



6<sup>th</sup> ANNUAL

# STATE OF LOGISTICS™ SURVEY FOR SOUTH AFRICA 2009

LOGISTICS VALUE AND COST DRIVING  
MACRO AND MICRO-ECONOMIC CHANGE  
TOWARDS GLOBAL COMPETITIVENESS  
AND **SUSTAINABILITY**





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## PREAMBLE

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With the world slowly emerging from the recession, many governments and organisations have spent time to learn from the factors leading to this situation. Thus it is possible to reconsider, improve and streamline the wide spectrum of ways of managing factors in an effort to do things better and strive towards peak performance in future.

The situation in South Africa is, as always, lagging behind; while positive indications of recovery exist, it will take time for visible signs of good, sustained growth to emerge. The Soccer World Cup this year will provide a very welcome injection into the economy, but this won't be enough to support sustained growth.

The logistics sector, across the board, has experienced the effects of the difficult economic times. The publication of the State of Logistics™ survey acknowledges the importance of the critical area of logistics and supply chain management in the world marketplace. Supply chains pervade every enterprise on the planet. These chains include all the activities, linkages, information exchanges and relationships that are formed by all those who choose to work together. The overriding goal and objective of each and every chain are to transport, distribute and move products and services ever closer to final consumption in a more cost-effective way, adding value in the process. This requires dedication, creativity and innovation by all parties involved.

The theme of this year's survey is 'Logistics Value and Costs – Driving Macro and Micro-economic Change towards Global Competitiveness and Sustainability'. It is very appropriate, given the persisting financial situation, that the emphasis is on the value that can be derived from logistics. Freight is still predominately on road and there seems to be little chance of this changing in the near future.

The recent World Bank report on logistics competitiveness is encouraging from a South African point of view. Although we are now positioned 28<sup>th</sup> as opposed to 24<sup>th</sup> in 2007, the actual LPI (Logistics Performance Indicator) score has improved from 3,53 to 3,46. When high-income countries – such as Germany and the USA – are excluded, South Africa ranks amongst the 10 most significant over-performers in the logistics field. Included in this group are China and India.

The Council for Scientific and Industrial Research (CSIR) and its associates believe we are addressing critical aspects in the sixth State of Logistics™ survey for South Africa. This year's survey is similar in format to previous ones and allows for comparisons in trends. These trends, together with essential business information from various industry sectors, are vital to keep track of the state of logistics. As in the past, the survey opens the way for further discussions, interactions and dialogue on various logistics and supply chain management issues. It is only through collaborative interaction that relevant

research can be conducted to the benefit of the country. Indications that this is starting to happen increasingly are welcomed. A number of new issues are raised and elaborated on in this survey, for example, the cost of bad roads and humanitarian logistics.

We believe that findings from studies published in the sixth State of Logistics™ survey will, as in the past, be referenced in numerous presentations and quoted in many media reports. We would like to thank our sponsor, IMPERIAL Logistics, for their continued financial support. Over the past year IMPERIAL Logistics has gone the extra mile, together with the CSIR and Stellenbosch University, which will underscore the standing of the State of Logistics™ as the authoritative study on logistics in South Africa.



Hans W Ittmann  
*Executive Director, CSIR Built Environment, Pretoria, South Africa*  
February 2010



HANS ITTMANN

## PREFACE from IMPERIAL Logistics

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Until recently, it would have been considered unnatural for corporations to set their priorities and goals with an eye toward improving their environmental performance. But a steady flow of high-profile corporate initiatives and studies of customer behaviour have revealed a change in the business climate. Companies that integrate sustainability practices throughout their supply chains are experiencing a clear benefit. Increasingly, key stakeholders – from investors to customers to prospective employees – are monitoring sustainability efforts for themselves and making their decisions accordingly.

But more than just the threat of negative publicity is pushing corporations into the green zone. With world leaders struggling to agree on a climate change treaty, it's only a matter of time before environmentally unaware companies will face steep fines for their failure to keep pace. At the same time, the global recession is forcing companies to focus on improving their efficiency to offset tepid demand and counterbalance the price volatility of commodities such as water and energy.

IMPERIAL Logistics is continuously working with customers to implement solutions and, for me, that's one of the positive things that one has to take out of the recession. Customers are more willing now to allow you to engage with them. Companies are more interested to find better ways of doing things, which allows us to work closer with them to create more sustainable and cost effective solutions. In the past, it was more about rate; the company with the lowest rate would get the contract. It has to be about taking waste out of the supply chain and I think this is what we're seeing now.

Sustainability has certainly, for the right reasons, become far more important to companies. It's also much easier to work with customers in this regard whereas previously it was seen as frivolous. IMPERIAL Logistics has had some great successes already. We won an Enviro Award at the 2009 Logistics Achievers Awards based on a study we did with Cardiff University, whereby we calculated the extra distance travelled as a result of uncertainties in the supply chain and that showed where performance gaps occur. I think people, for the first time, really link economic benefit to green benefit; in that, not only can you take costs out of the supply chain, you can also reduce emissions. The link is being made between taking cost out of the supply chain and being more sustainable in your approach towards logistics.

The drive towards green supply chains need not be a financial burden, since principles of optimally managed resources, energy and waste reduction have decreasing cost implications. Not only do green strategies speak directly to the bottom-line, but can also provide a competitive advantage as consumers and regulation start demanding greener products and manufacturing practices.

We believe that the findings from the 6th State of Logistics™ survey will highlight the importance of balancing aspects such as cost and sustainability as we strive towards creating a more competitive South African economy. IMPERIAL Logistics is proud to be part of our association with the CSIR and Stellenbosch University, making an ongoing commitment to contribute positively towards more sustainable supply chains.



Marius Swanepoel  
*Chief Executive Officer, IMPERIAL Logistics,  
a division of IMPERIAL Group (Pty) Ltd*  
February 2010

MARIUS SWANEPOEL

# EXECUTIVE SUMMARY

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*King DJ (CSIR)*

This year the theme for the survey is 'Logistics Value and Costs – Driving Macro and Micro-economic Change towards Global Competitiveness and Sustainability'. For South Africa to become and stay competitive internationally the logistics and supply chain sector will need to step up and improve its overall performance whilst taking into account the issue of continual sustainability. In the end the value that logistics adds to the country should be greater than the costs. The topics below expand on this statement.

## THE STATE OF LOGISTICS IN SOUTH AFRICA – SUSTAINABLE IMPROVEMENTS OR CONTINUED EXPOSURE TO RISK

Logistics costs relative to GDP are at its lowest level since the inception of the survey and stands at R339 bn or 14,7% of GDP, a drop of 1,2% from the previous year. Transport cost increases are also lower than in any of the previous surveys (transport costs only increased by 2,4%, but still account for 50,4% of total logistics costs). Inventory carrying costs were once again much higher in 2008 and increased by 21,2% from the previous year, now constituting 18,6% of total logistics costs.

Freight transport activity increased by 4% in 2008 in ton-kilometres shipped and 2% in tons shipped, which is just over 1,6 bn tons shipped on the four transport typologies (metropolitan, rural, corridor and bulk mining) in South Africa. Road transported 1,4 bn tons of freight at an average transport distance of 185 km. Rail transported 204 m tons at an average transport distance of 640 km, 100 m tons of which were on the two bulk mining corridors.

Given the significant contribution of fuel costs to total transport costs, and the exogenous volatility of its input commodity, the mitigation of this risk remains prominent on the strategic agendas of the road haulage industry and freight owners. In line with global trends, the drive towards a more sustainable logistics system is gaining prominence. Consolidation and other efforts to increase efficiency contributed to improvements, including the development of more fuel-efficient equipment with lower emissions. These improvements are, however, approaching a natural limit. To echo the key message from previous surveys – the real mitigation of risk and an increase in sustainability can come only from a structural change. And this is critical – right now.

## THE COST OF BAD ROADS TO THE ECONOMY

Deteriorating road quality can potentially have many negative effects on the vehicle maintenance costs of a company, which in turn can translate into increased logistics costs and may eventually have a negative effect on the broader economy of a country. The percentage of bad and very bad roads in the secondary road network of South Africa increased from 8% in 1998 to 20% in 2008. The deterioration of the secondary road network is problematic as many deliveries are routed on these roads.

Results obtained from a case study conducted indicate that the potential effect of deteriorating road quality on vehicle maintenance and repair costs and the total logistics costs of a company, is significant. Total vehicle maintenance and repair can increase by as much as 121% for a truck travelling on a road with a bad condition rating and total logistics costs of a company can increase by as much as 10%. This could lead to unnecessary increases in the total logistics costs of a country and hamper economic growth. It is therefore vital to create awareness of the potential negative impacts of bad roads amongst stakeholders to ensure that proper attention is given to timely and proper maintenance of roads.

## CONVERTING LOGISTICS VALUE INTO A COMPETITIVE ADVANTAGE

The continued challenge of any supply chain is to add value throughout and therefore a comprehensive view is necessary when looking at all the entries in the supply chain that modify raw materials into final products. Customers, manufacturers and suppliers need to work together and optimise the flow of information, products, services and money for mutual benefit. The best results are usually achieved by selecting and leveraging the right strategic partners in the process. Chief executive officers (CEOs) struggle to see the value of supply chain management to their organisations if not measured in financial metrics. The solution is not to try to explain the value to the CEO, but to let them experience it first-hand, thereby showing that it encompasses more than just a cost centre that is either outsourced or kept in-house.

The most outsourced business service globally is logistics and this industry is still growing. The future logistics service provider (LSP) industry will be more global, concentrated and segmented around customer types, and universally better at execution. Business processes will be standardised and systems integrated. There will be better visibility of end-to-end supply chain information, and integration with partners and customers. As the degree of global collaboration grows and global supply chains become even more complex, it is likely that visibility systems will continue to be a collection of discrete systems, with the leading companies most successful in integrating them and gaining a more end-to-end and close-to-real-time visibility of their supply chain operations.

Future supply chains must be tailored to the end-user; low costs can be replicated readily and are thus unlikely to lead to a competitive advantage over the long term. Supply chain managers will succeed only if they understand the needs of key customers and strive to maintain alignment between the supply chain's design and its customers' changing needs and desires.

## DEVELOPING A SOUTH AFRICAN PARADIGM OF HUMANITARIAN LOGISTICS

An increase in the frequency and impact of the broad range of events that has come to be included in the term 'disasters' has catapulted disaster management to prominence as an international strategic imperative. Humanitarian logistics accounts for 80% of disaster relief activities. The widely accepted disaster life cycle



comprises four phases: mitigation, preparedness, response and rehabilitation. Activities that qualify as humanitarian are measures against three criteria, namely humanity, neutrality and impartiality. These criteria form the boundaries of the humanitarian space.

It is argued that the scope of humanitarian logistics in the South African context should be expanded to include activities executed by non-profit organisations and corporate social investment initiatives to target social and economic development issues such as illiteracy, crime, abuse, unemployment and the increase in orphaned and vulnerable children. This argument is substantiated by the magnitude of the negative impact these matters have on the population and the national economy. A case study of the South African Breastmilk Reserve shows how the degree to which operations fall within the humanitarian space – and not whether these operations are in response to a *prima facie* ‘disaster’ – should qualify it as ‘humanitarian’. This shift in paradigm refocuses the popular research questions in the field to enhance their relevance to the South African context – which will make research outputs more practicable and useful.

## GREEN LOGISTICS AND SUSTAINABILITY

The average volume of fuel consumed per capita in South Africa’s transport sector is much higher than the world average. This is partly due to the country’s logistically-challenged distribution of industry and the population, where a large concentration of the production sector and consumers is situated 600 km from the coast. This adds a substantial (mostly road) transport leg to deliveries, requiring additional energy (fuel) and resulting in both economic (fuel costs) and environmental (green house gas pollutant) externalities. A case study conducted by Cardiff University, the CSIR and IMPERIAL Logistics illustrates a way of addressing unnecessary fuel consumption and accessing green (CO<sub>2</sub> reduction) and gold (cost savings) benefits through the reduction of uncertainties resulting in ‘extra kilometres’.

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## INTRODUCTION

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Globally pressures to reduce logistics costs remain, while increasing emphasis is being placed on providing quality service and adding logistics value. Given the recent global economic crisis the sixth annual State of Logistics™ survey is appropriately titled 'Logistics Value and Costs – Driving Macro and Micro-economic Change towards Global Competitiveness and Sustainability'. The CSIR, Stellenbosch University and IMPERIAL Logistics are pleased to present the survey, which covers the 2008 reporting year from a data analysis perspective. The survey continues to add data trend points of critical factors that are crucial in understanding the South African logistics environment.

The aim of the survey is to provide a comprehensive picture of the state of logistics in South Africa, incorporating a macro-economic view (top-down) and an industry-level perspective (bottom-up). A number of new, important issues are introduced in the report – we trust it will add to increased understanding of logistics in the country.

Logistics involves a whole array of activities including transport, warehousing, cargo consolidation, cross-border distribution and clearance, and information technology such as payment systems. A wide spectrum of public and private organisations and agents is involved in these activities.

### **Trade**

It is accepted today that a competitive network of global logistics is the backbone of international trade. Many countries have not benefitted from this. The recently-published World Bank Report<sup>1</sup> on the new dataset for the 2010 Logistics Performance Index (LPI) and its component indicators clearly states: *"Improving logistics performance has become an important development policy objective in recent years because logistics have a major impact on economic activity"*. Furthermore: *"The importance of efficient logistics for trade and growth is now widely acknowledged. Analysis based on the 2007 LPI or similar information has shown that better logistics performance is strongly associated with trade expansion, export diversification, ability to attract foreign direct investments, and economic growth"*.

The South African government's policies are geared towards the country becoming a player in the global marketplace. What holds true for international trade is also valid, to a large extent, for internal trade within a country. The World Bank Report shows that South Africa is rated 28<sup>th</sup> out of 155 countries on the world logistics performance index, with a score of 3,46. Although the actual score has improved from 3,53 South Africa is down from 24<sup>th</sup> in 2007. Nevertheless, this is encouraging although some countries are improving at a faster rate than South Africa.

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1 World Bank. 2010. Connecting to Compete: Trade Logistics in the Global Economy. Washington DC.

Our country is by far rated the highest in Africa and, excluding high-income countries such as Germany and the USA, South Africa is among the 10 most significant over-performers. Based on the income of the country, South Africa is actually over-performing from a logistics point of view. Other over-performing countries include China and India. Again these are very encouraging trends. At government level endeavours are in place to focus on further improvements, especially along the main corridors in the country<sup>2</sup>. These initiatives need to be applauded and encouraged.

### **Logistics costs**

The 'in-country' logistics costs as a percentage of GDP are presented in the survey. The total logistics costs in South Africa for 2008 were R339 bn – an increase of 6,9% on the 2007 amount of R317 bn. The logistics costs as a percentage of the GDP are 14,7%, which is the lowest it has been since the first survey in 2004. Although these numbers are seemingly moving in the right direction, they need to be analysed carefully to understand which factors are driving this percentage down. Compared to other countries, the logistics costs as a percentage are still high – in the USA the percentage for 2008 was 9,4% .

### **Freight**

The local situation with freight is exactly the same as in the past number of years. Total freight in 2008 increased slightly with 2% or 32 m tons, with all growth being on road again. This is not ideal; not only is this the main contributor to high transportation costs, but heavy vehicles are damaging our road infrastructure. Various efforts over the past few years have not had the desired effect of getting some appropriate freight back onto rail.

### **Infrastructure and the effect of bad roads**

Socio-economic development and growth are stimulated by extensive, modern and properly-maintained infrastructure, be it roads, rail, ports or airports. All supply chains 'operate' on this extensive infrastructure network across the country.

This survey highlights the effect of bad roads on total logistics costs. It is shown that worsening road conditions can have a substantial increase on the maintenance and repair costs of freight trucks and vehicles, adding to high logistics costs. While South Africa's national roads are in a reasonable condition, the roads that are the responsibility of provincial and local governments are deteriorating at an alarming rate. Roads are built to last 20 to 30 years, if maintained properly. The lack of maintenance is affecting the smooth running of the economy as well as the ability of South Africa to compete globally from a logistics point of view.

### **Humanitarian logistics**

Early in January 2010, the world was shocked by the devastating earthquake that hit Haiti, the poorest country in the western hemisphere. Assistance and relief operations from all over the world streamed into that country to support the victims. These were not very effective, especially immediately after the major quake. Logistics and supply chain management is an integral part of any such relief operations and constitutes almost 100% of the effort to assist the affected country. We therefore include an introduction to 'humanitarian logistics'

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<sup>2</sup> Engineering News, 29 Jan 2010. SA to launch big corridor-based logistics efficiency study.

in this survey. While many researchers are endeavouring to introduce commercial supply chain thinking and principles into this space, it is critical to understand the complexity of the humanitarian space.

### World Cup Soccer

As South Africa is preparing for and approaching the major event of the 2010 FIFA World Cup, everyone in the country is gearing up for delivery. The logistics and supply chain fraternity has a huge role to play in ensuring that products – specifically food supplies – are delivered to the various major soccer locations as well as to all the tourist attraction points across the country. Not only will this be a major challenge, it will also be a test of the ability of the logistics system to handle this critical event successfully.

## TRENDS IN SUPPLY CHAINS

Supply chain professionals worldwide are struggling to manage during a time of unprecedented change – what was standard practice yesterday is ineffective today. The one certainty is that supply chains operate in a dynamic and volatile business environment and will continue to do so in future. Gattorna<sup>3</sup> suggests a new supply chain model, which not only addresses technology and infrastructure concerns but also recognises the influence of the ‘human dimension’ – the decisions and choices made by people throughout the supply chain. Building on the ‘Triple-A’ model of agility, adaptability and alignment of Lee<sup>4</sup>, Gattorna promotes the concept of *dynamic supply chain alignment* where supply chain design and operations are developed from the perspective of the customer’s dominant buying behaviour. The trend will increasingly be towards dynamic alignment of supply chains which is the ability to engage different supply chain configurations as customers change their buying behaviours.

A recent IBM study<sup>5</sup> suggests that supply chains of the future will be “*instrumented, interconnected, and intelligent*”. Supply chain professionals will be working in a highly-automated world consisting of sensors, radio-frequency identification tags, meters, global positioning systems and other technologies. What is reported in this study is almost like science fiction – inventory will count itself; containers will detect their content; and pallets will report if they end up at the wrong place! Advanced analytics and modelling will help decision makers evaluate alternatives while taking complex risks and constraints into account. The trend is towards more intelligent, automated and smarter supply chains.

Gilmore<sup>6</sup> is very brave in looking towards 2015, naming 10 fairly specific trends that are likely to occur in supply chains. These are:

- The majority of companies will have reconfigured their supply chain networks.
- Supply chain planning and execution will start to blur.
- Substantial drops will be experienced in overall inventory levels.

3 Gattorna J and Friends, 2009. Dynamic Supply Chain Alignment: A New Business Model for Peak Performance in Enterprise Supply Chains Across All Geographies, Gower Publishing.

4 Lee Hau L, 2004. The Triple-A supply chain, Harvard Business review, Oct 2004, pp. 102-112.

5 The Smarter Supply Chain of the Future: Global Chief Supply Chain Officer Study.  
[www-935.ibm.com/services/us/gbs/bus/html/gbs-csco-study.html](http://www-935.ibm.com/services/us/gbs/bus/html/gbs-csco-study.html)

6 Gilmore D, 2009. Supply Chain 2015, Supply Chain Digest Newsletter, 22 October 2009.

- Web-based supply chain software will dominate the landscape.
- 'Green' factors will drive transportation collaboration.
- Everything will be visible, all the time.
- Common deployment of real-time performance management will exist.
- Distribution centres will take on one of two paths – lean or unautomated, or automated to levels difficult to imagine today.
- The focus of supply chains will turn to emerging markets.
- Increases in digitisation will impact on the physical chain.

As soon as the financial crisis has diminished, the focus will shift again to climate change and global warming, with green supply chains becoming a requirement.

Logistics and supply chains are integral parts of the economy of a country. For South Africa to be reckoned as a player in the global marketplace, the logistics and supply chain management environment will have to stay abreast of developments. It is therefore important to take note of these trends.

# THE STATE OF LOGISTICS IN SOUTH AFRICA – SUSTAINABLE IMPROVEMENTS OR CONTINUED EXPOSURE TO RISK

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## INTRODUCTION

This publication heralds South Africa's sixth annual logistics survey. Certain aspects of South Africa's logistics costs situation still require significant attention, but it is heartening to note that wide consensus exists amongst logistics stakeholders on many important initiatives.

As the results of the previous five studies were shared, dialogue ensued and it is gratifying that the researchers observe the application of the research results in facilitating consensus amongst logistics industry stakeholders. In this way, one of the objectives of South Africa's logistics survey (articulated in the first survey five years ago) is most certainly being achieved.

Another stated objective was to engineer continuous support for the research itself to ensure the development of a solid body of logistics costs and freight flow intelligence. This intelligence enables the overarching goal of support for government policy development, infrastructure decision making and improvement to the national logistics system.

In this regard Transnet recently contributed greatly to the development of a comprehensive freight-flow model and IMPERIAL Logistics sponsors the State of Logistics™ survey specifically. The continuous funding enabled the development of world-class logistics costs and freight flow measurements that have been peer reviewed and presented internationally.

The challenge however remains: Although consensus exists around issues such as regeneration and use of rail capacity – especially through domestic intermodal solutions and road/rail cooperation – not enough has been done yet. The competitiveness and sustainability of South Africa's logistics system remain at risk and moving from consensus to action is long overdue.



## COST OF LOGISTICS

The latest cost data indicate an improvement in the cost of logistics for South Africa, compared to the country's GDP (Figure 1).

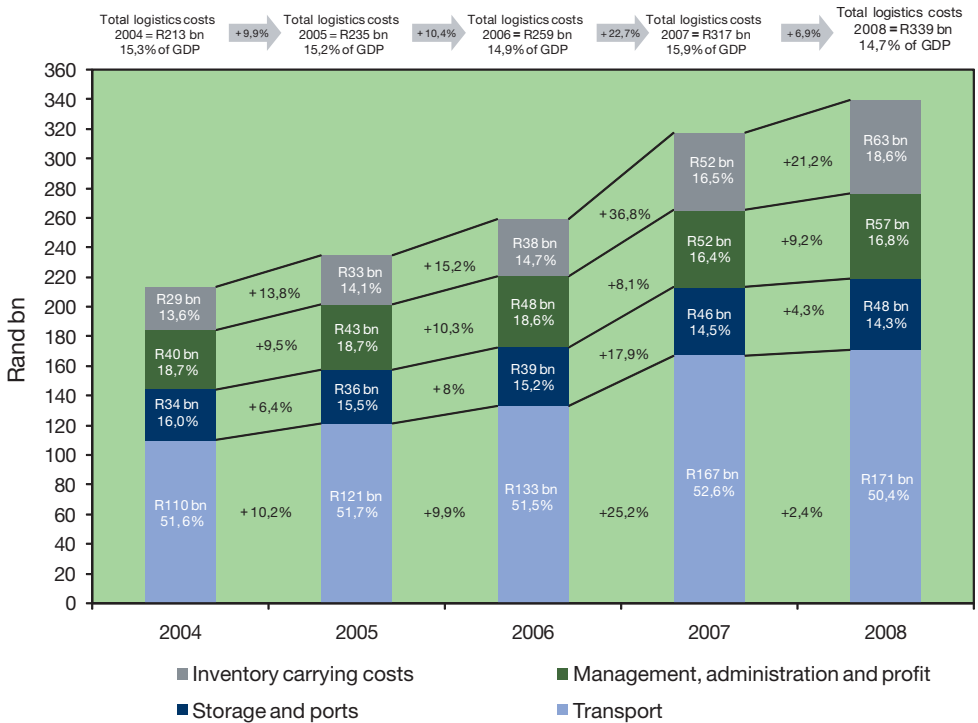


Figure 1: Logistics costs for South Africa

Logistics costs relative to GDP are at its lowest level since the inception of the survey and stand at R339 bn or 14,7% of GDP, a drop of 1,2% from the previous year. Transport cost increases are also lower than in any of the previous surveys (transport costs increased by only 2,4%, but still account for 50,4% of total logistics costs). On the surface, it could be interpreted that the desired results are finally being achieved. It is, however, critical to understand whether an intrinsic improvement in transport efficiency is at play, or whether external factors are at play (as alluded to in previous surveys). To answer this question, the significant impact of both the most important external factor (fuel prices) and intrinsic factor (improvement of load factors) are considered below.

## FUEL PRICE SCENARIOS

As depicted in Figure 2, road transport is by far the largest contributor to transport costs in South Africa. Road transport cost drivers were analysed in the previous survey and the economy's serious exposure to the cost of fuel explained. South Africa's logistics industry avoided a serious challenge narrowly when the oil price, which increased significantly during mid 2008, suddenly decreased markedly.

The very real risk is, however, still present and illustrated in Figure 2 by two fuel cost scenarios.

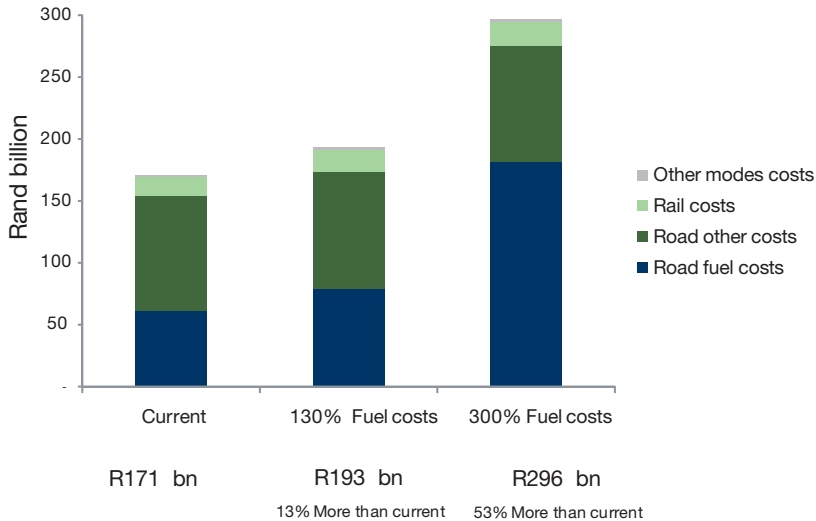


Figure 2: Impact of higher fuel price scenarios on total transport costs

If the fuel price were to triple, logistics costs would rise with 53% in 2008 terms and under 2008's conditions. This scenario is unfortunately quite realistic. The oil price is a highly unstable global phenomenon, evidenced again by significant fluctuations over the past decade with a low of \$17 in January 1999 and a peak of \$147 in July 2008<sup>7</sup>.

The short-term fluctuations are just as disconcerting. The oil price broke through \$100 dollars per barrel on 2 January 2008 and reached \$147.27 on 11 July 2008. It steadily declined with the economic recession to

<sup>7</sup> Wikipedia. Price of petroleum. [http://en.wikipedia.org/wiki/Price\\_of\\_petroleum](http://en.wikipedia.org/wiki/Price_of_petroleum). Accessed 27/01/2010.

\$33.87 a barrel on 21 December 2008. The average price for 2008 (\$91.48) was 42,5% higher than in 2007 (\$64.20)<sup>8</sup>. Economists who dare to forecast it see at least a doubling towards the middle of this decade<sup>9</sup>.

Though all economies are affected by it, South Africa's higher-than-normal transport demand and poor network configuration (as discussed in previous surveys) mean that the economy will be affected more than average (a worsening of the relative position), as illustrated in Figure 3.

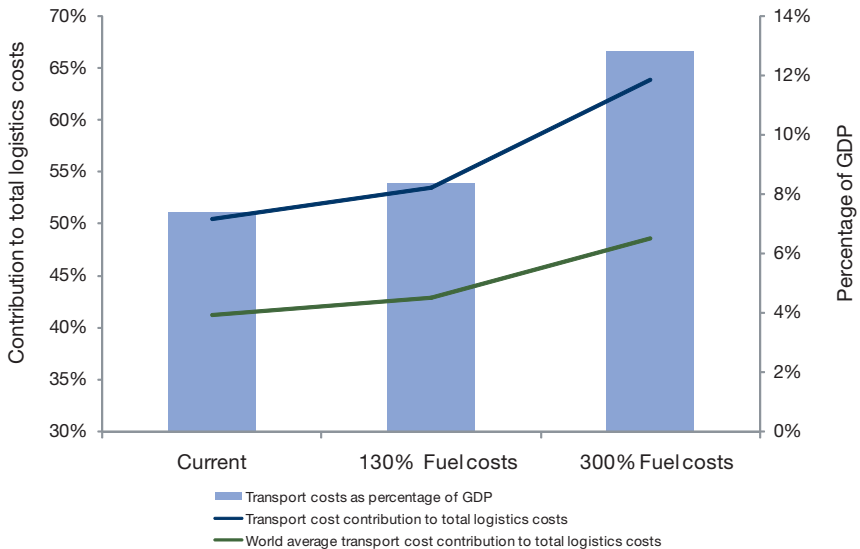


Figure 3: Relative effect of fuel price scenario on transport's contribution to GDP and total logistics costs

A triple fuel cost scenario translates into a rise in transport costs as a percentage of total logistics costs from half to two thirds (a rise of 14% compared to the world average rise of 8%). Transport costs (on its own) as a percentage of GDP will rise from 7,4% to 12,8%.

Ironically, the pronounced oil price fluctuations of 2008 led to a serious drive by many freight transport service providers and freight owners to improve efficiency through load-factor improvements. Eliminating empty legs has been an important objective for many years, but these events made improvements even more critical. In logistics terms an important trade-off was also highlighted. Smaller consignments with lower levels of consolidation (to reduce inventory) are a primary cause of empty legs. At some point, however, managing the

8 InflationData.com. [http://www.inflationdata.com/inflation/Inflation\\_Rate/Historical\\_Oil\\_Prices\\_Table.asp](http://www.inflationdata.com/inflation/Inflation_Rate/Historical_Oil_Prices_Table.asp). Accessed 27/10/2010.

9 McColl D, 2009. The Eye of the Beholder: Oil Sands Calamity or Golden Opportunity? Canadian Energy Research Institute. Calgary.

increasing transport costs will become more important than managing inventory carrying costs; especially for an economy with a significant road transport market share such as South Africa.

This approach also has a limit, i.e. the complete elimination of empty legs, and for corridor transport (which constitutes two-thirds of total transport costs) this objective is very close to being reached. Thereafter the threat of significant and detrimental oil price increases could be mitigated only by modal shift.

## STORAGE AND INVENTORY CARRYING COSTS

Costs associated with storing inventory are largely influenced by inventory volume as well as by how long it is being stored on the one hand, and the cost of storage and the interest rates on the other hand. Inventory volume and storage are managed by logisticians, while the cost of storage and the interest rates are largely 'administered costs' – especially interest rates – over which the logistician has no or little control. Table 1 reflects an analysis of the changes in storage costs.

**Table 1: Changes in storage costs**

Factor incurring change	R bn
Inflation	+3,7
Increase in storage volume	-1,8
Storage cost increase above (decrease below) inflation	-4,3
Delay in inventory	+3,6
<b>Total increase in storage costs</b>	<b>+1,2</b>

The R1,2 bn net increase for storage costs, specifically, is a result of storing slightly less inventory for a longer period of time at slightly lower real storage rates. This is a mixed result for efficiency and a positive result as far as price increases (price negotiation ability) are concerned.

Unfortunately the positive effect of lower storage rates is negated by higher inventory carrying costs. The trend in inventory carrying costs, which once again were much higher in 2008 (21,2% higher than in 2007), is illustrated in Figure 4. The reasons for the increase in inventory carrying costs are two-fold: The average weighted interest rate increased from 13% to 15% between 2007 and 2008, and the levels of inventory increased. The change in interest rates contributed 40% to the increase in inventory carrying costs, while the increase in inventory levels contributed the remaining 60%.

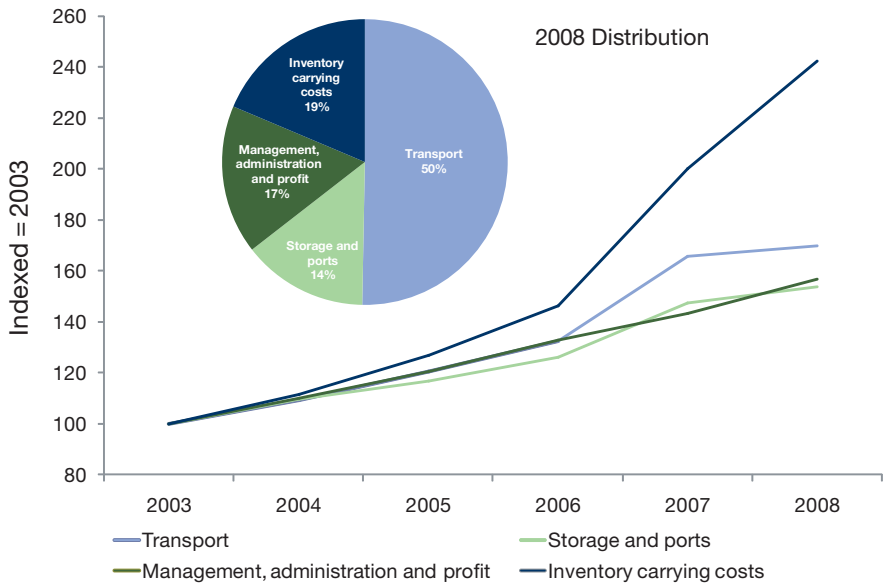


Figure 4: Logistics cost growth at current prices and 2008 cost contribution

## CURRENT FREIGHT FLOW POSITION

Freight transport activity increased by 4% in 2008 in ton-kilometres shipped and 2% in tons shipped (Figure 5).<sup>10</sup>

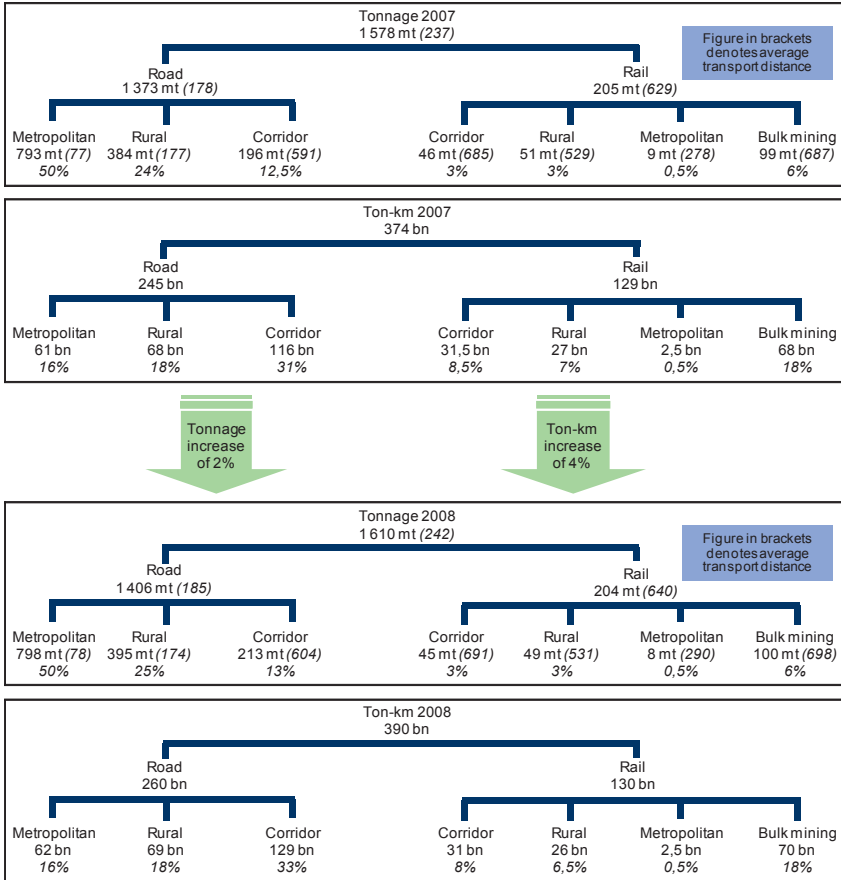


Figure 5: Modal distribution of road and rail freight in South Africa

<sup>10</sup> The model is an observation-based model (as opposed to a survey or gravity model). This means that freight is 'observed' or counted at 363 counting stations in the country and then allocated to a typology (corridor, rural, metropolitan or bulk mining). It is then further allocated to a specific sub-class, i.e. the Cape Town-Gauteng corridor or the Durban-Gauteng corridor. A vehicle travelling from Cape Town to Beitbridge, for instance, will be counted twice (once on the Cape Town-Gauteng corridor and once on the Gauteng-Beitbridge corridor). To enable road and rail comparisons, the actual rail data are classified in the same way. Since both gravity modelling results and actual rail data are available, the double-counting percentage can be estimated and is around 10%.

Just over 1,6 bn tons were shipped on the four transport typologies (metropolitan, rural, corridor and bulk mining). Road transported 1,4 bn tons of freight at an average transport distance of 185 km, delivering 260 bn ton-km. Rail transported 204 m tons at an average transport distance of 640 km, delivering 130 bn ton-km, of which 100 m tons were on the two bulk mining corridors, delivering 70 bn ton-km.

The trend of flattening rail traffic volumes and the absorption of growth in traffic volumes on road continue, as evidenced by the growth in road corridor traffic (Figure 6).

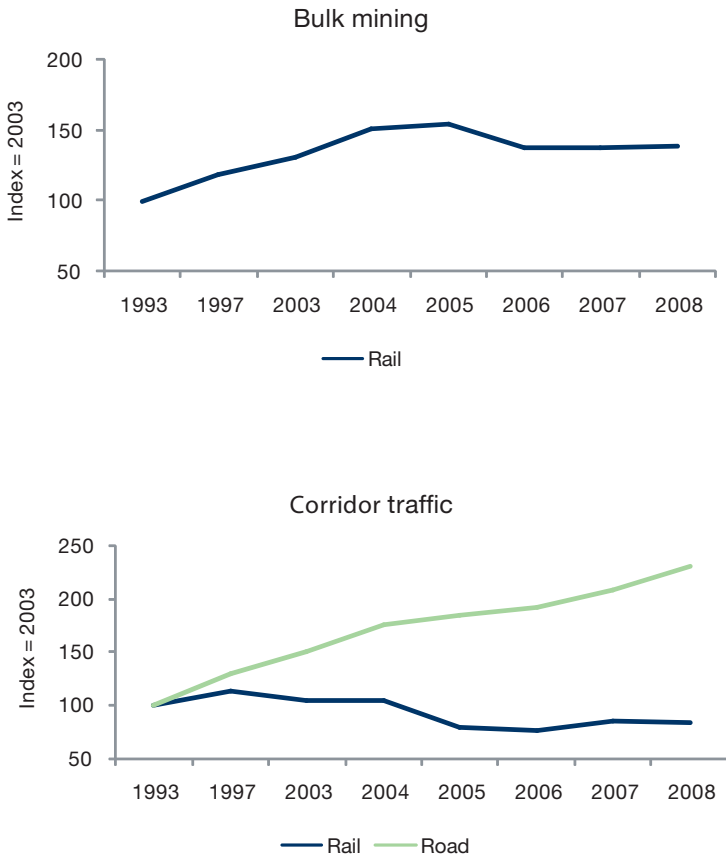


Figure 6: Bulk mining and corridor transport in South Africa since 1993<sup>11</sup>

11 Note the irregular time period prior to 2003 due to unavailability of data.

Transnet announced a major capital investment plan recently. Initial analysis suggests that this will have a positive impact on rail volumes, but most probably not enough. Much more funding is needed to develop more capacity, especially if domestic intermodal solutions come into play.

## SUSTAINABILITY OF LOGISTICS SERVICE PROVISION

Captains of industry interviewed recently by the Centre for Supply Chain Management indicated that the sustainability of logistics service provision is becoming ever more prominent and requires improved management from logistics service providers (LSPs). Three key trends are emerging globally:

- Consumers give preference to economies that adhere to sustainability principles.
- Measurement of critical elements is becoming more transparent and used as bargaining tools, giving rise to phenomena such as emissions trading.
- Freight and inventory users are starting to favour less harmful solutions.

The measurement of sustainability in logistics service provision is difficult, but in this survey an attempt is made to measure the externalities for the South African logistics system for the first time. Externality costs are estimated to add another R34 bn (or another 19%) to the South African transport bill (Figure 7)<sup>12</sup>.

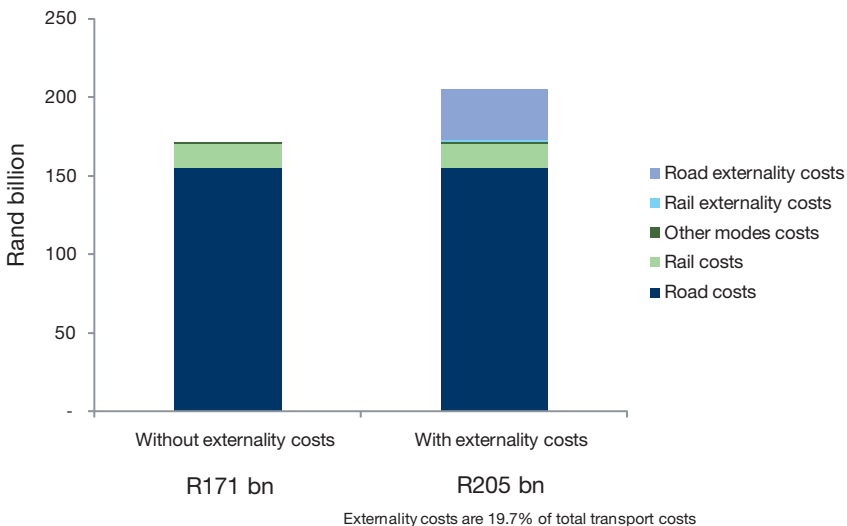


Figure 7: The impact of externality costs on total transport costs

<sup>12</sup> Externality cost measurements are still in its infancy and more detailed work is required. Some results were presented by Allen Jorgensen at the Africa Rail and SATC conferences in 2009, and the data in this section are based on his research. It is clear that the impact is significant.



Adding these costs to the cost of transport increases the cost percentage of transport from 7,4% to 8,8% of GDP. The combined effect of a tripling of the fuel price and the transparent accounting of externality costs could make the cost of transport 14,2%, relative to the GDP.

The main contributors to externality costs are emissions and accidents, as illustrated in Figure 8.

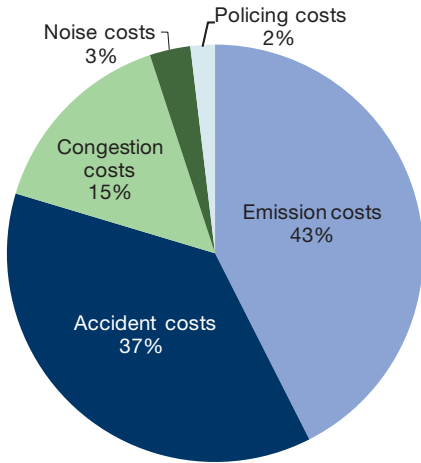


Figure 8: The externality cost of transportation

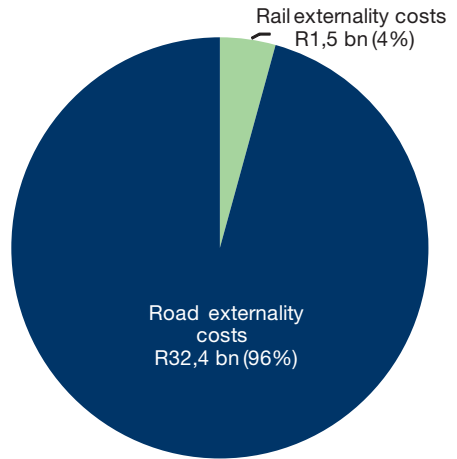


Figure 9: The externality cost of road and rail transport

Previous surveys highlighted the advantages of a modal shift. The sustainability advantages in this regard are obvious with the much lower externality costs associated with rail transport (Figure 9).

## CONCLUSION

Given the significant contribution of fuel costs to total transport costs, and the exogenous volatility of this input commodity, the mitigation of this risk remains prominent on the strategic agendas of the road haulage industry and freight owners. In line with global trends, the drive towards a more sustainable logistics system is gaining prominence. Consolidation and other efforts to increase efficiency have contributed to improvements, including the development of more fuel-efficient equipment with lower emissions. These improvements are, however, approaching a natural limit. To echo the key message from previous surveys – the real mitigation of risk and an increase in sustainability can come only from a structural change. And this is critical – right now.

## COST OF BAD ROADS TO THE ECONOMY

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*Steyn WJvdM (University of Pretoria), Bean WL (CSIR)*

### INTRODUCTION

Deteriorating road quality can potentially have many negative effects on the vehicle maintenance costs of a company, which in turn can translate into increased logistics costs and may eventually have a negative effect on the broader economy of a country. This idea was introduced in the 2008 State of Logistics™ survey when a study was done on the potential effects of deteriorating road quality on vehicle maintenance and repair costs<sup>13</sup>. It was found that the deterioration of road quality can lead to drastic increases in vehicle maintenance and repair costs of companies.

Increased maintenance and repair costs lead to increased vehicle operating costs for transport operators. In addition, worsening road conditions could result in increased vehicle vibrations, which can eventually be translated into increased damages to transported cargo. The transport operator may be held liable for any damages during the transportation of goods. It therefore follows that on roads with deteriorating riding quality the transport operator either has to make a loss or increase transport tariffs due to the higher operating costs. Consequently, the selling price of products may increase – the increased transportation costs are either absorbed by the seller or, as usual, transferred to the consumer.

This problem can be circumvented partially in three ways:

- Improve the packaging of products being transported. This will increase the total packaging costs of the manufacturer, resulting in an increase in the total costs to the consumer. Improving or increasing the packaging material used for transported cargo could potentially increase the quantity of non-renewable packaging material used, which in turn could affect the environment negatively.
- Improve the vehicle used to transport products, which will decrease damages to transported cargo and vehicles that will be more likely to withstand bad roads. This approach needs to be applied to every vehicle used for transporting cargo and will consequently have massive cost implications for transport operators.
- The final option is to improve and maintain the condition of roads in South Africa. This alternative may potentially provide the best long-term solution, since the root of the problem is addressed as opposed to merely addressing the symptoms. However, it is important to investigate whether this alternative will be economically feasible as the costs of maintaining roads are not negligible.

The aim of this article is to refine and expand the initial and limited analysis that focused only on the potential increases in the total repair costs of suspension and trailer component breakages resulting from deteriorating road quality<sup>14</sup>.

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13 Steyn WJvdM, Bean WL and Monismith CL. 2008. The potential costs of bad roads in South Africa. 5th Annual State of Logistics™ survey for South Africa. CSIR, Pretoria. RSA

14 Ibid.

## OVERVIEW OF THE CURRENT SOUTH AFRICAN ROAD NETWORK

This section provides an overview of the existing South African road network and its condition to serve as a basis for the analysis of the problem of deteriorating road quality in South Africa.

### Condition of current road network

The South African road network can be divided into three categories, i.e. the primary, secondary and tertiary road networks. Figure 10 provides an overview of the current condition of the South African paved road network, since the majority of trucks travel on the primary and secondary networks<sup>15</sup>. The primary road network is mainly owned and maintained by the South African National Roads Agency Limited (SANRAL) and is generally in a good condition. However, the overall condition of the secondary road network proves to be a bit problematic since these roads are generally in an inadequate condition and not maintained as required.

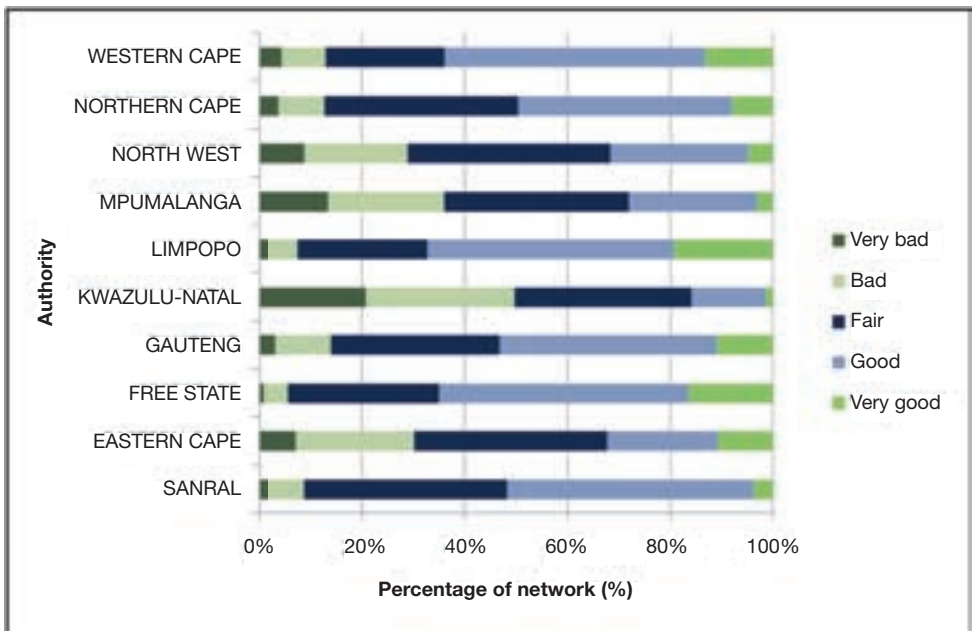


Figure 10: Summary of the South African road network condition

15 Kannemeyer L. 2009. Road Pavement Forum, Meeting address.

### **Changes in road condition over time**

The condition of a road network changes as time progresses. The trend of changes in the condition of the South African national and provincial road networks between 1998 and 2008 was investigated by deriving the changes from data available from SANRAL and provincial samples. Unfortunately, some gaps exist in the data as all the provinces in South Africa did not have the appropriate data available. It is important to focus on obtaining the appropriate data to enable a more accurate analysis of the situation in future.

During the investigation, it was found that the condition of national roads remained relatively constant whereas the condition of the secondary road network decreased over the 10-year period. When considering the percentage of bad and very bad roads in the South African road network, for the national road network this varied between 7% and 9% throughout the 10-year period. The percentage of bad and very bad roads in the secondary road network increased from 8% in 1998 to 20% in 2008.

The deterioration of the secondary road network is problematic as many deliveries are routed on these roads. It is therefore important to build a case for the effective and adequate maintenance of the secondary road network in South Africa.

### **CASE STUDY**

To understand the potential effects of bad roads on the total logistics costs of companies, a case study was conducted at two operating companies within a large logistics service provider (LSP) in South Africa. Company A transports cargo mainly on the national road network, whereas company B transports cargo on both the primary and the secondary road networks of South Africa. Data from these two companies are used to compare the effects of good and bad roads on vehicle maintenance and repair costs. Data from the first company are used to evaluate the effect of increased vehicle maintenance and repair costs on the total logistics costs of a company.

It should be emphasised that this analysis provides merely an indication of the potential effects of bad roads. The results and findings are by no means absolute, since only limited data were available and many other factors that can potentially influence logistics costs were not taken into account. An example of such a factor is the increase in vehicle operating costs and cargo damages due to road works and congestion.

### **Analysis of vehicle maintenance and repair costs on worsening road conditions**

Roughness indices are single values used to quantify the roughness level of a specific road. These indices are typically calculated using mathematical equations and measured road profiles. The International Roughness Index (IRI) is a standardised roughness measurement relating to the roughness qualities that impact vehicle response. It is widely used and is most appropriate when road roughness is looked at in relation to vehicle operating costs, riding quality, dynamic wheel loads and overall surface conditions. The IRI of a good road should typically be below 2,7. In the analysis the IRI values of the roads are used as the indication of the road condition.

The average repair and maintenance costs of vehicles of the two companies travelling on specific routes, the associated IRI of the road<sup>16</sup> and condition rating of that route can be seen in Table 2. Company A identified 10 trucks from its fleet, travelling mostly on the same route, and provided a database of actual maintenance and repair costs for these vehicles for the period January to June 2008. Company B provided a database of its actual maintenance and repair costs for a fleet of 577 trucks for the period January to September 2008, operating on a range of roads in South Africa. Typical trucks had gross vehicle masses (GVM) of around 50 000 kg and six axles. For each company, similar truck types were used to ensure that the route, and therefore the IRI, is the only factor of difference in the analysis of the individual companies.

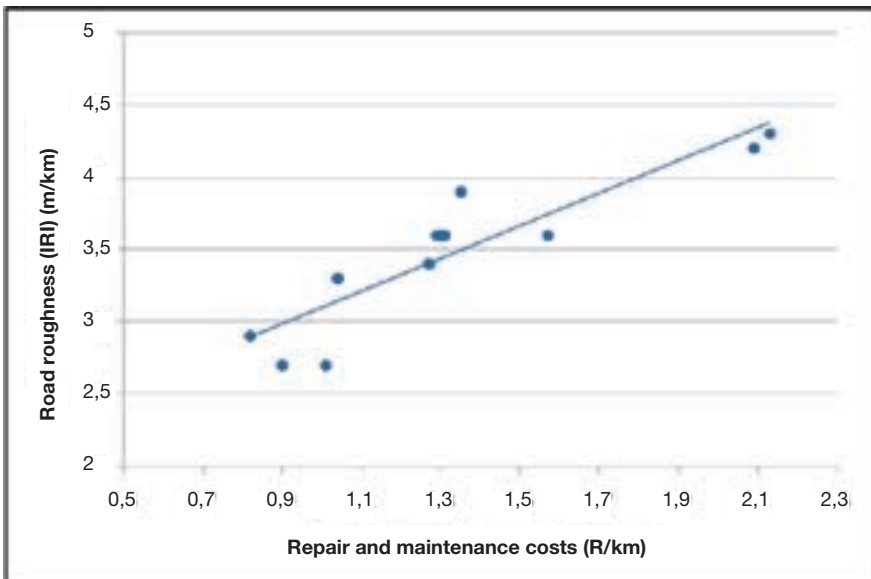
**Table 2: Summary of vehicle maintenance and repair costs for routes with different IRIs**

Company	Route information	Average IRI (m/km)	Road condition rating	Average maintenance and repair costs (R/km)
A	Gauteng to Durban (N3)	2,7	Good	1,01
	Gauteng to Cape Town (N1)	3,6	Fair	1,30
B	Gauteng to Durban (N3)	2,7	Good	0,90
	Gauteng to Nelspruit (N4)	2,9	Fair	0,82
	Gauteng to Witbank (N12)	3,4	Fair	1,27
	Gauteng to Rustenburg (N4)	3,3	Fair	1,04
	Gauteng to Richardsbay (N17 and N2)	3,6	Fair	1,31
	Johannesburg to Vereeniging (R82)	3,6	Fair	1,57
	Gauteng to Cape Town (N12 and N1)	3,6	Fair	1,29
	Gauteng to Botswana (N4)	3,9	Fair	1,35
	Newcastle to Gauteng (N11 and N17)	4,2	Bad	2,09
	Gauteng to construction sites	4,3	Bad	2,13

<sup>16</sup> IRI figures for the specific South African roads obtained from SANRAL's 2009 year-end report.

The results potentially indicate that a truck (truck 1) from Company B travelling from Newcastle to Gauteng (300 km) has on average maintenance and repair costs of R627 per trip. A similar truck (truck 2) from the same company travelling on the N3 between Gauteng and Durban for 300 km will have on average maintenance and repair costs of only R270 per trip. If we assume that both trucks make 100 round-trips a year (200 trips in total), the total maintenance and repair costs of truck 1 could potentially amount to R125 400 per year and for truck 2 it would be R54 000. This indicates a potential percentage increase in maintenance and repair costs of 132% per year when comparing a truck travelling on a bad road with one travelling on a good road for company B.

The potential increase in vehicle maintenance and repair costs as a result of worsening road conditions is provided in Figure 11. The sample correlation coefficient between the two data sets is 0,9022 indicating a strong linear relationship between road roughness and repair and maintenance costs.



*Figure 11: Potential increase in vehicle maintenance and repair costs due to worsening road conditions*

### **Impact on total logistics costs**

To investigate the impact of the increase in vehicle maintenance and repair costs on the total logistics costs of a company, a further analysis was done. Additional data were obtained from company A for two periods between January and June 2008 and 2009. The particular data required for this analysis were the total vehicle maintenance and repair costs and the logistics costs of the company for the two time periods. By using the percentage increase in truck maintenance and repair costs that can be attributed to worsening road conditions

in conjunction with this additional information, one can get an idea of the potential effects of worsening road conditions on total logistics costs.

A summary of the potential increase in vehicle maintenance and repair costs when moving from a good road condition to a fair or bad road condition, as well as the increase in the total logistics costs of a company as a result of worsening road conditions can be seen in Table 3. The estimated maintenance costs of company A varied between 7,48 and 9,01% of total logistics costs, during the specified time periods. These percentages were used to derive the potential effect that increases in maintenance and repair costs may have on the logistics costs of a company.

**Table 3: Summary of potential increases due to worsening road conditions**

Road condition	Average maintenance and repair costs (R/km)	Average percentage increase in the truck maintenance and repair costs	Average percentage increase in company logistics costs
Good	R0,96	-	-
Fair	R1,24	30,24%	2,49%
Bad	R2,11	120,94%	9,97%

The results obtained from the comparison indicate that the maintenance and repair costs of a truck increase as the condition of the road on which the truck is travelling deteriorates. When moving from a **good condition** road to a **bad condition** one, increases in vehicle maintenance and repair costs of approximately 121% can potentially be experienced. In addition, the increase in truck repair and maintenance costs due to deteriorating road conditions can potentially lead to an estimated increase of around 10% in the total logistics costs of a company.

Other costs that can potentially be attributed to deteriorating road quality are increased vehicle operating costs, increased fuel consumption, increased cargo damages and ultimately increased vehicle design and manufacturing costs. The analysis of the actual effects that road quality may have on these costs does not form part of this study. However, an increase in any of these costs can potentially lead to an increase in the internal logistics costs of companies without adding any additional value to the final product.

## CONCLUSION

The increase in internal logistics costs due to inadequate road conditions is experienced by most, if not all transportation companies in a country. This figure eventually adds up to a significant increase in the logistics costs of a country. As the logistics costs increase, the cost of products in the global marketplace increases, which can have devastating effects on the global competitiveness of that country.

Results obtained from the analyses indicate that the potential effect of deteriorating road quality on vehicle maintenance and repair costs and on the total logistics costs of a company, are significant. This could lead to unnecessary increases in the total logistics costs of a country and hamper economic growth. It is therefore vital to create awareness of the potential negative impacts of bad roads amongst stakeholders to ensure that proper attention is given to timely and proper maintenance of roads.



# CONVERTING LOGISTICS VALUE INTO A COMPETITIVE ADVANTAGE

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*De Swardt A (IMPERIAL Logistics)*

## DEFINING THE SUPPLY CHAIN

The ability to increase market share while lowering prices is the result of implementing superior logistical and end-to-end supply chain solutions and systems. Many companies have found that moving materials, components and finished products through their supply chains at a low cost helps them be more competitive. When defining a supply chain, it is imperative to remember that the supply chain begins at the point of origin for each raw material and ends at the point of consumption for the finished item. It is the supply chain network's continued challenge to add value throughout, and it remains everybody's job to reduce or eliminate waste – i.e. no and low-value-adding steps – and to assure that risks along the chain are adequately assessed, managed and reduced.

The traditional supply chain approach focuses only on the price of the item, which leads to a lack of understanding of the full supply chain costs or a willingness to explore opportunities. A comprehensive supply chain view looks at all the entries in the supply chain that modify raw materials into final products. Implementing supply chain management techniques can lead to significant improvements in service delivery and decreases in excess inventory, as well as enabling faster business growth by utilising external sources for components previously made in-house, thereby reducing capital requirements.

An effective and successful supply chain therefore links several organisations (from the suppliers' supplier to the customers' customer) to compete as a whole against other supply chains. How closely we link these various organisations to compete effectively is a key consideration. In effect, we want to create a horizontally-integrated, virtual supply chain. Customers, manufacturers and suppliers need to work together and optimise the flow of information, products, services and money for mutual benefit. The best results are usually achieved by selecting and leveraging the right strategic partners in the process.

## THE VALUE OF LOGISTICS

Is logistics a cost centre or a competitive differentiator? Is it a core competency or a function that should be outsourced?

Many chief executive officers (CEOs) have viewed logistics historically as a cost centre (trucks, warehouses, overheads, etc.), a separate business function that falls short of their 'core competency' definition. This perspective has led to the ongoing growth of the logistics outsourcing industry. This does not necessarily mean that just because a business function is not considered a core competency, or is outsourced to a third party, that it's not valued by the CEO. The true test of value is whether a CEO is willing to continue

investing in logistics, either internally — in people, technology, assets, etc. — or by developing more strategic relationships with logistics service provider (LSP) partners. If neither type of investment is taking place, there is a problem<sup>17</sup>.

If this is the case in your company, how do you explain the value of logistics to your CEO?

The common advice is to communicate the value of logistics in terms that the CEO, as well as the chief financial officer (CFO), can understand. You have to speak ‘their language’, which entails linking logistics with financial metrics. Unfortunately, many traditional logistics managers are financially illiterate, which hampers the attempt to convey the value of logistics to CEOs and CFOs. If you can’t read and understand an income statement or balance sheet, e.g. your ability to communicate the value of logistics effectively to the CEO/CFO is severely limited.

It is therefore fair to assume that placing logistics in a financial context will get your foot in the door, but is that enough?

Probably not. CEOs have a similar challenge: Most of them are supply chain and logistics illiterates. According to Rueben E Slone<sup>18</sup>, CEOs are often the weakest link in a company’s supply chain. He states: *“We advise CEOs not to become unwitting weak links in their companies’ own supply chain strategies. The costs of neglecting important matters of supply chain management are damaging to any type of business for which SCM is potentially a competitive differentiator (most notably, manufacturing, retail, and distribution). CEOs should get involved.”*

Sir William Osler, MD, the father of modern medicine, once said, *“Medicine is learned by the bedside and not in the class room. Let not your conception of manifestations of disease come from work heard in the lecture room or read from the book: see and then research, compare and control. But see first.”*

For CEOs to truly appreciate the value of logistics, they too must ‘see first’, e.g. by spending time picking goods at the warehouse; joining the delivery truck on a customer delivery; finding capacity for uncovered loads; tracking and tracing shipments; building pallets near the loading dock; by calling suppliers abroad and taking calls from customers – always answering the same question: “Where is our order?”

If getting your CEO immersed in your logistics operations is not feasible, have him/her attend a supply chain and logistics conference or short course. While not as good as ‘see first’, spending a few days with supply chain and logistics professionals, hearing case studies and discussing industry trends are still a valuable means of seeing and hearing.

How do you explain the value of logistics to a CEO? You don’t. The value has to be experienced first-hand, like getting soaked in the rain. Everything else is merely words and numbers.

17 Gonzalez A. Explaining the Value of Logistics to the CEO. Obtained from [www.logisticsviewpoints.com](http://www.logisticsviewpoints.com). Accessed 14/09/2009.

18 Executive Vice President of Supply Chain at Office Max quoted in “Are You the Weakest Link in Your Company’s Supply Chain?” Harvard Business Review. September 2007.

## LOGISTICS AND SUPPLY CHAIN MANAGEMENT OUTSOURCING

Outsourcing has indeed become popular in management literature and practice over the past two decades. The way it is implemented, however, differs from one organisation to another. Different frameworks exist for evaluating an organisation's decisions and its application and impact on logistics. Outsourcing, the practice of charging external service providers with the task of performing in-house activities, has attracted growing interest in recent years as managers consider whether it is in their best interest to perform activities in-house or externally.

The global growth is proof that outsourcing is not a fad or passing trend; the most outsourced business service globally is logistics. Outsourcing is a viable option for companies, i.e. the users of logistics services, and for LSPs. It is important to note that businesses outsource for many and varied reasons and that the associated benefits are either tangible or intangible. Reasons include to increase shareholder value, reduce costs, improve operations, overcome a lack of internal capabilities, gain a competitive advantage, improve capabilities, increase sales and therefore revenue, increase service levels, reduce inventory and/or increase inventory velocity and turns, mitigate capital investments, improve cash flow, or turn fixed costs into variable costs.

Southern African users of logistics services, in line with global trends, are seeking differentiation from competitors through superior customer service, e.g. through greater availability, reliability and responsiveness, which consistently need to be enabled at lower total costs. As higher performance from greater end-to-end supply chain integration – supported by better visibility tools – becomes more attainable, however, the approaches of LSPs diverge.

More users of logistics services are recognising that to realise the full value of the potential trade-offs from outsourcing, they need to broaden their span – from purchasing many piece-meal transportation and warehousing services, to fewer, bigger contracts with a much wider scope. The relationship must become less transactional in nature.

In response, the LSP industry has been evolving to offer greater scope and more complex solutions. However, for the more demanding customer segments – those seeking greater integration and higher degrees of process conformance – a gap often exists between user needs and provider capabilities. Often, LSPs market and represent capabilities that they have not yet implemented, so they over-promise and under-deliver. The business model of most providers traps them due to their inability to scale offerings, thus failing to generate returns that will allow them to meet the expectations of high-process conformance buyers. High-process conformance, in this context, is the ability to deliver end-to-end supply chain integration and synchronisation repeatedly for many customers, establishing *de facto* process and technology standards<sup>19</sup>.

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<sup>19</sup> Butner K, Moore D, et al. 2006. Building value in logistics outsourcing – the future of the logistics service provider industry. IBM Business Consulting Services: IBM Institute for Business Value.

For the more demanding users of logistics services, the provider model must be reinvented. Providers must innovate increasingly to profitably serve as big a footprint as possible across the large commodity segment and the growing, but more demanding, high-process conformance segments. The pay-off for LSPs is tighter integration with customers along the supply chain, delivering greater value and increased 'lock-in'. Increased complexity offers more opportunities to sustain higher margins. Success will be measured in terms of how well reliability and overall service performance are increased at a reduced total cost for their customers.

An increasingly important criterion for users of logistics services will be the ability to obtain more global sources of supply and customers' own outsourcing of manufacturing and other activities. The extended logistics network will require visibility from the off-shore manufacturer to final consumption, with synchronised and blended service level attainment. The battle among providers will be for the middle ground – for the more demanding users who tactically outsource while continuing to retain planning and control in-house. The journey towards value starts with having strategic clarity about the market segments in which to participate – and how – profitably.

The future LSP industry will be more global, more concentrated, more segmented around customer types and universally better at execution. Business processes will be standardised and systems integrated. There will be better visibility of end-to-end supply chain information, and integration with partners and customers. Providers can also develop a single view of their larger global customers<sup>20</sup>.

## THE IMPORTANCE OF SUPPLY CHAIN VISIBILITY

The recession and credit crisis have thrust supply chain visibility – and the need to gain greater visibility and control over inventory and landed costs within the global supply chain – to the top of the corporate agenda<sup>21</sup>.

*“The economy, global competition, ongoing business transformation, and the increased lead times/complexity of global supply chains are creating a situation where pipeline inventory and landed costs per unit handled have increased dramatically,”* says Bob Heaney, senior research analyst, Aberdeen Group. *“But before you can reduce pipeline inventory or landed cost you need visibility to them. Our survey of 209 companies provides insight into how today’s leading companies are deploying best practices to achieve granular visibility across multiple tiers of their supply chains and to utilize automation to create supply chain management processes that are strategic, responsive, and more cost-efficient than before.”*

For example, leading companies have responded to these challenges and have:

- Decreased total landed costs by 5,5 % per unit in the past year, compared to a 7,3% increase for Laggards over the same time.
- Decreased the frequency of out-of-stock inventory by 7,3% compared to a 3,5% increase for Laggards over the previous year.

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<sup>20</sup> Ibid.

<sup>21</sup> Supply Chain Visibility Excellence: Reduce Pipeline Inventory and Landed Cost. The Aberdeen Group. 2009.

As the degree of global collaboration grows and global supply chains become even more complex, it is likely that visibility systems will continue to be a collection of discrete systems, with leading companies most successful in integrating them and gaining a more end-to-end and close-to-real-time visibility of their supply chain operations. The report is a 'must read' as it examines the capabilities that top performing companies are deploying and strategic alliances they are using to capture, integrate and optimise the myriad supply chain events of their overall global enterprise. These are the kinds of best practices that southern African businesses need to consider to reduce total landed costs. This kind of behaviour will also be required to contribute towards an overall reduction in systems costs in the region to contribute towards greater global competitiveness.

## SKILLS SHORTAGES, DEVELOPMENT AND TALENT MANAGEMENT

Much has been written about skills shortages. We are not just short of people with skills, but of people with the right skills: People who link their functional role and activities to the needs of the supply chain within which they operate. We certainly need to work much harder at attracting 'new blood' into logistics and portray it to young people as attractive, interesting, and important as it truly is. Simultaneously, we need to develop 'supply chain thinking' in all those who work in logistics, be they a CEO of a retailer or manufacturer, or a warehouse or transport manager.

Logistics can be defined in three ways. Some are the logistics activities covered by the 'function' – activities that are the responsibility of the logistics manager or director. The second definition is the 'sector' – those companies that provide services in logistics. The third definition of logistics is the 'management of the supply chain'. The last is the most powerful, as that is the professional definition rather than the 'sector' or 'functional' one and this is where skills development should focus. In this way we will embrace the needs stemming from the first two definitions, while also tackling the wider challenges of raising the profile and skills set of logistics across the whole value chain. This will improve the performance of all value chain players and the global economy in which we all operate.

So, what is 'logistics' in terms of the third definition? It's the management of the supply chain from end to end. As highlighted earlier, we should think of the end-to-end supply chain, because our success ultimately depends on the success of this supply chain of which we are only one part. This requires both a strategic and operational approach, which is a big agenda in terms of addressing global skills shortages.

If these skills shortages go unchecked, we just won't be able to compete. We won't be able to work effectively within organisations to ensure that functions work together seamlessly. We will not be able to work effectively across organisations to ensure that businesses collaborate for their own and the common good. Companies are totally dependent on their supply chain partners. They should be thinking "If they fail, we fail". We will also not be able to work effectively as an economy to ensure that we leverage the supply chain, not only to reduce costs and improve competitiveness, but also to improve customer service and add value and growth to the top line.

However, it is not only about attracting the right skills into the logistics industry. Talent management is the key to higher earnings, a more efficient company and a smoother running supply chain<sup>22</sup>. The Hackett Group recently released the results of a three-year study that focused on more than 60 companies. The results show that companies with “*mature talent management capabilities*” have 18% higher earnings than most Global 1 000 companies, as well as significantly higher net profit margins and higher returns on equity and assets.

The Hackett Group says that companies with “*mature*” talent management understand that three specific tasks are needed, namely ensuring that the company’s core talent processes are well-defined, making full use of the company’s culture and organisation, and utilising the latest technology. Stephen Joyce, the Hackett Group’s human resources advisory practice leader, says too many companies are using software for recruiting, performance management and other functions, and that software is the quick-and-dirty solution that many companies believe to be a “*silver bullet*” that will fix all their problems. “*Some organizations start with technology to solve a problem, and that’s absolutely the wrong way to do it,*” says Joyce.

According to the research, companies that really want to be talent management leaders need to embrace the other two tasks. Numerous companies recently underwent lay-offs, with the initial reaction of assigning work previously handled by laid-off employees to those who are still employed. According to the study, this is a mistake. Corporate leaders need to eliminate redundant processes, not just redundant positions, and learn how disparate, siloed parts of the company work together. “*Technology is a tool,*” says Joyce. “*It’s an enabler. It needs to support the business direction and business objectives, not lead them.*”

## FINAL THOUGHTS

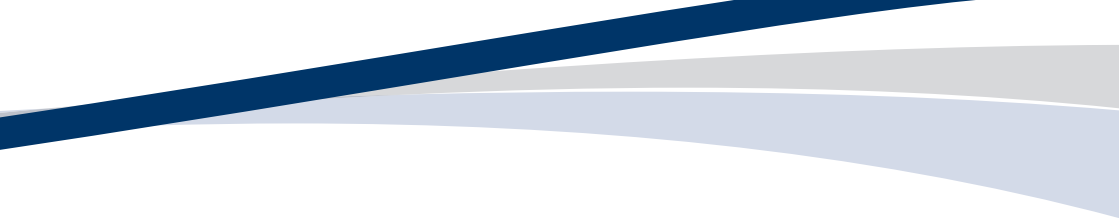
Today’s managers are seeking more sophisticated supply chains that will help sustain a competitive advantage with multiple performance goals, according to the Supply Chain Management 2010 and Beyond, a four-year research initiative comprising surveys and workshops<sup>23</sup>.

Participants found that supply chains can be designed for six basic outcomes: costs, responsiveness, security, sustainability, resilience and innovation. Once a preferred outcome is chosen, it impacts supply chain practices and characteristics. Each outcome has a corresponding set of specific design traits. These traits need not be present in each and every link, but at least somewhere in the supply chain. Outcomes should be blended wherever possible, which helps differentiate a supply chain from that of its rivals. However, it is important not to focus excessively on any single outcome. Some combinations are complementary, e.g. cost-focused supply chains that can be transformed into sustainable supply chains because of similar underlying tools and processes. If a supply chain is developed to boost responsiveness and resilience, it may be challenging to focus on measuring and rewarding costs. While conventional supply chains were price-driven and decoupled in the past, today’s supply chains are value-driven and strategically coupled.

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22 Murphy S. Study: Leaders Have Better Talent Management Skills. Supply Chain Management Review. December 2009.

23 Langdon B. Supply Chains — Seeking a New Strategic Advantage. CMA Management. December 2009.



History has shown that one size does not fit all and that future supply chains must first and foremost be tailored to the end-user. In today's world, low costs can typically be replicated readily and thus be unlikely to lead to a competitive advantage over the long term. Supply chain managers will succeed only if they understand the needs of key customers and strive to maintain alignment between the supply chain's design and its customers' changing needs and desires. To paraphrase Charles Darwin, *"It is not the strongest that survives, it is the most adaptable to change"*.

# DEVELOPING A SOUTH AFRICAN PARADIGM OF HUMANITARIAN LOGISTICS

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Viljoen NM (CSIR)

## INTRODUCTION

An increase in the frequency and impact of the broad range of events that has come to be included in the term ‘disasters’ has catapulted disaster management to prominence as an international strategic imperative. A primary constituent of disaster management is the management of the relief supply chain, which is often referred to as ‘humanitarian logistics’. Kovács and Spens<sup>24</sup> state that humanitarian logistics accounts for 80% of disaster relief activities. According to Van Wassenhove<sup>25</sup>, the attention given to understanding and developing the field of humanitarian logistics – practically and academically – in the past century did not do justice to its importance and complexity.

However, the past decade witnessed a change in this trend as humanitarian logistics became more popular through academic and mainstream publications, conferences, special editions of prolific journals dedicated to the topic and the inclusion of humanitarian logistics in academic curricula.

Disasters are commonly categorised by the schema presented in Figure 12.

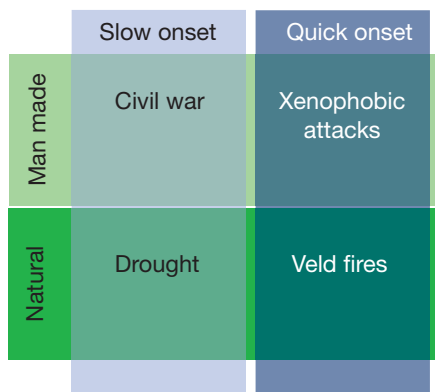


Figure 12: Schema for classification of disastrous events

24 Kovács G and Spens KM (2007). Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management*. 37(2): 99–114.

25 Van Wassenhove LN (2006). Humanitarian aid logistics: supply chain management in high gear, *Journal of the Operational Research Society*. 57: 475–489.



The widely accepted disaster life cycle comprises four phases: mitigation, preparedness, response and rehabilitation<sup>26</sup>. The **mitigation phase** refers to the continual application of measures to prevent the onset of a disaster or reduce its impact<sup>27</sup>. Examples would be conflict intervention or agricultural strategies to improve food security in vulnerable areas. Perry and Lindell<sup>28</sup> describe **preparedness** as the readiness of a country or organisation to respond constructively to disastrous events in a way that effectively reduces the negative impact on the health and safety of individuals and the integrity of physical structures and systems. A classic measure taken to increase preparedness is the stockpiling of food and medical supplies to shorten delivery lead times in the event of a disaster. The **response phase** encompasses all operations required to assist all victims and neutralise any imminent threat. These activities are often recalled more vividly by the public as they get extensive media coverage.

The variation in intensity of aid as the response to a disaster progresses is illustrated in Figure 13<sup>29</sup>.

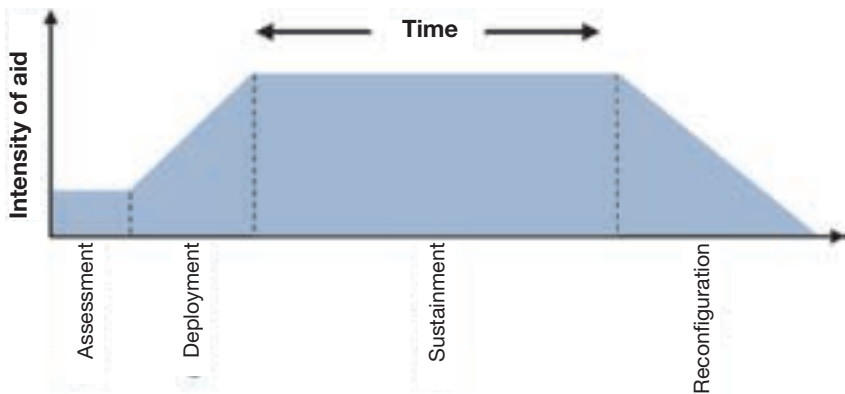


Figure 13: Variation in intensity of aid as the response to a disaster progresses

Lastly, the **rehabilitation** or **recovery phase** takes place after the immediate impacts of the disaster have been dealt with. It comprises the long-term actions taken to stabilise the community and restore a sense of normalcy<sup>30</sup>.

26 Van Wassenhove LN (2006). Humanitarian aid logistics: supply chain management in high gear, Journal of the Operational Research Society. 57: 475–489.

27 Altay N and Green WG III (2006). OR/MS research in disaster operations management, European Journal of Operational Research. 175: 475–493.

28 Perry RW and Lindell MK (2003). Preparedness for emergency response: Guidelines for the emergency planning process. Disasters. 27(4): 336-350.

29 Adapted from: Beamon BM (2004). Humanitarian relief chains: Issues and challenges. 34th International Conference on Computers and Industrial Engineering. San Francisco, USA. 14 – 16 November.

30 Altay N and Green WG III (2006). OR/MS research in disaster operations management, European Journal of Operational Research. 175: 475–493.

The relief efforts surrounding the recent earthquake in Haiti can be categorised according to these four phases. An earthquake of magnitude 7 devastated Haiti at 16:53 local time (21:53 GMT), 12 January 2010, due to a rupture in the Enriquillo-Plantain Garden fault zone. Scientists have been predicting the possibility of an earthquake around the magnitude of 7.2 in this geographical vicinity since 2006<sup>31</sup>. Although nothing could have been done to stop the earthquake, authorities could have forced people to move away from the vicinity. This would have classified as disaster **mitigation**.

Knowing that an earthquake was imminent, the Haitian government and relief organisations could also have stockpiled relief supplies in warehouses in the vicinity to allow for rapid distribution to victims. This repositioning of relief supplies would have constituted disaster **preparedness**. Most of the activity reported via the media discusses efforts to rescue victims from rubble or distributing aid to those left homeless. All these efforts are classified as disaster **response** activities. Plans to repair and rebuild infrastructure such as roads, water supply and electricity in Port-au-Prince aim to restore the city to its previous state and is therefore called disaster **recovery**. Each disaster can be analysed according to the phases of the disaster life cycle.

## CHARACTERISTICS OF HUMANITARIAN SUPPLY CHAINS

Disasters affect all sectors of life, putting in motion response activities across the continuum between commercial and welfare entities. Therefore, classifying the activities executed in the wake of a disastrous event that qualify as 'humanitarian' requires evaluation against certain criteria. Figure 14 represents the three criteria of humanity, neutrality and impartiality and how these form the boundaries of the humanitarian space.

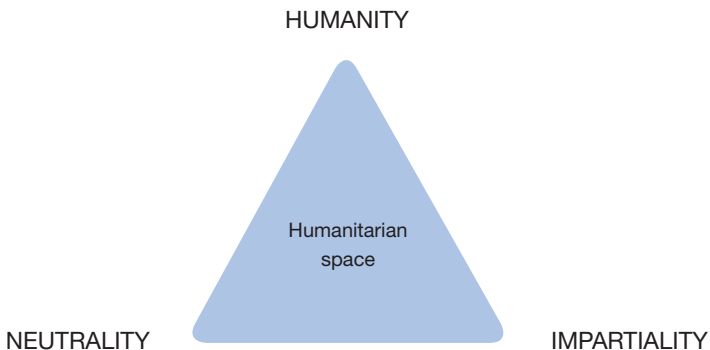


Figure 14: Criteria that delineate the humanitarian space<sup>32</sup>

31 Mann P, Calais E, Demets C, Prentice CS and Wiggins-Grandison M, 2006. Enriquillo-Plantain Garden strike-slip fault zone: A major seismic hazard affecting Dominican Republic, Haiti and Jamaica. Available: [http://www.ig.utexas.edu/jsg/18\\_cgg/Mann3.htm](http://www.ig.utexas.edu/jsg/18_cgg/Mann3.htm). Accessed 27 January 2010.

32 Maspero EL and Ittmann HW (2008). The rise of humanitarian logistics, Paper presented at the 27<sup>th</sup> Annual Southern African Transport Conference, South Africa.

Humanity implies that anyone in need will be assisted, regardless of where and in what state they are found. When rescue workers discover that someone is trapped below a mountain of debris after an earthquake, they will do everything in their power to free the person – even if they suspect that the person may be dead by the time they do. This is termed humanity as the decision to assist someone disregards whether or not they are dying. Secondly, neutrality states that those assisting will not influence the outcome of conflict through their intervention (there is no political agenda). A prime example of neutrality would be the operations of medical relief organisations in the Darfur region during the civil war. Their aim was solely to provide medical assistance to anyone who needed it without choosing sides or influencing any party to the war.

Lastly, impartiality vows not to favour one group of beneficiaries above another. The xenophobic attacks that started on 12 May 2008 in the Alexandra townships left many foreigners wounded and destitute. Relief agencies provided the same level of assistance to people from various nationalities, regardless of whether or not they were illegal immigrants. Their impartiality was illustrated by neither favouring legal immigrants over illegal immigrants, nor Malawians over Zimbabweans.

In literature, the humanitarian sector has been compared famously to the commercial sector to highlight the blatant differences in both the context and operations of their supply chains<sup>33, 34, 35, 36</sup>. Some authors have even assessed the similarities between these supply chains, seeking ways to translate efficiencies from the commercial sector to the humanitarian sector<sup>37</sup>.

While the humanitarian and commercial sectors are, for all practical purposes, regarded as opposites, the humanitarian and military sectors are regarded as cousins. When considering military activities – peace-keeping missions in particular – the boundaries between the two sectors blur. Consequently, it is expected that many similarities can be drawn between these two sectors, creating opportunities for the transfer of knowledge and expertise.

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33 Beamon BM (2004). Humanitarian relief chains: Issues and challenges. 34<sup>th</sup> International Conference on Computers and Industrial Engineering, San Francisco, USA. 14 – 16 November.

34 Maspero EL and Ittmann HW (2008). The rise of humanitarian logistics, Paper presented at the 27<sup>th</sup> Annual Southern African Transport Conference, South Africa.

35 Olorunfoba R and Gray R (2002). Logistics for humanitarian aid: a survey of aid organisations, in Griffiths J, Hewitt F and Ireland P (eds). Proceedings of the Logistics Research Network 7<sup>th</sup> Annual Conference. Birmingham.

36 Olorunfoba R and Gray R (2003). Humanitarian Aid Organisations and Logistics. The Institute of Logistics and Transport. Corby.

37 Olorunfoba R (2009). On Relief and Supply Chain Similarities. Beresford A, Evans B, Marlow P, Mason R, Naim M, Pettit S and Potter A (eds). 14<sup>th</sup> Annual Logistics Research Network Conference. Cardiff. 9 – 11 September.

Authors have gone to great lengths to characterise the context and operation of humanitarian logistics. For the sake of brevity the reader is referred to the literature for the clarification of the following summarising statements<sup>38, 39, 40, 41, 42, 43</sup>.

Humanitarian logistics is characterised by:

1. Multiple stakeholders with individual political, social, economic or religious agendas. These agendas are often totally opposed.
2. Lack of professionalism due to a lack of formalised training and high staff turnover.
3. Great uncertainty with regard to
  - a. the occurrence of disastrous events
  - b. quantity and composition of demand generated by events
  - c. origin, volume and composition of donations.
4. Lack of institutionalised knowledge, knowledge sharing and data management.
5. Lack of collaboration and cooperation between relief agencies.
6. Outdated systems, techniques and equipment.

## THE NATURE OF SOUTH AFRICAN DISASTERS

Considering that South Africa is not plagued by internationally-notorious disasters such as war, hurricanes, earthquakes or tornadoes, it is tempting to assume that the need for disaster management (and therefore humanitarian logistics) is not as great. However, South Africa is indeed harried by many disasters – some deceptively subtle.

It is easy to accept that floods, droughts, fires, hailstorms, xenophobic attacks, outbreaks of communicable diseases and the HIV/Aids pandemic qualify as disasters – each fitting into a specific quadrant of the schema in Figure 12. But what about crime, illiteracy, unemployment, the increase in orphaned and vulnerable children and violence against women and children? Such matters are often regarded as social or economic development issues, not man-made disasters. However, these cause severe distress and injury to a significant proportion of the South African public and have a detrimental effect on the national economy.

Given their prevalence in South Africa and the related costs to the country the argument is sustained that these matters be regarded as equally slow-onset, man-made disasters and as issues of social and economic development. This then implies that operations conducted to remedy these matters are akin to disaster

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38 Balcik B and Beamon BM (2008). Facility location in humanitarian relief. *International Journal of Logistics: Research and Applications*. 11(2): 101–121.

39 Beamon BM (2004). Humanitarian relief chains: Issues and challenges. 34<sup>th</sup> International Conference on Computers and Industrial Engineering. San Francisco, USA. 14 – 16 November.

40 Gustavsson L (2003). Humanitarian logistics: context and challenges. *Forced migration review*. 18: 6–8.

41 Maspero EL and Ittmann, HW (2008). The rise of humanitarian logistics, Paper presented at the 27<sup>th</sup> Annual Southern African Transport Conference, South Africa.

42 Sheu J (2007). Editorial. *Transportation Research Part E*, 43(6): 655–659.

43 Van Wassenhove LN (2006). Humanitarian aid logistics: supply chain management in high gear. *Journal of the Operational Research Society* 57: 475–489.

management. Consequently, supply chain activities required for these operations can be regarded as humanitarian logistics.

Practically, the inclusion of operations targeting social and economic development issues in the scope of humanitarian logistics magnifies its importance greatly. Not only does humanitarian logistics now refer to disaster management operations focusing on widely accepted 'disasters' (of which South Africa experiences relatively few), but also the daily operations of a myriad non-profit organisations and corporate social investment (CSI) initiatives that target illiteracy, unemployment and crime, poverty alleviation and abuse.

A case study from recent work conducted by the CSIR substantiates the argument that logistical activities required to target matters that are not considered 'disasters' *per se*, but still fall into the humanitarian space (Figure 14), should be considered as humanitarian logistics. The South African Breastmilk Reserve (SABR) supplies pasteurised donor breast milk (DBM) to premature infants whose mothers are unable to lactate. This service protects hundreds of infants annually against the fatal threat of necrotising enter colitis (NEC) and other infections. Within the parameters stated by the Medical Advisory Board, the SABR distributes DBM to premature infants regardless of whether they are in public or private hospitals and regardless of race and gender. The SABR's operations can thus be regarded as impartial. The SABR educates mothers about the different feeding choices available for infants, at no point advocating the use of one feeding choice above the other. They are, therefore, also neutral. Lastly, the SABR will distribute DBM to an infant whether or not that infant is clearly already dying from NEC. Therefore, their operations also demonstrate humanity. Considering this, it is clear that the SABR operates within the humanitarian space. It can thus be concluded that the logistics of moving DBM through the SABR network is indeed humanitarian logistics.

The proposed South African paradigm is one that qualifies operations as humanitarian based on the degree to which these operations fall within the humanitarian space and not necessarily whether these operations are in response to events that are unmistakably defined as disasters. This slight shift in paradigm refocuses popular humanitarian research questions, thus promoting the relevance of the development of theories and solutions to the South Africa context. Combining concepts of disaster management with those of social and economic development and corporate social responsibility (CSR) could provide solutions that harness economies of scale, political willpower, public interest and support from a larger forum of stakeholders.

## RESEARCH GAPS

Oloruntoba<sup>44</sup> comments that, internationally, the current state of academic discourse in the field of humanitarian logistics is characterised by a lack of practical research, making it difficult to develop frameworks in a deductive, organised and systematic way. More often than not research is based on conceptual ideas and anecdotal evidence. The author suggests that the difficulty of obtaining accurate field data and the recent emergence of the research area are causes of the current situation. The need exists for formalised case studies and action research.

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44 Oloruntoba R (2009). On Relief and Supply Chain Similarities. Beresford A, Evans B, Marlow P, Mason R, Naim M, Pettit S and Potter A (eds). 14<sup>th</sup> Annual Logistics Research Network Conference. Cardiff. 9 – 11September.

While international research in humanitarian logistics may be experiencing an imbalance between concepts and theories based on practical research and those based on anecdotal research, it is still striding ahead of the scant body of knowledge regarding South African humanitarian logistics. Inroads have been made by organisations such as *Triialogue*<sup>45</sup>, which conducts annual research in the CSI arena. However, the research canvas of humanitarian logistics, viewed from the paradigm discussed in this article, is mostly blank. A multitude of research opportunities exists in both inductive theory development and action research.

## CONCLUSION

Disaster management and thus humanitarian logistics have risen to prominence as a strategic imperative in the past decade due to the frequency and impact of recent disastrous events. Internationally, humanitarian logistics is considered as the sum of all logistical activities performed, in support of the disaster life cycle, which fall within the humanitarian space. However, events are usually considered disastrous only if they can be classified strictly and unambiguously according to the schema in Figure 12.

It is argued that the scope of humanitarian logistics in the South African context should be expanded to include activities executed by non-profit organisations and CSI initiatives to target social and economic development issues such as illiteracy, crime, abuse, unemployment and the increase in orphaned and vulnerable children. This argument is substantiated by the magnitude of the negative impact these matters have on the population and the national economy. A case study of the SABR shows how the degree to which operations fall within the humanitarian space – and not whether these operations are in response to a *prima facie* ‘disaster’ – should qualify it as ‘humanitarian’. This shift in paradigm refocuses the popular research questions in the field to enhance their relevance to the South African context – which will make research outputs more practicable and useful.

Many research gaps exist in the international body of knowledge regarding general humanitarian logistics, but even more so in the South African context. Research opportunities abound in both theory development and action research.

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45 Available at <http://www.trialogue.co.za/>.

# GREEN LOGISTICS AND SUSTAINABILITY

Schoeman C (CSIR), Sanchez-Rodrigues V (Cardiff University)

## BACKGROUND

As reported in the 2008 State of Logistics™ survey, transport is the fastest growing green house gas (GHG) emitting sector in South Africa. Up to 75% of most local operating companies' carbon footprints come from transport and logistics<sup>46</sup>. Figure 15 illustrates that the average volume of fuel consumed per capita in South Africa's transport sector is much higher than the world average<sup>47</sup>. This is partly due to the country's logistically-challenged distribution of industry and population, where a large concentration of the production sector and consumers is situated 600 km from the coast.

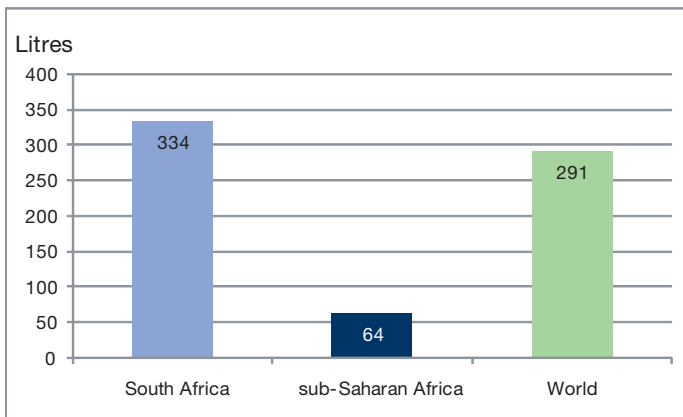


Figure 15: Transport sector fuel consumption per capita

This adds a substantial (mostly road) transport leg to deliveries, requiring additional energy (fuel) and resulting in both economic (fuel costs) and environmental (GHG pollutant) externalities. Yet in its Energy Efficiency Strategy of 2005, government advocates a 9% final energy demand reduction for the transport sector by 2015<sup>48</sup>. The perception persists that conforming to such green measures will result in reduced profit margins, by increasing the cost burden faced with new eco-friendly equipment and technology, and additional process measures. However, the case study described here illustrates a way of addressing unnecessary fuel consumption and accessing green (CO<sub>2</sub> reduction) and gold (cost savings) benefits through the reduction of uncertainties resulting in 'extra kilometres'.

46 Van Kerken O and Katz V (2008), Sustainable Supply Chains. Paper presented at SAPICS Conference.

47 International Road Federation (IRF) 2008.

48 Xia X. (2008) Energy Optimisation in Residential, Industrial, Building, and Transportation Sectors – A Control Engineering Approach Presentation at the TransportSig Forum.

## GREEN-GOLD CASE STUDY:

The diagnosis and impact of ‘extra kilometres’ on the sustainable performance of a major South African FMCG company’s supply chain<sup>49</sup>

### Introduction

Cardiff University, IMPERIAL Logistics and the CSIR partnered in this case study on the South African fast moving consumer goods (FMCG) industry to assess the impact of extra kilometres on the supply chain. This includes its effect on both the environment (green) and the bottom-line (gold) and to analyse the causes of extra kilometres travelled with the aim of informing better supply chain decision making.

Extra kilometres can be defined as the difference between the number of kilometres vehicles actually run, and the kilometres they would have needed to run if transport planning was undertaken with accurate and timely information on the volumes to be moved, and/or no operational failures disrupting the delivery process. The economic impact of these extra kilometres can be described in terms of additional fuel needed to complete a delivery, and the environmental impact in terms of more CO<sub>2</sub> produced.

Strong parallels exist between this extra distance moved and the concept of non-value adding transport in the lean manufacturing literature. Figure 16 illustrates how this measure can be linked directly to non-value adding transport kilometres.

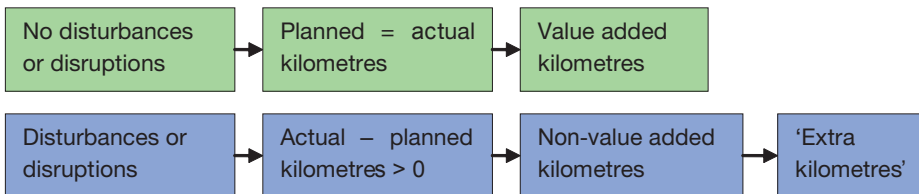


Figure 16: Value added and non-value added kilometres

Previous research by Cardiff University in the UK indicated that the difference between the ideal and the actual kilometres run was the result of various causes of uncertainty which impact on the sustainable performance of the supply chain. Through focus groups involving a range of industrial sectors, the main causes of transport uncertainty were identified as delays within the supply chain; variable demand and/or inaccurate forecasts; lack of supply chain coordination; and delivery restrictions<sup>50</sup>.

49 For related articles see Sanchez-Rodrigues V *et al* (2009). Diagnosis of ‘extra distance’ in the South African FMCG Retail Sector. Proceedings of the 20<sup>th</sup> International Conference on Production Research, Shanghai, 2 – 6 August and Schoeman C and Sanchez-Rodrigues V. Green Supply Chain Overview and a South African Case Study, (2009). Proceedings of the South African Transport Conference.

50 Sanchez-Rodrigues V, Potter A, Naim MM (2007). Determine the uncertainties hindering sustainability in the UK transport sector. Proceedings of the 12<sup>th</sup> Logistics Research Network Conference, Newcastle, 5 – 7 September, pp. 359-364.



The South African case study set out to identify the uncertainty-causes and quantify the consequences of these in terms of resulting extra kilometres in the supply chain of a major FMCG company in South Africa.

### **Context and methodology**

The concept of extra kilometres was applied to the company's secondary distribution network – consisting of three distribution centres (DCs) servicing over 200 stores throughout the country. (Secondary distribution implies the transport link between the DC and the store – as opposed to primary distribution which takes place between the supplier and the DC). The warehousing operation is managed by the client, while the transport operations within this network are outsourced to a logistics service provider (LSP).

The extra kilometre data used for the analysis were gathered from distance-based archival data and focused on the two major DCs in Johannesburg and Cape Town. A week in January 2009 was selected, which represented a typical or average week and a fair sample of what happens over a one-year period.

Attribute-based sampling was used to find incidents with the common attribute of causing extra kilometres. These extra-kilometre-originating incidents were identified and captured from the following reports:

- Johannesburg
  - » The additional volume report (which summarises the extra trips run due to short-notice volume increases);
  - » The summarised extra trip report (which sums up the additional runs due to operational failures at the DC, stores and within the delivery process).
- Cape Town
  - » The report encapsulating service levels and delivery performance for the operation.

An Excel spreadsheet was used to capture detailed information on the trips that contained an extra kilometre incident. This included store location; kilometres run; extra kilometre source; and visible cause. Interviews were conducted with managers and transport planners from both the LSP and the client to confirm the accuracy of the data collected and to understand the root causes of extra kilometres. Incidents were then categorised according to their causes and quantified as follows:

- The number of extra kilometres originated by each supply chain uncertainty-source was calculated.
- For each source of extra kilometres, frequency and impact were determined.
- The costs and carbon emissions of extra kilometres originated by all the uncertainty sources were estimated using the average running cost per kilometre and the average fuel consumption given by the LSP.

Thereafter, the week's extra kilometres were extrapolated to annual estimates. These results were used to perform risk assessments. Finally, recommendations were made regarding informing better supply chain decision making.

### Results and analysis

Table 4 summarises the overall impact of extra kilometres on the two secondary DCs in a typical week. The Johannesburg facility represents just over 80% of the total kilometres run between the two DCs. Extra kilometres account for 6,35% of the total kilometres run and the rest are value-added kilometres. The total extra kilometres represent R170 859 additional costs and 20 600 kg additional CO<sub>2</sub> pollution.

**Table 4: Impact of extra kilometres on two secondary DCs in a typical week**

	Johannesburg	Cape Town	Overall
Total kilometres run	172 000 km	35 000 km	207 000 km
Extra kilometres	11 538 km	1 605 km	13 143 km
% Extra kilometres	6,71%	4,59%	6,35%
Costs of extra kilometres	R149 994	R20 865	R170 859
Kg of CO <sub>2</sub> due to extra kilometres*	18 100 kg	2 500 kg	20 600 kg

\*Calculated as follows: Extra km \* Average fuel consumption (ℓ/km) \* UK Defra factor (which is 2,63)

The four main causes of extra kilometres were found to be DC failures, short-notice volume increases from the client, client-planned volumes more than actual, and vehicle size less than planned, as depicted in Figures 17 and 18.

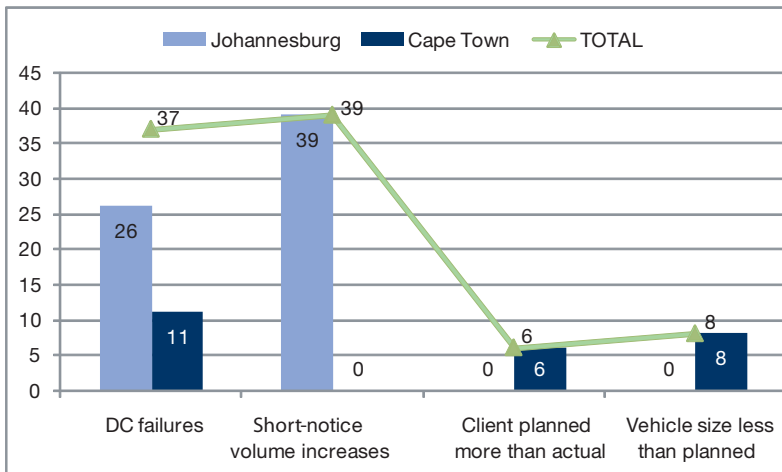


Figure 17: Number of incidents creating extra kilometres per category

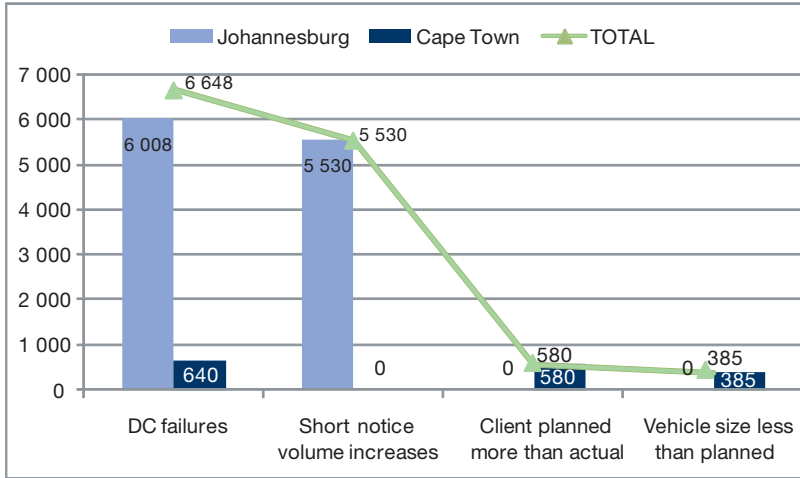


Figure 18: Amount of extra kilometres created per incident category

From the two graphs it is clear that the two main causes of extra kilometres are DC failures and short-notice volume increases from the client. Together they account for more than 90% of the extra kilometres.

DC failures were found to be the largest source of extra kilometres (345 696 extra kilometres annually) and therefore additional CO<sub>2</sub> pollution (10 415 kg). According to the staff involved this source of extra kilometres is caused by picking delays due to a shortage of staff to pick the products.

Short-notice volume increases (mostly in long-life products) were the second major source of extra kilometres found and significantly the most frequent source. It was responsible for 287 560 extra kilometres annually resulting in 8 663 kg of CO<sub>2</sub> pollution. According to the LSP staff involved, this issue occurs primarily since the demand forecast of volumes to be moved, which is managed by the client, is not accurate enough.

The other two sources of extra kilometres occurred only at the Cape Town DC where significantly fewer kilometres are run, and therefore have only a marginal impact on overall results. Planned volume that are more than actual represent 4% and vehicle size that is less than planned represents 3% of the total extra kilometres found.

The planned volumes are more than the actual volumes since the client over-plans the resources to have more flexibility during the delivery process. However, the fact that the client creates an artificial need for spare capacity has a knock-on effect on vehicle capacity utilisation. Between three and six vehicles a day have less than 30% capacity utilisation. Therefore, the transport network can be optimised better if volumes were more accurate.

The vehicle size is less than planned primarily due to breakdowns of vehicles returning from store deliveries. When there is a breakdown of a vehicle and only a smaller vehicle size is available, one needs to use two vehicles instead of one.

Risk can be measured in terms of an outcome and probability – if the frequency of an event is low but its outcome can have a highly-detrimental impact on the supply chain, the occurrence of such an event represents a considerable risk to the supply chain. Due to their high impact and medium probability of occurrence, both these sources of extra kilometres constitute a high risk and need to be monitored and controlled closely.

One DC failure incident generates on average some 185 extra kilometres and occurs about 1,85% of the time, or approximately five times a day. The picking process in the DC should therefore be evaluated and re-engineered to reduce this extra kilometre source.

One short-notice increase in volume incident originates on average just over 142 extra kilometres and happens around 1,75% of the time, approximately five times a day. This extra kilometre source is caused by inaccurate volume forecasts, hence to minimise it the product demand forecast process needs to be revised.

This risk assessment was discussed with the client and LSP management to inform future decision making.

## Recommendations

This case study defined extra kilometres as any non-value added kilometres run within a distribution network. The extra kilometre assessment applied can be used as a diagnostic tool in other transport operations to assess the efficiency of the transport function within distribution networks in terms of extra kilometres, or unnecessary vehicle usages. It can also be used to determine the causes of unnecessary kilometres and estimate the risk that these represent – in this way, a more explicit link can be made between supply chain uncertainty and deviations in transport execution/performance.

According to the South African case study findings the extra/non-value adding kilometres account for more than R8,88 m additional costs and 1 071 additional tons of CO<sub>2</sub> pollution annually. The two main extra kilometre sources found are distribution centre failures and short-notice volume increases. To reduce extra kilometres, the LSP and the client need to collaborate to find mechanisms for improving the volume demand planning and product picking processes.

The transport operation being run by the LSP and the client running the DC could present a significant barrier between the two supply chain functions. Both companies therefore need to review the warehousing process jointly to improve the coordination between the DC and the transport network, and the process of demand management from the client's network to the LSP. While this active collaboration process will provide overall supply chain benefits, these may not be evenly distributed between the parties. Beier (1989)<sup>51</sup> has argued

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51 Beier F (1989). Transportation contracts and the experience effect: a framework for future research. *Journal of Business Logistics*, Vol. 10 No. 2, pp. 73-89.

that the shipper, carrier and customer should work together and share benefits through a concept termed the logistics 'triad'. This would enable all to benefit from a reduction in extra kilometres.

Before embarking on any extra kilometre reduction programme, the LSP should monitor extra kilometres for a longer period of time. The findings are based on data gathered over a fairly average week, therefore the exercise needs to be extended to verify findings before basing future decision making on these results.

The extra kilometre tool needs to be tested further in other transport operations and industries. However, since information on the efficiency of transport operations vary from company to company, it is necessary to review how information on the efficiency of the transport function is recorded by each company before applying the extra kilometre tool in order to gather data in the most effective way.

## CONCLUSION

With transport being a substantial contributor to GHGs, supply chains can have a significant effect on sustainability by analysing the uncertainty causes and measuring the impact of variables (such as extra kilometres) that influence resource usage (e.g. fuel) and emissions. The aim is to inform better supply chain decision making.

The drive towards green supply chains does not need to be a financial burden, since principles of optimally managed resources, energy and waste reduction have decreasing cost implications. Not only do green strategies speak directly to the bottom-line, but they can also provide a competitive advantage as consumers and regulation start demanding greener products and manufacturing practices.

This case study illustrates opportunities to increase value and save money by reducing energy consumption and waste, and improving efficiencies and performance leading to return on green investment (ROGI).

## PROFILE OF IMPERIAL LOGISTICS

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IMPERIAL Logistics is one of three divisions of the IMPERIAL Group, a diversified international industrial services group with an impressive blue chip customer base. IMPERIAL entered the South African logistics and transport market in 1975 with a small fleet of light commercial vehicles, which were principally rented to clients and utilised to distribute food and fresh produce to restaurants. Today IMPERIAL Logistics is the leading logistics and supply chain management company in southern Africa with an extensive footprint in Europe.

Home to more than 70 operating companies in southern Africa, the IMPERIAL Logistics Group has approximately 17 000 employees, more than 5 500 owned vehicles with access to approximately 2 000 sub-contractor vehicles and warehouse capacity of more than 740 000 m<sup>2</sup>. The multi-brand structure ensures that the Group optimises the benefits, scale and synergies that are derived from large businesses, while retaining its agility, customer focus and an entrepreneurial flair that characterise smaller businesses. Managed on a decentralised basis, IMPERIAL Logistics ensures a healthy autonomy at operational level. At the same time, high level cooperation between divisions and cohesiveness of strategy are maintained through close communication, regular meetings and following a multi-disciplinary thought process.

IMPERIAL Logistics' strategy of combining the best available skills and supply chain management specialists with a large and modern resource base of vehicles for transportation, warehousing facilities and best-in-breed IT systems means that it is able to provide customers with the most efficient and cost effective logistics and supply chain management solutions available.

Apart from established operations in southern Africa, IMPERIAL Logistics has extended its activities to Europe with an International division headquartered in Germany. Comprising four brands, namely Panopa Logistik, neska, IMPERIAL Reederei and Brouwer Shipping, collectively IMPERIAL Logistics International offers services including air, sea and land transportation, warehousing, clearing and forwarding, container operations and multi-modal transportation.

IMPERIAL Logistics southern Africa comprises four core divisions supported by a number of services companies. The operational divisions are Transport & Warehousing, Specialised Freight, Consumer Products and Integration Services:

- IMPERIAL Logistics Transport and Warehousing (ILTW)  
The division delivers full-spectrum logistics and supply chain services throughout South Africa and in neighbouring countries. Services include line-haul, local distribution, consolidation, warehousing and logistics, 4PL solutions, cross-border transport, logistics and supply chain management solutions.

- **IMPERIAL Logistics Specialised Freight (ILSF)**  
Boasting the largest and most modern tanker fleet in the country, this division provides dedicated, specialised transport services to tanker industries throughout Africa. It is the brand leader in the petrochemical industry, with unrivalled expertise in managing HSEQ requirements. In addition, it also provides transport solutions in the fast-moving consumer goods (FMCG) industry for the delivery of milk and other raw materials shipped in tankers.
- **IMPERIAL Logistics Consumer Products (ILCP)**  
Consumer Products provides an integrated supply chain solution to a wide range of FMCG and retail companies, as well as the agriculture and furniture markets. The division distributes into top-end retail, mid-market trade and smaller retail environments, and offers express food distribution, selling and merchandising services.
- **IMPERIAL Logistics Integration Services (ILIS)**  
Through ILIS, IMPERIAL Logistics offers value-added services to customers including supply chain intelligence and the development of strategy, integrated logistics, macro- and micro business process modelling, analysis and re-engineering, warehouse and supply chain optimisation solutions, benchmarking and other consulting services.

IMPERIAL Logistics' operations within Africa span across 11 countries, including South Africa, Lesotho, Swaziland, Namibia, Botswana, Zimbabwe, Mozambique, Zambia, Tanzania, Kenya and Angola.

Visit [www.imperiallogistics.com](http://www.imperiallogistics.com) for more information.



## PROFILE OF STELLENBOSCH UNIVERSITY CENTRE FOR SUPPLY CHAIN MANAGEMENT

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The Centre for Supply Chain Management (CSCM) is an academic consultative research centre within the Department of Logistics at Stellenbosch University that creates value for global and local organisations and businesses.

The CSCM facilitates a symbiotic relationship between the academic development of supply chain management theory and the practical application of the theory. It provides clients and the community with cost-effective research solutions in the field, but at the same time produces results that are publishable and contribute to the discipline. In order to do this the centre has core staff and a complement of associates. The CSCM team has provided successful consulting interventions to a number of leading South African and multi-national companies and provides continuous strategic guidance to various small and medium-sized clients.

The core competencies provided are in the field of supply chain strategy, business strategy and positioning, market and economic research, freight flow modelling and transportation planning.

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## PROFILE OF THE CSIR

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The CSIR performs multidisciplinary research and technological innovation. The generation and application of knowledge take place within themes such as the built environment; industry (advanced manufacturing and mining); defence and security; energy; health; and the natural environment. Cross-cutting themes include information and communications technology; materials; and research infrastructure.

The CSIR's expertise in the built environment domain is consolidated in clusters, each concentrating on specific research areas:

- Building science and technology
- Infrastructure engineering
- Infrastructure systems and operations
- Logistics and quantitative methods
- Planning support systems
- Rural infrastructure and services

In the built environment arena, the CSIR supports the country's competitive performance and the welfare and quality of life of its people through knowledge-generation for the development of an efficient and globally-competitive built environment system. Most of the CSIR's research and development (R&D) in the built environment arena resides in one of the organisation's operating units, namely CSIR Built Environment. The unit is situated on the CSIR's Pretoria campus, Gauteng, with a regional office in Stellenbosch, Western Cape.

The vision of CSIR Built Environment is to be the premier R&D organisation in South Africa in disciplines pertaining to the built environment, providing solutions for public good, the government and the private sector.

R&D is conducted in collaboration with local and international partners at universities and research institutions. Relationships are nurtured with a number of national and provincial government departments and parastatals, while opportunities are actively pursued to establish new relationships in the private sector.

### LOGISTICS AND QUANTITATIVE METHODS

The CSIR applies a multidisciplinary approach to conduct innovative R&D in the areas of logistics and supply chain management, and complex decision-aiding, using mathematical and statistical modelling. Quantitative methods have proved to be useful in many applications, with some being highly complex and challenging, and others requiring high levels of innovation.

Expertise used in this area includes optimisation, stochastic process simulation, forecasting, statistical modelling, development of indicators, spatial modelling and geographical information systems, standards and their development, supply chain research, and complexity science. Specific research areas include statistical modelling and analysis; and advanced modelling and supply chain research.

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## STATE OF LOGISTICS™ SURVEYS

Since the publication of the first annual State of Logistics™ survey in 2004, this document has become one of the premier references for logistics in South Africa. The CSIR and its associates – Stellenbosch University and IMPERIAL Logistics – believe the surveys open the way for further discussions, interactions and dialogue on various logistics and supply chain management issues.

The surveys are similar in format and thus allow for comparisons in trends. These trends, together with essential business information from various industry sectors, are vital for keeping track of the state of logistics in South Africa.

The State of Logistics™ is a CSIR trade mark, with trade mark applications filed.





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