LAND FREIGHT ISSUES IN SOUTH AFRICA

H J STANDER[1] and W J PIENAAR[2]

[1]BKS (Pty) Ltd, PO Box 112, Bellville 7535 (021 950 7500).
[2]Dept of Logistics, University of Stellenbosch.

ABSTRACT

The split of freight movement between the road and rail network in South Africa has moved strongly towards roads after the deregulation of freight movement that took place in the late eighties. Many are saying that the trucks on the road network are causing costly damage to the roads and also present a road safety concern. This is happening while the rail network is under-utilised. On the other hand it is considered that the service that can be provided by the rail operator is not complying with the needs of the economy. Whilst there is no argument that the present rail facilities are not ideal, it has been announced that large sums will be invested in rolling stock and other facilities.

Some politicians have indicated that the playing fields (between road and rail freight) are not level – implying that the road fraternity is favoured in certain ways. On the other hand it has been shown that road users as a group are tax milking cows – the government is doing extremely good business (tax-wise) with them. Transnet profits have not existed for some time now - admittedly SAA is the major reason for this, but Spoornet has also not been good business.

The question that arises from this is what should the roles of the two competing modes be? Do we really need new legislation to force some freight back to rail even though it may not be the most effective mode? Is the planned investment in the rail system justified? The objective of this paper is to provide some perspective on these issues. It is the intention to briefly refer to the historic roles of rail and road freight, to investigate the land freight market, to investigate the investment in land freight versus the costs and to consider future possibilities.

1. INTRODUCTION

Since the 1970's road transportation has started to replace rail freight carriage as the dominant form of long distance freight movement in South Africa. It was shown in 2002[1] how the split of freight movement between the road and rail network in South Africa has accelerated towards roads after the deregulation of freight movement in the late eighties/early nineties. It was further illustrated how the road users as a group have become tax milking cows par excellence and in effect that the road network of South Africa has developed into a profit making business cross subsidising other liabilities of the state. On the other hand rail operations, while playing an important role in the development of South Africa, have rarely showed profits and in fact had to be subsidised in a number of ways by the state (tax payers). Even though many still disagree with these facts, no evidence to the contrary has been produced. Some speakers add to the confusion with the popular statement that the playing fields (between road and rail freight) are not level – implying that the road fraternity is favoured in certain ways.

Whilst there are externalities caused by the road users (accidents, pollution and congestion), these are largely carried by the people using roads, and their impact on the tax payer in general is small[2]. It was concluded that trucks are most likely not carrying the proportion of the road costs that they cause (when compared to cars) and could be considered to be "subsidised" by cars. This is largely owing to the costly impact of trucks on road pavements (even when they are legally loaded, i.e. not overloaded) and also their road safety implications. A more equitable user charge for trucks is still lacking.

Meanwhile the existing rail network can be considered to be under--utilised. This resulted inter alia from freight transport deregulation, but also from the fact that the service provided by the rail operator is not complying with the needs of the economy. Under-investment in rail infrastructure and rolling stock, as well as managerial difficulties undoubtedly contributed to the situation. Recent announcements indicate that government plans to invest large sums in rail rolling stock and infrastructure.

Since the first attempts to shed some light on these issues and to get some debate going (in 2000), little clarification surfaced. In 2004 the first State of Logistics Survey for South Africa was completed. This survey provides interesting information (summarised here), but little interpretation. The question that still remains is: what should the roles of the two modes be? Is new legislation to force some freight back to rail required? Is the planned investment in the rail system justified? The aim of this paper is to provide further perspective on these issues and to add value to the important debate on the transport challenges that face South Africa to 2010.

The objectives of this paper are:
1. to briefly refer to the historic roles of rail and road freight and to identify changes that occurred;
2. to identify the freight markets being served by road and rail;
3. to investigate investment in road and rail infrastructure versus the costs required to keep the two systems operational;
4. to identify perspectives for moving forward with freight movement in South Africa.

2. HISTORIC ROLES

The development and regulation of freight movement by road and rail have been described before[1]. A short abstract of these articles is provided below in an effort to give some background and perspective.

2.1 Development of Road and Rail Networks

2.1.1 Road

Before 1910 most road links between towns catered for oxwagons and consisted mainly of tracks. The railway system was being expanded and the important rail links between the ports and inland towns were built. Between 1910 and the middle of the thirties motorised vehicles started to replace oxwagons and from then to the seventies, the original national road network (consisting of two lane surfaced roads), linking all major towns, developed. From 1970 to the middle of the eighties the emphasis moved to the urban areas where huge investment was required to cater for the ever increasing commuter and business traffic. The national road system was enhanced with the introduction of freeway sections in the vicinity of the major cities. From the middle of the eighties to the present time, funds for road construction were restricted and the Department of Transport commenced with a toll

road network to upgrade old and inadequate sections. This has developed into the current situation where existing road sections are being tolled in order to maintain and upgrade them to the required standards.

2.1.2 Rail

Similar to most countries, the South African rail network is the indirect product of the great railway boom in England in the 19th century. The first lines to be opened were in Durban (Point to Durban, 1860) and Cape Town to Eersterivier in 1862. By the late 1870s both the Cape and Natal governments were in control of the short rail lines existing in their jurisdiction. Even though there were “Anti Railway Conferences” towards the end of the 1880s, most people realised that the days of the oxwagon were coming to an end. With the establishment of the Union of South Africa in 1910, the South African Railways (SAR) came into being. The railway network at that time joined the major inland towns with the ports. Branch lines to all agricultural areas could not be built and the National Road Motor Services was created in 1912 to act as feeder to the existing lines.

By the late 1920s, the era of rapid construction of rail lines ended, as the technological development of motor vehicles impacted upon the rail lines. The growth and adaptability of road haulage presented serious problems to the SAR from early on. By 1925 the SAR accepted a policy of not building any more branch lines and using road transport as far as possible.

2.2 Regulation of Road and Rail Networks

2.2.1 Road

At the beginning of the twentieth century the road system was in its infancy and little competition between road and rail existed. However, it was not long (by the twenties), owing to the tariff structure of the SAR, before profitable high-tariff traffic started to divert to the road network. The Le Roux Commission recommended a fair degree of economic control over road transportation in 1929. The Motor Carrier Transportation Act (Act 39 of 1930) followed a year later and established Local Road Transportation Boards (LRTBs), which had to issue motor carrier certificates on routes and within areas where competition with the SAR was most severe. Sparsely populated areas remained uncontrolled.

By 1941 motor carrier transportation on all roads was brought under the control of Act 39 and virtually all transportation of persons and goods for reward was under control of LRTBs. The Page Commission recommended in 1947 that the regulation of road transportation and also the prevention of excessive competition between road and rail freight transport should be continued.

Both the Marais Commission (1965) and the Van Breda Commission (1977) concluded that control and regulation of road freight had to remain, although the latter brought in the concept of gradual deregulation. The Road Transportation Act (Act 74 of 1977) made concessions to achieve freer competition, but control by the LRTBs on the type of goods, area of operation and the effective permit period remained. The National Transport Policy Study (NTPS) of 1986 proposed new principles, such as the desirability of competition, easier entry into the road transport market, more scope for private initiative, encouragement of small business and the creation of a more efficient and a less costly transport system for South Africa. The recommendations of the NTPS led to the Transport Deregulation Act (Act 80 of 1988), which together with the Road Traffic Act (Act 29 of 1989) abolished economic regulation of the freight transport industry and replaced it with technical and safety regulation of operators and vehicles.

2.2.2 Rail

With the formation of the South African Railways, Clause 127 of the Act of the Union (1910) stipulated that the railways had to be administered on business principles, but that agricultural and industrial development had to be promoted by means of cheap transport. This led to a differentiated tariff structure with relatively high tariffs for industrial freight and low tariffs for agricultural and mining products.

The Schumann Committee proposed in 1964 that rail rates should be aligned more closely to the real cost of transport and in 1965 this was endorsed by the Marais Commission, which also suggested a modernisation programme for the rail network. In 1981 the South African Transport Services Act (Act 65 of 1981) changed the SAR&H to SATS. Section 7(1) of this act stated that SATS should be administered on business principles. The De Villiers Report on SATS (1986) was largely accepted by Parliament. It became government policy that the goods transport market should be deregulated and that SATS should be pursuing profit and pay tax like any other company and that privatisation of government enterprises receive high priority.

Eventually in 1989, the Legal Succession to the South African Transport Services Act created the mechanism to commercialise SATS and to separate the (uneconomic) commuter services from the freight and long distance passenger services. The former services became the responsibility of the SA Rail Commuter Corporation (SARCC) and the latter resorted under TRANSNET. In 2004 the Director General of the Department of Transport announced that a new entity is being established, encompassing SARCC, Metrorail as well as the long distance rail passenger service (which resorts under Spoornet). The new entity will focus on passenger transport and allow Spoornet to concentrate its efforts on freight transport in line with its turnaround strategy announced in August 2004.

3. LAND FREIGHT MARKET

The Department of Trade and Industry, together with the CSIR Centre for Logistics and Decision Support and Spoornet, have recently published the first State of Logistics Survey[3] for South Africa. The survey addressed the state of logistics from three viewpoints namely a macro-economic perspective, an industry level perspective and a small business development perspective. Valuable information is provided, but as is often the case with research, many questions remain and further research is recommended. This section is extracted from the macro-economic perspective of the survey and the main purpose is to accentuate the markets being served by road and rail freight and the importance of the two modes in these markets.

The production of goods occurs largely in three sectors of the economy. The total quantity of goods that is produced in/or imported into South Africa annually, amounts to the following:

	Million tons
Manufacturing	330 (45%)
Mining	370 (49%)
Agriculture	45 (6%)
Total	745 (100%)

This amount of freight is transported from ports to consumers or from manufacturers to users, etc. The same freight can be transported twice or even three times and the total amount of freight transported annually is therefore substantially higher than the goods produced or imported. See below. Land freight movement can be categorised in a number of ways, but in order to use the available information, the following three classes are distinguished:

3.1 Movement in corridors

(See Figure 1) – This includes exports/imports to the neighbouring countries, as well as internal corridors between major centres. There are basically five corridors (by land) over South Africa's borders, namely: Gauteng to Maputo, Zimbabwe, Botswana and Namibia; and Cape Town to Namibia.

The major corridors are however inside South Africa, namely Durban to Gauteng and Cape Town to Gauteng. The other internal corridors between Cape Town, George, Port Elizabeth, East Londen and Durban, as well as from George, Port Elizabeth and East Londen inland, are relatively small.

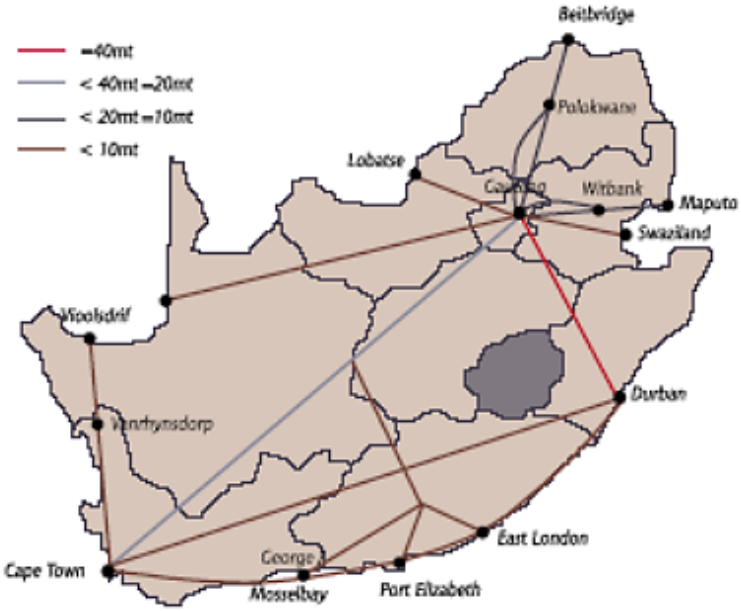

Figure 1. South African freight corridors (Ref 3).

3.2 Movement in metropolitan areas

This represents the collection/distribution of goods in metropolitan areas from/to industry, business (retail, office, etc) and households. Due to the relatively short length of trips, as well as the diversity of origins/destinations, this category of freight movement does not suit rail movement and requires road transport.

3.3 Inter city or rural movement

This represents all other freight movement, i.e. outside the main corridors and the metropolitan areas and forms a relatively small portion of total freight movement.

It is considered that the highest degree of competition between road and rail freight should occur with the corridor traffic, which is in fact illustrated clearly in the table below. The distribution of freight by mass and by distance moved between the three categories is as follows:

	Tonnage (m ton)			Distance (bil tonkm)		
	Road	**Rail**	**Total**	**Road**	**Rail**	**Total**
Corridors	140(13%)	145(13%)	285(26%)	105(35%)	95(33%)	200(68%)
Metropolitan	570(51%)	10(1%)	580(52%)	40(14%)	1(0%)	41(14%)
Rural	210(19%)	30(3%)	240(22%)	40(14%)	15(4%)	55(18%)
Total	920(83%)	185(17%)	1105(100%)	185(63%)	111(37%)	296(100%)

From the above figures the following is clear:

Whilst road and rail movement play an almost equal role in corridor movement (both in terms of weight and distance carried), the small impact of rail freight in the metropolitan and rural markets is illustrated – both with respect to mass and distance carried. Just over 50% of the total freight market (in terms of mass) lies in the metropolitan areas, while approximately one-third lies in corridor movement. Rail and road freight are therefore only really in competition in a portion of the freight market. Although not illustrated, it is considered that *in general* the higher value (industrial) freight is transported by road while the bulky, lower value materials should be on rail.

For comparison it can be mentioned that Australia, with an economy roughly three times that of South Africa, moves 1664 (75%) million tons of freight by road annually (141 billion tonkm) and 568 (25%) million tons by rail (156 billion tonkm)[4]. Whilst the amount of freight moved is approximately double that of South Africa, the mass-distances are equal, which is unexpected for such a large country compared to South Africa.

In view of the figures above (83% of freight by mass on road) it could almost be concluded that rail freight movement is unimportant in the total picture. The fact that rail freight accounts for almost 40% of the mass-distance, indicates however that it still has to play an important role in the SA economy. Should more of these mass-distances have to transfer to roads, then the impact on road maintenance would be even more serious than it already is.

4. ESTIMATE OF ROAD AND RAIL INVESTMENT IN SA

4.1 Characteristics of Road Travel[5,6]

The table below shows vehicle numbers as well as the total travel by different vehicle classes as estimated for South Africa.

Table 1. Vehicle numbers and distance travelled.

	Number of Vehicles		Distance Travelled	
	Total (10^6)	%	Total Veh-km (10^9)	%
Cars	4.076	64.2	73.173	56.2
Light Delivery Veh (LDV's)	1.667	26.3	38.434	29.5
Minibuses	0.255	4.0	6.702	5.1
Buses	0.027	0.4	0.977	0.8
Heavy Vehicles	0.324	5.1	10.851	8.3
Total	6.349	100.0	130.137	100.0

Cars and LDV's form 90.5% of the vehicle pool, but account for only 85.7% of the vehicle kilometers travelled. In South Africa small trucks are used by many as their first vehicle,

rather than a car, which explains the relatively high proportion of travel by LDV's. Heavy vehicles contribute more to the vehicle kilometers travelled than their portion of the vehicle pool – 8.3% versus 5.1%.

4.2 Expenditure on Roads and Cost Apportionment

The exact expenditure on all roads in South Africa is difficult to ascertain, inter alia due to the fact that spending takes place by at least four groupings, namely:

- Central Government – National Department of Transport (NDOT) and the National Roads Agency;
- Provincial Governments – nine of them;
- Local Government – all cities and towns in SA;
- Private Toll Concessionaires.

The spending by the latter has been growing but could be considered small in relation to the rest and is excluded for the moment. The spending by the rest is estimated as follows:

Table 2. National Department of Transport (Budget for 2000/01).

	Rand Millions
Administration	30.502
Regulation and Safety	774.711
Policy, Strategy & Implementation	3 288.396
Total	4 093.609

It is important to note that the majority of the budget for policy, strategy and implementation was earmarked for bus and rail operating subsidies, namely R1.43 billion for buses and R1.78 billion for rail (R3.21 billion in total). The amount of money that the NDOT allocates to the operation, management and maintenance of roads was therefore less than R1 billion, assumed to be approximately *R400 million*.

Table 3. National Roads Agency (from Reference 5).

Construction	158.960
Maintenance	460.381
Administration	155.741
Total	775.082

Expenditure on Proclaimed National Roads (Non Toll) Rand Millions – 1999/00

Table 4. Provincial road budgets (from References 5 and 6 – 2001 Rand millions).

	Constr.	Maint.	Admin.	Total
Mpumalanga	81.247	114.744	20.491	216.482
Western Cape	133.676	235.417	46.831	415.924
Gauteng	112.651	187.65	43.167	343.468
Free State	1.986	142.448	11.315	155.749
North West	33.786	182.544	53.804	270.134
Eastern Cape	109.4	237.569	36.486	383.455
Kwazulu-Natal	262.59	391.949	65.812	720.351
Northern Cape (Rand)	1.311	49.446	4.879	55.636
Northern Province (Limpopo)	37.973	365.743	182.99	586.706
Total	774.62	1 907.51	465.775	3 147.905
2001 Rand Millions				

4.2.1 Local Government

Spending by local government on the maintenance and construction of roads is financed from property taxes, development fees and other revenue, which includes provincial grants. From a total budget of R10 billion+, it is estimated that the City of Cape Town spends approximately R400 million on road maintenance and construction. Should this be considered 15% of the total spending in South African cities, then the total spending in the metropolitan areas on roads is *±R3.0 billion.*

4.2.2 Total Spending on Roads

In view of the above, the total spending on road maintenance and construction in South Africa is estimated for 2000/01 to have been approximately R7.5 billion. To allocate this spending to the different vehicle classes is not simple. The following distribution of costs is suggested (percentages), based on American practice[7] as well as judgement.

Table 5. Road cost allocation – percentages.

	Cars/ LDV's	Mini-buses	Buses	Trucks	Total
New Capacity	11.4	1.1	0.2	2.3	15
System Preservation	11.2	5.6	1.9	56.3	75
System Enhancement	5.0	0.5	0.5	4.0	10
Total	27.6	7.2	2.6	62.6	100

Should this be accepted, then the total cost, as well as the cost per kilometer for the different vehicle classes, are as follows:

Table 6. Road cost allocation – cost in Rand.

	Total Cost (R mill)	Cost/km (Rand)
Cars/LDV's	2 070.0	0.019
Minibuses	540.0	0.081
Buses	195.0	0.200
Trucks	4 695.0	0.433
TOTAL	7 500.0	0.058

If it is considered that cars on average consume (say) one liter of fuel for every ten kilometres travelled, then the fuel levy payment of cars is roughly 12 cents per kilometre. This is six times the road cost that they cause, should the assumptions made above, be accepted. Should trucks consume on average one liter of fuel for every four kilometers travelled, then the fuel levy contribution of trucks, is 30 cents per kilometer, which is only two-thirds of the road cost that they cause.

Of course all road vehicles also pay license fees, excise tax on imported parts, etc. License fees for trucks are high in relation to cars – it is estimated that as a group the truck population pays approximately double the license fees that cars pay. The fuel levy on its own constitutes approximately two-thirds of the total taxes that road vehicles have to pay. If this is considered then the truck population approximately pays for the road costs that they cause through the existing road taxes, including the fuel levy (which was since its inception considered to be a proxy for a road user charge).

This effort to do a road cost allocation estimate for the South African road network confirms previous views[1] that trucks (as a group) do not contribute proportionally to motor cars for their use of the roads and could be considered to be "subsidised" by motor cars. This disparity could be considered unfair and points to the need for a more equitable road

user charge for trucks. Based on the calculations provided here (which should be improved) it is concluded that trucks do in fact currently pay for the road cost that they cause and in that respect the playing fields with rail freight carriage is level. The real tax milking cows on South Africa's road network are the car users.

4.3 Rail Cost

The annual investment required to keep the South African rail network operational can be estimated from the Transnet 2004 annual report[8]. Spoornet, which is the largest division of Transnet, focuses on the transportation of freight, containers and mainline passengers by rail. The passenger transportation role of Spoornet has diminished owing to the competition of inter-city bus services and other problems and it forms a small part of their business. The core business is seen as "freight logistics solutions designed along industry-based business segments, particularly in the mining and heavy and light manufacturing sectors".

Spoornet had a turnover of R13.4 billion in the 2004 financial year and reported a loss of R668 million. General freight carried was 83 million tons, whilst 66 million tons were carried on the coal line and 27 million tons on the iron ore line (Sishen – Saldanha). This provides a total of 176 million tons carried, which might not be the total volume transported, but it should be close to the total, especially if compared to the State of Logistics Survey data – see Section 3 above.

The breakdown of Spoornet's expenditure is not easy to ascertain, but it is stated[8] that "Transnet invests heavily in infrastructure, not only to replace and expand capacity, but also on ongoing maintenance (over R2.7 billion this past financial year, mainly in respect of Spoornet)". It is further stated that "subsequent to the year end, Spoornet announced a R14 billion, five year programme (i.e. R2.8 billion annually on average) to upgrade ageing rolling stock and infrastructure. This will be funded through the capital markets and public-private partnerships. The capital expenditure plan is critical to Spoornet's turnaround strategy".

From this it is concluded that Spoornet could be investing R5 billion+ annually in infrastructure (also rolling stock) and maintenance to keep the South African rail network operational in the next five years. This amount is of the same magnitude as the estimated expenditure allocated to truck operation on South Africa's road network and could be an indication of the precarious position of rail operations. The continuous under- investment has brought about a serious backlog in rail infrastructure – possibly even more than is the case for roads.

Should these infrastructure investments be compared to the role that the two modes play in the movement of freight, both mass-wise and distance-wise (see Section 3 above), then it is concluded that rail freight movement appears to be less effective, at least from an infrastructure investment perspective.

5. WAY FORWARD

Based on the motivation provided above, as well as other considerations, the following is suggested:

- South Africa has moved from an agricultural and mining economy to an industrial economy. Manufactured goods are generally more valuable and the time available for transport has to be as short as possible. This implies that arrival/departure times of freight, reliability, speed, etc have become crucial. Higher standards are required and

users are willing to pay for this. The transportation of freight is more driven by a profit incentive than a cost-reduction incentive. This implies that the rail market is shrinking rather than expanding. Investment in rail should focus on the movement of bulk materials over relatively long distances.

- It is considered that the possibilities for intermodal arrangements, such as the use of containers, piggy backing, double stacking, etc, are limited. This is mainly due to geometric constraints (bridges, tunnels, overhead electricity supply), the narrow gauge and relatively short route distances (only the Cape Town to Johannesburg corridor is more than 1000km).
- A feasible approach for Spoornet is considered to be the formation of strategic alliances with the industries requiring bulk freight transport. These include the mining groups, Iscor, etc. The highest level of co-operation and partnering can only be to Spoornet's benefit.
- Spoornet has a considerable task in motivating its employees. Other than private hauliers, the employees are not likely to become shareholders in the foreseeable future. The importance of a profitable operation is therefore likely to be not as high as for private organisations.
- It would assist commerce and industry if Spoornet clearly indicate their focus with the often-quoted heavy investment in rail infrastructure that is on the cards. Knowledge of targeted investments with specific time horizons, enhances stability in the freight market, whereas the nuances of re-regulation are not assisting at all.
- As was indicated above, it would appear as if trucks do pay their road costs. The relationship between costs and charges are not fair though when cars and trucks are compared. This issue needs to be resolved and a more equitable user charge for trucks needs to be developed. It is known that the German system of satellite tracking of individual vehicles is operational now, indicating that advanced methods are available.

6. CONCLUSIONS AND RECOMMENDATIONS

The most important conclusions are considered to be:

- Whilst road and rail movement play an almost equal role in corridor movement (both in terms of weight and distance carried), the small impact of rail freight in the metropolitan and rural markets is illustrated – both with respect to mass and distance carried. Just over 50% of the total freight market (in terms of mass) lies in the metropolitan areas, while approximately one-third lies in corridor movement. Rail and road freight are therefore only really in competition in a portion of the freight market.

  In view of the figures above (83% of freight by mass on road) it could almost be concluded that rail freight movement is unimportant in the total picture. The fact that rail freight accounts for almost 40% of the mass-distance, indicates however that it still has to play an important role in the SA economy.

- The fuel levy payment of cars is roughly 12 cents per kilometre or six times the road cost that they cause, should the assumptions made above, be accepted. The fuel levy contribution of trucks, is ±30 cents per kilometre, which is two-thirds of the road cost that they cause. With license fees, excise tax on imported parts, etc, it is estimated that as a group the truck population pays for the road costs that they cause (estimated as approximately R4.7 billion annually) through the existing road taxes.

This effort to do a road cost allocation estimate for the South African road network confirms previous views[1] that trucks (as a group) do not contribute proportionally to motor cars for their use of the roads and could be considered to be "subsidised" by motor cars. This disparity could be considered unfair and points to the need for a more equitable road user charge for trucks.

- The available information indicates that Spoornet could be investing R5 billion+ annually in infrastructure (also rolling stock) and maintenance to keep the South African rail network operational in the next five years. This amount is of the same magnitude as the estimated expenditure allocated to truck operation on South Africa's road network and could be an indication of the precarious position of rail operations. The continuous under-investment has brought about a serious backlog in rail infrastructure – possibly even more than is the case for roads.

  Should these infrastructure investments be compared to the role that the two modes play in the movement of freight, both mass-wise and distance-wise, then it is concluded that rail freight movement appears to be less effective, at least from an infrastructure investment perspective.

A number of suggestions have been offered in Section 5 above. It can be summarised as follows:

- Investment in rail should focus on the movement of bulk materials over relatively long distances.
- A feasible approach for Spoornet is considered to be the formation of strategic alliances with the industries requiring bulk freight transport.
- It would assist commerce and industry if Spoornet clearly indicate their focus with the often-quoted heavy investment in rail infrastructure that is on the cards.
- The issue of an equitable truck user charge needs to be resolved and a more fair (towards car users) system for trucks needs to be developed.

7. REFERENCES

[1] Stander, H J, Pienaar, W J, Perspectives on Freight Movement by Road and Rail in South Africa, South African Transport Conference, July 2002.

[2] Stander, H J, Pienaar, W J, Road Use Taxation and External Costs in South Africa, 50th Anniversary Conference, South African Road Federation, Cape Town, November 2000.

[3] The First State of Logistics Survey for South Africa 2004, CSIR Centre for Logistics and Decision Support, CSIR, Pretoria, October 2004.

[4] Australian Transport Statistics 2004, Australian Department of Transport and Regional Services, www.btre.gov.au.

[5] National Department of Transport, Annual Transport Statistics 2001, Pretoria 2003.

[6] National Department of Transport, Annual Transport Statistics 2002, Pretoria 2003.

[7] Federal Highway Cost Allocation Study, Federal Highway Administration, 1997, www.fhwa.dot.gov///policy/hcas.

[8] Transnet website.