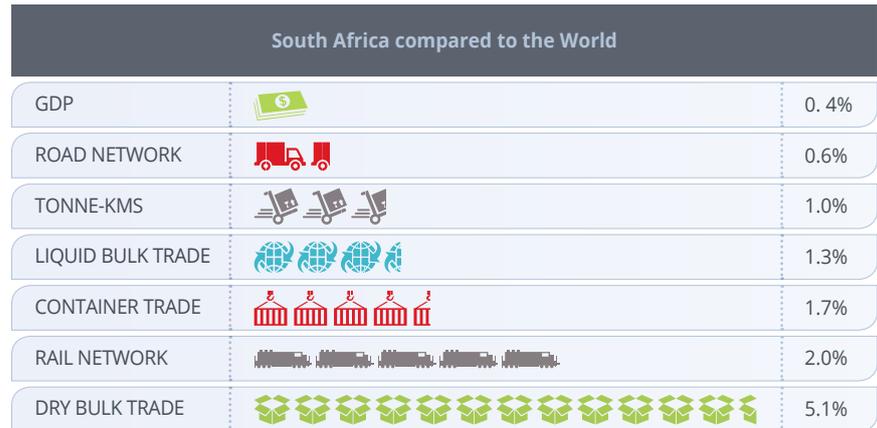


Figure 1

¹ World Bank Statistics. Available at: <http://data.worldbank.org/topic/economy-and-growth>. [Accessed: May 2015]





THE COST OF TIME AND PLACE UTILITY



THE COST OF TIME AND PLACE UTILITY

Logistics puts freight at the right place, at the right time. Expressing the cost of this place and time utility as a percentage of GDP is the benchmark in gauging logistics efficiency and the impact of cost drivers on the industry. South Africa's logistics costs as a percentage of GDP in 2013 was 11.1% which is higher than developed countries but competitive when compared to other developing regions².



Figure 2: Logistics costs as % of GDP – global statistics



Figure 3: Logistics costs as a % of GDP – a 12 year time-series

The 11.1% of 2013 is 0.5 percentage points down from 2012 as a direct result of more efficient last mile distribution. The diesel price hikes endured in 2013 spurred a drive towards more efficient supply chain management, reducing the number of tonne-kilometres spent on last mile distribution.

The impact of the industry response clearly offset the impact of the fuel price hike in that year. Since 2013 it is estimated that the logistics costs as % of GDP rose to 11.4% in 2014 and will rise further to 11.7% in 2015 (given specific industry assumptions). The brief respite in fuel prices enjoyed recently could possibly ease the focus on efficient last mile distribution, adding back the tonne-kilometres in future, but overall the consistent upward creep in input costs is the underlying reason for this outlook.

² Armstrong & Associates Inc. Global 3PL Market Estimates. Available at: <https://www.3pllogistics.com/3PLmarketGlobal.htm>. [Accessed: April 2015]



Expressing logistics costs as a % of transportable GDP paints a slightly starker picture, inching over the 50% mark from 2012 onwards. This implies that half of the landed cost of agriculture, mining and manufacturing goods is incurred by ensuring products are at the right place, at the right time. Clearly logistics deserves special attention – not only in industry boardrooms, but also within government.

Providing the logistics services for South Africa's economic commodities in 2013 accrued R393 billion which was 3.5% (R14 billion) more than in 2012. Taking inflation into account the real logistics costs for 2013 were actually lower than for 2012.

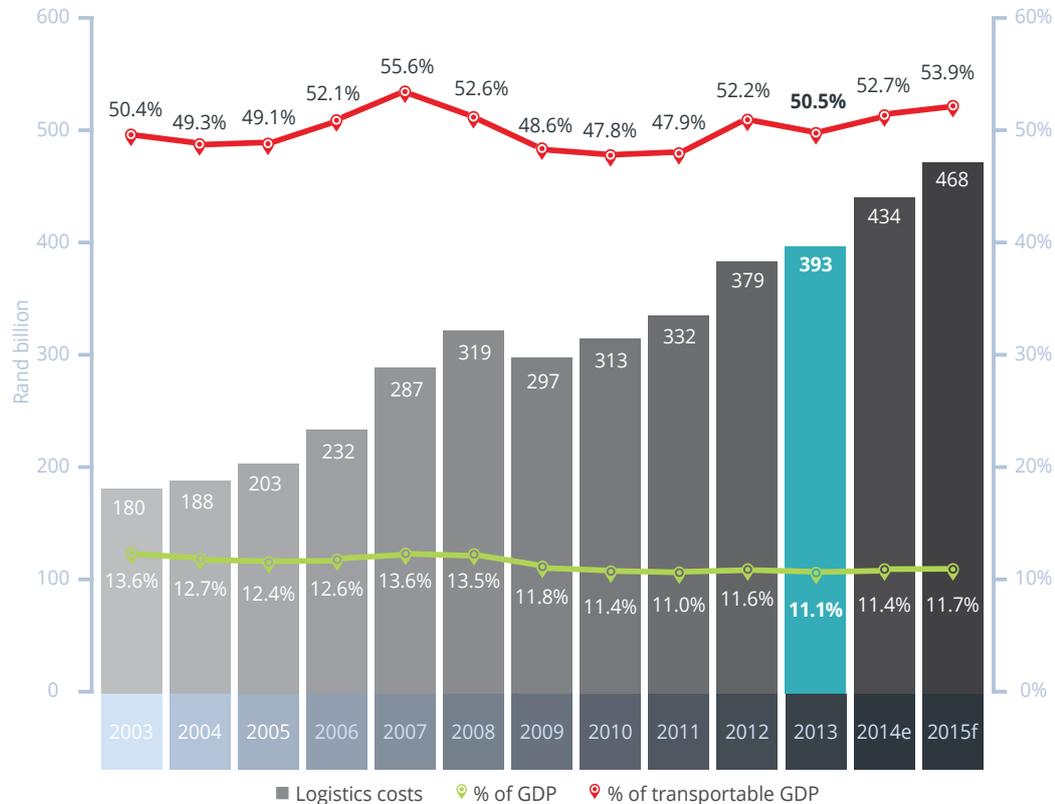


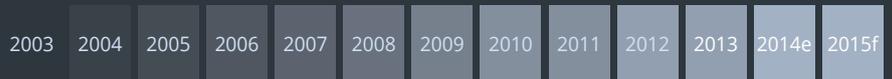
Figure 5: South Africa's logistics costs in perspective



The contributors to logistics costs in 2013 were: transport (59.8%); inventory carrying costs (13.5%); warehousing (14.3%); and management and administration (12.5%).



Figure 6: Cost contribution of logistics components in 2013



Logistics costs REFRESH

Stellenbosch University takes pride in being the leading reference for South Africa's national logistics costs since 2003.

Until 2014 this research was published in the State of Logistics™ survey for South Africa in partnership with the CSIR and Imperial Logistics. The Logistics Barometer is a new platform with a deeper focus on logistics costs and their drivers.

As such, this first edition takes the opportunity to further refine the methodology used to calculate logistics costs. At the same time Statistics South Africa revised their historic GDP figures. The time series was recalculated using the updated GDP data and the refined methodology. The result varies from figures previously stated in the State of Logistics™ publications, as indicated in the graph.



📍 Logistics Barometer 📍 State of Logistics™

Figure 4: Comparison between the State of Logistics™ and Logistics Barometer time series.



Since 2011 the cost contribution in absolute monetary terms for each component has increased year-on-year, but there have been interesting changes in the contribution percentages, indicating that industry trends and trade-offs have shifted slightly since then.

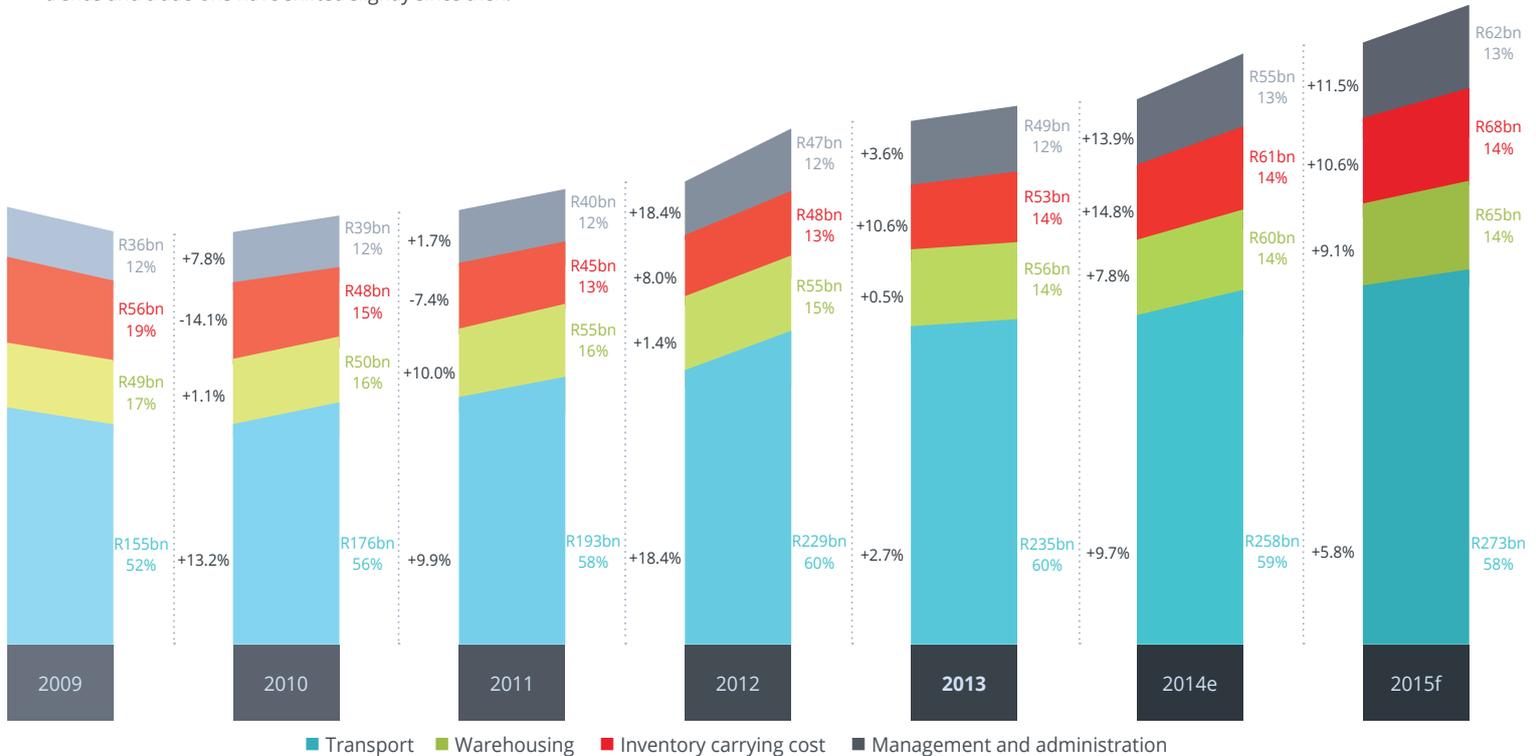


Figure 7: Logistics cost components tracked over time



Changes in the underlying input costs have a definite, albeit delayed, effect on industry behaviour with changes in one year moulding the behaviour of the industry in the next year. The fuel price and the prime lending rate changed drastically in 2011, spiking and dropping, respectively. This caused a knee-jerk industry reaction that had a definite impact in 2012. Both the volumes (tonnes) and transport intensity (tonne-km) dropped off, a result of the consumer base tightening its belt as the fuel price dented disposable income. At the same time, the lowered lending rate provided supply chains with some respite – edging the balance in favour of higher inventories, longer storage times and reduced transport frequency.

During 2012 the fuel price continued to increase, but at a much lower pace while interest rates showed a slight increase. The impact this had in 2013 was a slight bounce back in volume growth as consumer sentiment relaxed a little, but the industry's drive towards streamlined transport activity continued with reduced last mile distribution. Noteworthy is that the interest rate increase in 2012 caused a great reduction in the inventory levels and length of stay in 2013. Either customer service suffered during 2013 with reduced transport activity *and* reduced inventory levels, or necessity became the father of invention, unlocking innovative efficiencies.

The next year (2013) saw yet another change in cost trends with the fuel price rising and the interest rates dropping to an all-time low. The impact on inventory levels in 2014 is estimated to again be significant, the reason for this being the sheer size of inventory investment and the executive-level attention this receives. Volumes and transport intensity are estimated to have shown only a slight increase.

Finally, towards the end of 2014, an encouraging drop in the fuel price sparked hopes for a more lucrative 2015. However, the short-lived nature of the respite coupled with the country's on-going electricity issues have made industry (and consumers) extremely cautious. The forecast for 2015 is thus conservative, not making any grand allegations of trend changes. The verdict is "wait and see".



Figure 8: Input cost volatility – how the industry adapts



Despite the trend changes over the past five years, transport remains the most significant portion of logistics costs, warranting a more in-depth discussion. More than 80% of transport costs (85.1% in 2013) are due to road transport with rail tariffs contributing between 11% – 13% and pipeline tariffs 2% or less in recent years. (Port and maritime costs are traditionally excluded when calculating the national cost of logistics – in keeping with international benchmarks.)

Fuel remains the biggest contributor to road transport costs. Even with reduced tonne-kilometres in 2013 the total fuel bill was still higher than in 2012, owing to the higher price of diesel. Slight decreases were seen in other variable costs, notably driver wages, depreciation and insurance. However, it should be remembered that these decreases are not because of a drop in input costs, but rather a slight change in industry behaviour. The cost per tonne-kilometre increased between 2012 and 2013, not only due to the fuel price but also increases in other input costs. The fuel price drop allowed for significant decreases in the last year but with the fuel price back on its upward trajectory the input costs are inching back towards 2013 levels.

Table 1: Indicative change in the average cents per tonne-km incurred by a 7-axle interlink covering 200 000km per annum, operational 286 days a year.³

	100% load factor	50% load factor
2012 (December)	38c	76c
2013 (December)	41c	82c
2014 (December)	40c	80c
2015 (February)	37c	74c
2015 (April)	39c	77c

Much can be speculated regarding the fuel price. The massive drop in the oil price towards the end of 2014 rocked players all along the value chain. The R9.26 per litre (inland wholesale price) charged in January 2015 heralded a very positive year for road transport, but a mere 18 weeks later it had shot back up to R11.29, a whopping 22% increase. Volatility seems to be the only constant in the fuel price going forward.

³ Analysis conducted by Max Braun Consulting Services

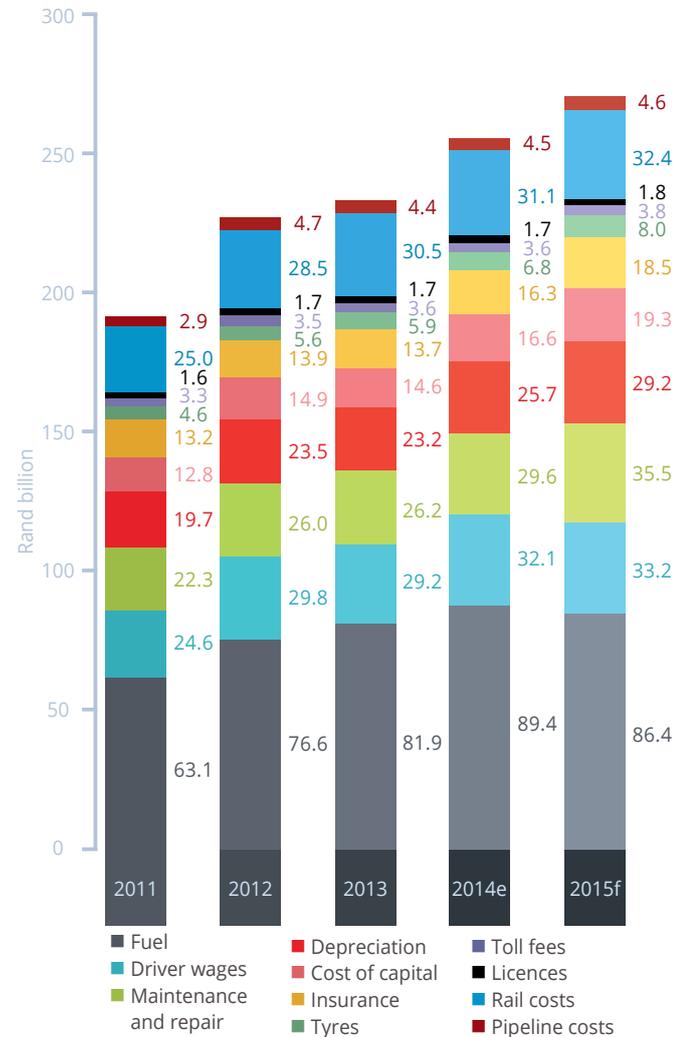


Figure 9: Transport cost components



South Africa's current electricity conundrum has impacted warehousing costs significantly in two ways. The direct impact of electricity price hikes in recent years is evident across the board, but especially in temperature controlled and heavily automated warehouses. Load shedding disrupts operations indirectly. This necessitates a number of mitigating actions such as additional labour to compensate for lost time or installation and maintenance of uninterrupted power supply - all incurring additional costs. Issues relating to labour productivity and wage increases have also added to costs in recent years. The gravity of ongoing electricity and labour concerns could edge warehousing costs into the limelight previously dominated by inventory carrying cost and transport alone.



The cost factors discussed so far are all input costs to the delivery of time and place utility. While it is useful to measure, track and predict the impact these drivers have on the logistics bill, these definitely do not fully explain why South African logistics costs are what they are. It would be similar to looking at a tree and imagining that all there is to it is what you see above ground. Essentially it is the roots that define the tree. Just as these roots are mostly invisible, it is difficult to discern the cost impact of the structure of South Africa's logistics landscape.





THE DEMAND AND SUPPLY OF LOGISTICS

THE DEMAND AND SUPPLY OF LOGISTICS

South Africa's economy is transport intensive. Every rand earned requires more kilometres to be travelled than in most other countries. Immediately the distance of Gauteng to the ports of Durban and Cape Town springs to mind, but consider also the influence of the country's economic structure. South Africa greatly depends on manufactured imports funded predominantly by the bulk export of minerals and agricultural products. If the manufacturing industry was greatly bolstered, the reliance on imports would decrease, negating many trips between the ports and Gauteng. Exporting low value commodities from the center of the country also yields very low bang for buck. A stronger manufacturing sector would shift exports up a few notches in the value chain, earning the country more for the same number of kilometres travelled.

Logistics systems

Approximately 75% of South Africa's freight belongs to the primary economy. These raw materials (locally sourced and imported) are conveyed domestically to production centres. The related logistics systems require expensive infrastructure and adequate bulk logistics handling capability to ensure efficient, low cost production and global competitiveness.

The secondary economy makes up the remaining 25% of the country's freight. Comparatively, the logistics systems required to service manufactured freight are far more complex. This freight is handled and shipped multiple times as it moves through networks of terminals and distribution centres. Its contribution to GDP is also far greater.

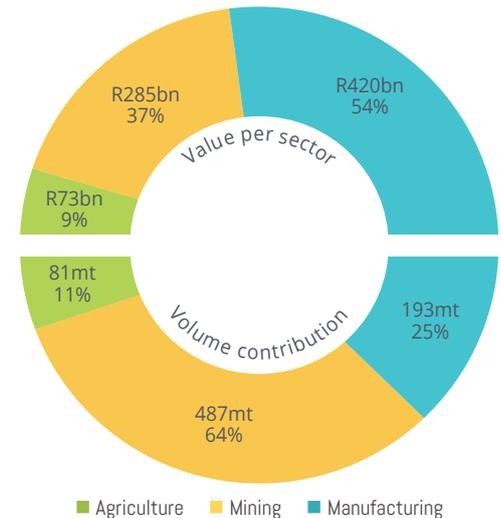


Figure 10: Economic and volume contribution of the transportable sectors



A logistics system classification has been developed over time. Bulk logistics systems that add value to raw materials are usually tailor-made and often do not follow main travel corridors in South Africa. These systems connect mines to export and manufacturing destinations and are generally suited to rail transport. Bulk logistics requires long term investments and a channel management focus between mines, large manufacturers and bulk logistics infrastructure owners and operators.

The heavy breakbulk output of manufacturing facilities follow the same logic, but commodities require specialised equipment for loading and offloading as well as rolling stock and vehicles that are custom made. Skips are used for aggregate, mostly in the building industry, and are mostly used over short distances.

Palletised freight is easily unitised into containers or truck trailers and often travel long distances, mostly following the metropolitan corridor connectors of South Africa. Refrigerated and Ro-Ro (automotive) freight requires highly specialised systems and equipment which are usually expensive to acquire and operate.

Long travelling distances are observed for most of South Africa's logistics systems. Overall, the largest average transport distances (ATD) belong to mining dry bulk, palletised and refrigerated commodities – three commodity classes that comprise the greatest majority of the total tonnes moved in the economy. In fact, coal, iron ore, aggregate stone, cement, bricks used in building activities and processed foods account for 61% of the total tonnes.

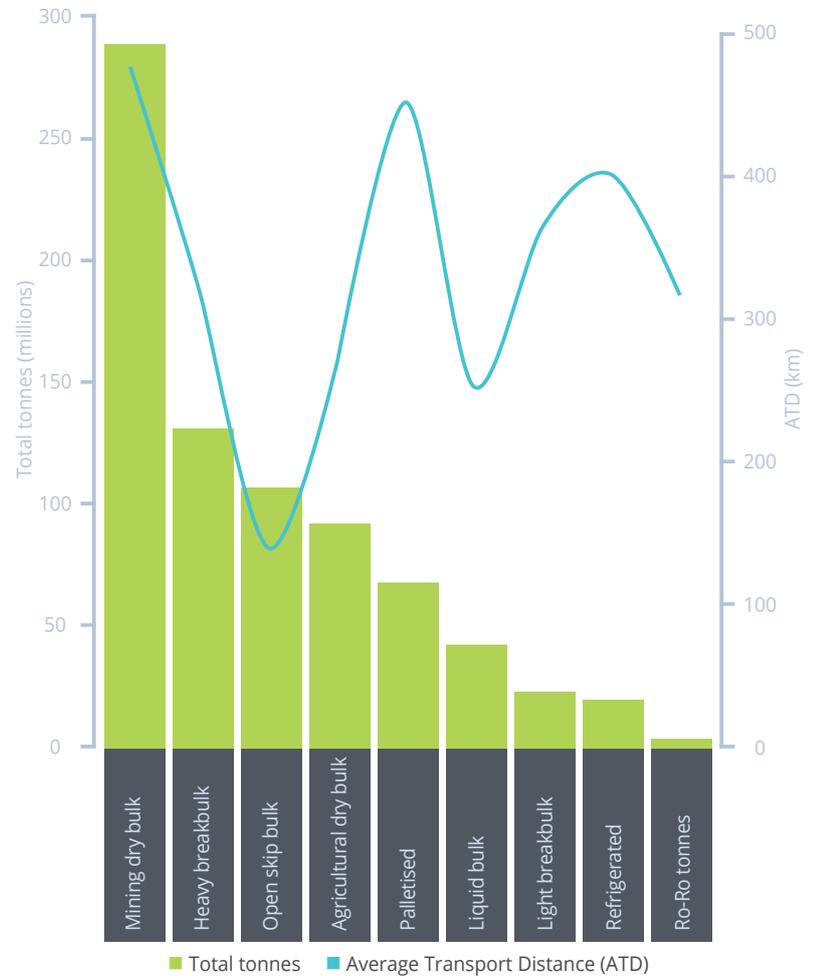


Figure 11: Volume and average travel distance for different logistics systems



Modal splits

South Africa's logistics systems all share three distinct transport networks: corridor, metropolitan and rural. In most cases when freight is transferred from one network to the next, it is handled. The National Freight Flow Model observes freight on each of these networks – making it possible to estimate how many times each tonne was handled. The 781.7 million tonnes of freight transported via road, rail, pipeline, coastal shipping and conveyor belt in 2013 were each handled an average of 1.92 times, totalling 1 500 million observed tonnes.

The journey of a tonne is thus far more complex than a simple point A to B transfer. The same tonne of freight may cross multiple networks, utilising many different modes, making the question of market share for various modes more complicated than merely splitting up the 781.7 million shipped tonnes. Therefore, in matters relating to market share, it is more valid to consider tonne-kilometres than tonnes.

In 2013 South Africa had a transport task of 362 billion tonne-km. Road transport and the rail general freight business (GFB) accounted for 260 billion of these tonne-kilometres, the rail export lines (coal and iron ore) contributed a further 90 billion tonne-km and the remainder was split between pipelines, conveyor belts and coastal shipments. That means that the

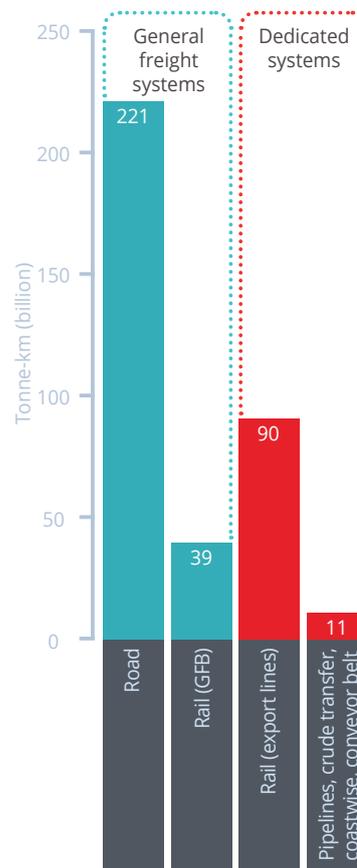


Figure 12: Tonne-kilometres per mode

road network shouldered 61% of the transport activity burden while rail transport hauled 36%.

Significantly, 28% of freight activity is part of dedicated systems such as bulk export lines, pipelines, crude oil transfer systems and refineries and conveyor belts. The remaining 72% of transport activity on the road (221 billion tonne-km) and rail (39 billion tonne-km) networks can be further subdivided into corridor, metropolitan and rural transport. This freight uses what can be called “public” infrastructure and requires greater focus. Road freight, and also often rail freight, share infrastructure with passengers and have many different users, thus requiring policy interventions, infrastructure planning and regulation that will impact a broad audience.



Of the 260 billion tonne-kilometres using general freight systems, the 48% of freight on corridors is a main focus given the high volumes.

Answering the question of market share depends on what perspective is considered. A few options are:

Rail market share		
of total tonne-kilometres	36%	Transport activity is a better indicator than tonnage
of surface freight tonnes (excluding export lines and pipelines)	15%	Dedicated systems such as export lines, pipelines and crude oil transfers are not actually competitive
of all freight tonnes excluding metropolitan short-haul	21%	Metropolitan short-haul freight is mostly not rail friendly
of corridor freight tonnes only	23%	Much of rail's rural freight is not to serve rural areas, but to connect mines with manufacturing areas

This means that rail's market share can be described as anything between 15% and 36%, depending on the specific context of the analysis.

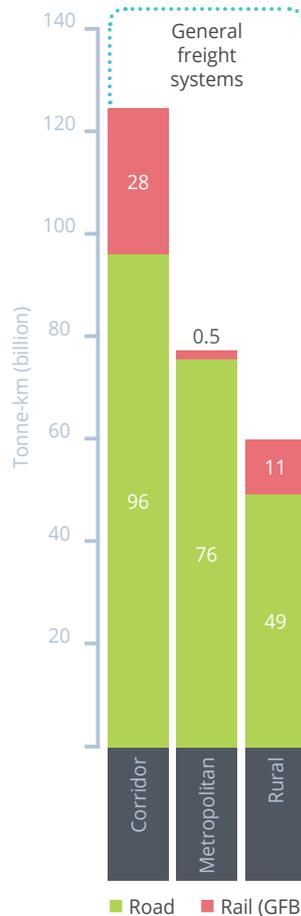


Figure 13: General freight system tonne-kilometres by typology



Supplying logistics capacity

Supplying the logistics capacity required is a concerted effort between industry and government. In 2013, 781.7 million tonnes of freight required logistics. In 30 years this is expected to grow to 1 981.4 million tonnes. Significant investment plans are on the cards to address crucial capacity shortages on national road corridors, port and rail infrastructure. The timing of when this capacity will become available remains uncertain, but encouraging strides are being made.

Quantifying the cost impact of having more or less infrastructure capacity or better or worse infrastructure quality is complicated, and sometimes deemed impossible. Similarly, analysing the difference between different infrastructure configurations on a national level can be a challenge. The cost modelling presented in this report provides a starting point for such analysis.

The funding of different logistics infrastructure is also a complex matter. Storage capacity is almost exclusively funded by private industry, with the exclusion of port and rail terminals. Port, rail and pipeline infrastructure is funded almost exclusively by Transnet without the usual fiscal subsidies enjoyed by similar infrastructure in other countries. For these transport modes, the service providers using the infrastructure are also in the position to invest in that infrastructure. The same cannot be said for road infrastructure. Although it is proven that poor road conditions and congestion increase logistics costs, there are no industry level strategies that can improve the infrastructure, no investment plan that can drive it. It is a peculiar situation where much is dependent on public contribution as fixed infrastructure is funded indirectly through toll fees and a fuel levy. In fact road freight users “pay” for the use of fixed infrastructure in a variable way, which is not true for other modes. The involvement of private funds in public infrastructure investment is one important strategy that should contribute towards a more balanced approach.

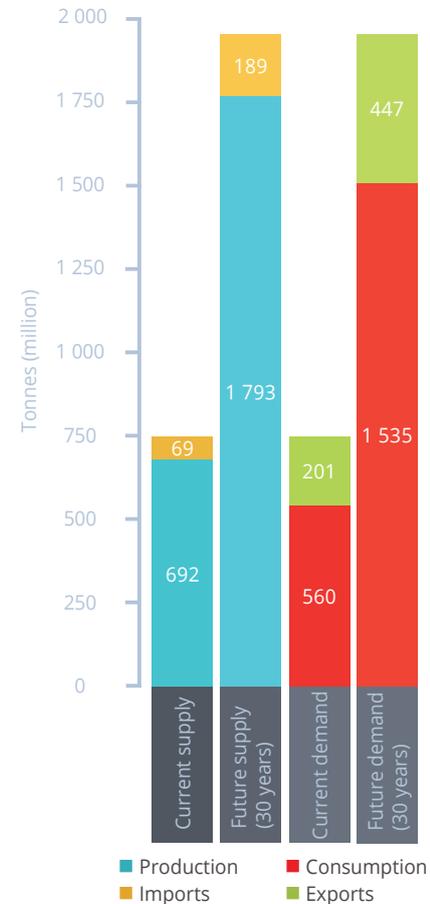


Figure 14: Freight supply and demand – current and long-term view





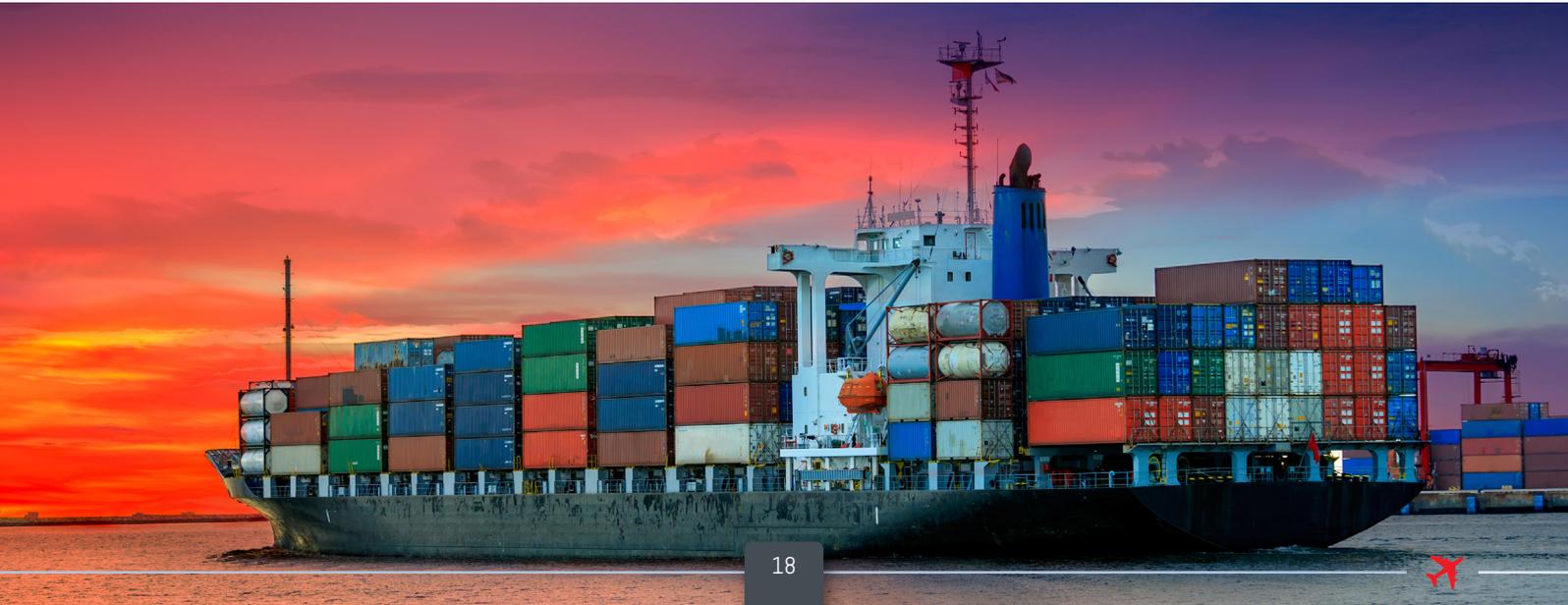
SHIFTING PARADIGMS



SHIFTING PARADIGMS

Essentially the goal of leveraging logistics as a strategic resource for the nation's economy goes far beyond mitigating changes in input costs, it has to target the structure of the industry – the demand for and supply of logistics.

Traditionally, much focus is placed on how logistics can be made more efficient when really, in South Africa, there is much to be done about reducing the demand for logistics – in other words reducing the kilometres travelled by each tonne, how long it is stored and how often it is handled. 'Buying local', beneficiation-at-source and recycling-at-source are all philosophies that reduce the distance between the point of supply and the point of demand for a commodity. In Europe, initiatives promoting in-season consumption and self-sustaining communities have shown promise. Substituting high-value imports with locally manufactured goods and exporting beneficiated products instead of bulk minerals and agriculture ultimately changes the structure of the economy with far-reaching benefits beyond just the reduction of logistics requirements.



Supply-side interventions are also much broader than operational efficiency improvements. Ultimately, the combined efficacy of the South African logistics system must be scrutinised. The provision and improvement of infrastructure as well as the enforcement of policies and regulations should a) be coordinated on a provincial and national level and, more importantly, b) be tuned in and be proactive in terms of the real implications this would have on private industry. The formation of the National Transport Forum by the Transport Minister is an encouraging development in this regard. Its objective is to enlist as much of the private sector expertise, experience and knowledge to assist government to simplify and implement the National Transport Master Plan that was first tabled in 2005. A major objective of the master plan is to achieve sustainable funding and maintenance for the infrastructure used by each transport mode. Hopefully this and similar forums will help untangle the complex web of pros and cons associated with a number of pending infrastructure and regulatory matters for instance the production or import of cleaner fuels; imminent changes to road transport regulations affecting overloading and labour restrictions; provision of high-speed corridors juxtaposed with metropolitan access restrictions; operational responses to changes in the maritime container industry such as mandatory weighing and the advent of high-cube containers; and the successful implementation of the AARTO Act.

These system-level initiatives to reduce demand and provide more efficient supply serve to provide a more effective framework within which logistics services can be provided. Within such a context the benefits reaped by more efficient operations are multiplied. Reducing the monetary cost of logistics is one such benefit but equally important is the reduction in societal costs such as emissions. Interestingly, the initiatives that decarbonise logistics are often also the same strategies that will consume less infrastructure, use less fuel and make the overall system more efficient and lower costs.

The cost of emissions

Global warming awareness has highlighted the importance of reducing our carbon footprint. In 2013 freight logistics caused 21 million tonnes of CO₂ emissions, which at R265 per tonne added R5.5bn to the national CO₂ bill.

While carbon dioxide (CO₂) constitutes the bulk of diesel emissions (DE), it is not the only burden DE places on society. Combustion of diesel creates both gasses and soot. The major components of the former are CO₂, carbon monoxide (CO), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂). CO is highly toxic while NO_x and SO₂ are both respiratory irritants and contribute to acid rain. Other than the acute health hazards of NO_x, Nitric Oxide (NO) has been evaluated to have 298 times more impact per unit mass of CO₂ on global warming over a 100 year period. The soot which is emitted from DE consists of carbonaceous particulate matter. These particles can absorb organic compounds and are small enough to be transported deep into the lungs. Many of these compounds are known to be individually carcinogenic and long-term exposure to DE pose a chronic respiratory hazard. Reducing DE is thus not just a matter of long term environmental sustainability, but of immediate public health. The total cost of emissions is estimated to have placed an R14.1bn burden on the economy.



