Scoping Study

Developing and Upgrading of Infrastructure in Southern Africa's Transport Corridors

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1.0 INTRODUCTION AND OBJECTIVES

DFID appointed Kagiso Urban Management (KUM) to carry out a scoping study to identify how DFID might provide support for the development and upgrading of infrastructure in Southern Africa's transport corridors. The study is being carried out over a four-month period, in four phases as follows:

Phase 1 - Inception Report: Confirmation of scope and terms of reference
Phase 2 - Overview Report: Overview and status report
Phase 3 - Draft Report: Including initial analysis and recommendations (this report)
Phase 4 - Final Report: Final recommendations

Scheduled completion of Phase 4 is the end of February 2007.

This Phase 3 Draft Report incorporates the regional overview and includes further analysis of the key issues related to the regional transport sector and the preparation of a characterisation of the transport sector (Section 10). This report is intended to provide a comprehensive and critical presentation of the Southern African transport corridors including their operations and infrastructure.

The relevant organisations and stakeholders involved in transport infrastructure policy, planning, development, financing, operations and regulation have been listed, expanded and revised, describing their main functions and activities. The database of recent transport studies and reports, some of which remain confidential, has been revised for the draft report. Appendix 4 includes a preliminary list of various transport projects and activities which are currently being implemented, are under consideration or being studied or promoted. These databases are work in progress and will be expanded on and revised for the Final Report. The draft report includes the diagrams given in the overview showing the key features of the transport routes, traffic flows and regional ports.

The Final Report will include input from the planned workshop and will focus on areas requiring assistance and intervention related to the institutional environment, including co-ordination, monitoring, regulation and communication. An 'institutional map' will be proposed indicating where DFID would be best suited to provide support or could initiate changes.

2.0 SOUTHERN AFRICA REGIONAL OVERVIEW

Southern Africa has a physically well developed and flexible road, rail and port network, providing landlocked countries with several alternative and competing transport routes serving both regional and international trade. Most of the extensive Southern African railway network, with the exception of the South African heavy mineral lines and the Tazara railway, was built at a time when road transport was not a viable option. It is therefore more a result of technological and economic development and political factors than the result of regional cooperation and careful planning.

Two key regional railway systems, the Benguela and Sena Railways, remain closed due to earlier political conflicts. Both of these systems are currently being rehabilitated and upgraded and are scheduled for reopening by 2009.

Southern Africa is far better equipped with transport infrastructure than areas of west and east Africa where there is limited interconnectivity and flexibility and a higher degree of vulnerability. For example, there is no railway interconnectivity in west Africa or Angola, and poor road connectivity between transport corridors to and from the coastal ports. The recent conflict in Côte D'Ivoire has caused major transport and trade problems for Burkino Faso, whereas the Angolan conflict caused the DRC copper belt to use alternative routes to the east and south.

With the exception of the South African dedicated bulk railway lines, the Southern African regional freight transport sector is characterised by long distances, relatively low volumes and therefore relatively high railway tariffs as compared with most other regions internationally including the USA, India and Europe. With reference to the railway summary given in Appendix 6, the average figure for million tonne kilometer (tkm) per route km provides an indication of freight density for the different systems. South Africa is estimated at 4,8 on average (the heavy mineral lines are between 30 and 60), whereas many of the SADC systems are less than 1. On the other hand, road tariffs in US cents per tkm remain very low because of the unregulated and highly competitive road sector. However, the overall transport cost component of imports and exports remains high.

The transport system as a whole operates at well below the design capacity, although some sections, particularly key roads and port terminals, require urgent refurbishment and upgrading. All the regional transport routes or corridors outside South Africa essentially compete for the same traffic from the landlocked countries (see Appendix 1 Figures 1 and 2). Traffic includes exports of mining and agricultural goods from Botswana, Zimbabwe, Zambia, Malawi and the DRC totaling approximately 3 mtpa (million tonnes per annum), and imports of manufactured goods, mainly from South Africa, estimated at around 5 mtpa. These volumes could, in theory, be carried by one transport corridor, rather than six or seven competing systems (see Appendix 1 Figure 4). In spite of this, there are several current initiatives to further expand the railway network and regional interconnectivity. For example, there are project proposals to link the underutilised Zambian railway system to the Lobito, Nacala, Beira and possibly even the Walvis Bay railway systems, when there is not enough freight traffic to financially justify the existing system. Given these relatively low volumes within the region, inappropriate investment in the regional transport sector could have the effect of increasing rather than reducing transport costs. Equally, highly targeted and well considered investment in upgrading and operational improvements could have the opposite effect. It therefore appears necessary to adopt a well-coordinated, judicious and programmatic approach to major capital investments in transport infrastructure and equipment.

As shown in Appendix 1 Figure 1, there are broadly four key operating regions with transport corridors linking the sea ports with the main regional inland production centres. These are:

1. The southern region, including Namibia, southern Zimbabwe, Botswana, southern Mozambique, Swaziland and Lesotho, served by the South African ports, Walvis Bay and Maputo, linked to the production centres of Gauteng , Gaborone, Windhoek and Bulawayo / Harare. This region has by far the highest freight density.

2. The central region, including Zimbabwe, Zambia, Malawi and Central Mozambique, served by the ports of Beira and Nacala, linked to the production centres of Harare / Mutare, Blantyre / Lilongwe, Lusaka, Ndola. The freight density on the Nacala route is very low, and is likely to remain so until agricultural production in northern Mozambique increases. Beira is the closest port to the Copperbelt by road by a margin of more than 400 kms.
3. The eastern region, including Zambia, northern Malawi, the DRC, Tanzania, the great lakes region, served by the port of Dar es Salaam, linked to the production centres of Ndola / Chingola, Lubumbashi / Kolwezi, Mzuzu / Mbeya.
4. The western region, including the DRC and Angola, served by the ports of Lobito and Luanda (not yet fully operational), linked to the DRC Copper Belt and the Angolan mining and agricultural regions.

As there is considerable overlap among the four regions, the overview focuses on the key ports within these regions and the transport corridors they serve. In this way it is possible to determine the transport infrastructure constraints to the key productive and economic centres in the sub-region.

Regional Ports

The most important operational feature of the regional ports, besides the land side road and rail access and the efficiency of the terminal handling equipment, is the depth of the port and quays. Increasing volumes of international trade requires the use of larger vessels. The 'Cape' size bulk vessel now typically exceeds 150,000 dwt (deadweight tonnage) and container vessels are increasing to post 'Panamax' size, 5,000 to 6,000 teu's (twenty-foot equivalent units) and more than 65,000 dwt. In the Southern Africa region, only Richards Bay and Saldanha Bay can handle these large vessels, but neither port has a dedicated container terminal. Most regional ports, such as Walvis Bay, Maputo, Beira (siltation problem) and Dar es Salaam have a design depth of 10m to 12.8m, whereas Sadanha has a depth of 26m and Richards Bay 18.5m. Durban is being deepened to 14m, eventually to 16m, and Nqgura is at 16.5m.

It should be noted that container throughput is measured in teu's per annum, in and out, including empties, and that transshipments are counted twice. The average weight of the goods in a teu varies, but is often taken as approximately 10 tonnes.

Type	dwt range	Length (m)	Beam (m)	Draft (m)
Handysize	10 000 – 34 000	160 - 200	20.0 – 27.0	Up to 11.0
Handymax	35 000 – 49 000	200 - 230	Up to 32.2	Up to 12.5
Panamax	50 000 – 79 000	230 - 260	32.2	Up to 14.0
Capesize	Up to 200 000+	> 260	> 32.2 up to 50	Up to 18.5

Another important criterion which affects the marketability of the smaller regional ports (the selection of the port by customers) is the port volume throughput, expressed as

vessel calling frequency. Ports with low volume throughput attract very few direct vessel calls and act as feeder ports to the larger hub ports such as Cape Town, Durban and Mombasa where the cargo is transshipped into larger vessels. It is pointless to send goods via the shortest and quickest route to the closest port if there is a one week wait for the next vessel, with the additional costs of feeder and transshipment services. For this reason, Durban remains the port of choice for many remote regional importers and exporters. It is also the reason why it is difficult to develop ports such as Walvis Bay as truly competitive hub ports before a volume threshold is reached, which would result in frequent vessel calls. This volume threshold for container terminals to serve as regional hubs could be of the order of 150,000 to 200,000 teu's per annum, typically the terminal at Dar es Salaam. Maputo and Beira are of the order of 40,000 teu's and are trying to attract direct vessel calls, mainly to and from the east, to improve marketability of the ports.

Container terminal efficiency is most often measured in terms of teu's per hour per crane with the benchmark for competitive performance usually set at 25 moves per hour, Durban has not been able to achieve this. Ports such as Singapore achieve more than 40.

Regional Railways

The regional SADC railways are all built to the 'Cape gauge' of 1,067 mm (3 ft 6 inches) between the rails, with the exception of the TRC system in northern Tanzania and the Kenyan / Ugandan systems which have a 1,000 mm gauge. This means that there is almost full railway interconnectivity within the SADC area. Recent discussions in South Africa of upgrading the whole regional system to the 1,435 mm standard gauge cannot be justified given the low freight densities, but could be implemented on isolated high densities lines – for example the new Gautrain rapid passenger service in South Africa is being built with the standard gauge of 1,435 mm. The higher permissible operating speeds offered by the standard gauge provides no real advantage because the average operating speeds of less than 30 km/hr are mainly dictated by other factors which can be dealt with more cost effectively. Axle loads are generally 15 t to 18 t in the region, up to 26 t in South Africa, but ideally should be not less than 20t to make rail more competitive with road. This would allow a railway wagon to carry almost twice as much as a large combination road rig. Braking systems are a mixture of vacuum and air but are gradually being upgraded to air to allow trains longer than 40 wagons. Almost all the regional railway systems are undergoing restructuring with private sector involvement or concessioning in an attempt to improve financial viability.

Regional Roads

The regional road systems are generally in good order, with recent upgrades on many of the main routes and the construction of two new bridges across the Zambezi, with another bridge being built at Caia on the N1 in Mozambique. There is also a study being planned for a bridge at Kazungula. This will bring much improved flexibility and reliability to the N-S road network.

Regional freight traffic is almost exclusively carried in large double trailers, 7 axle combination rigs, with a maximum GVM of 56t, considered to be the highest in the world. Overloading has been a major problem in the past but is gradually being brought under

control. It not only affects road maintenance, but also affects transport tariffs as it gives unfair advantage to those who practice overloading. FESARTA (the Federation of East and Southern African Road Transport Associations) has been actively campaigning for increased overload control in order to keep the transport tariffs competitive and stable.

Road user charges are levied in most SADC countries on foreign registered trucks at the rate of about US$ 10 per 100 km (higher in Botswana, Mozambique and Namibia), whereas in South Africa the system is based on toll roads for most major routes, paid by all users.

SADC Legal Load Limits

	Steering Axle	Single Axle	Single Axle	Tandem Axle	Tandem Axle	Tridem Axle	Tridem Axle	Combination
	Two Tyres	Two Tyres	Dual Tyres	Four Tyres	Dual Tyres	Six Tyres	Twelve Tyres	GVM (t)
Botswana								
Malawi	**8**	8	**10**	16	**18**	24	**24**	**56**
Mozambique	**8**	8	**10**	16	**18**	24	**24**	**56**
Namibia	**8**	8	**10**	16	**18**	24	**24**	**56**
South Africa	**8**	8	**10**	16	**18**	24	**24**	**56**
Tanzania	Similar to Zambia	but	7 axle	interlinks	not yet	permitted	(likely to change in 2006)	
Zambia	**8**	4	**10**	8	**16**	12	**24**	**56**
Zimbabwe	**8**	8	**10**	16	**18**	24	**24**	**56**

Note: The lower Zambian limits are probably related to absence of harmonisation of measuring equipment.

2.1 South African Ports and Transport Corridors

The South African ports and transport corridors are dealt with here in relation to serving the SADC region rather than from the national South African economy**.** Therefore, the ports of Saldanha Bay, Cape Town and East London have been omitted because they have very little regional SADC traffic. Cape Town does currently serve as a transshipment port for the west coast but this role is gradually being taken over by Walvis Bay.

A regional overview of the port and transport corridor infrastructure follows, with reference to Figures 5 to 14 for the transport corridors and Figures 33 – 44 for the regional ports.

2.1.1 Durban Port (see Appendix 1, Figures 12, 13, 19, 41)

Durban remains the premier 'hub' port in Southern Africa in respect of containerised traffic, handling more than 1,5 million teu's pa. (including imports, exports, transshipment and empty containers). Durban also serves as a clean bulk port, has a large car terminal and the only 'soft loading' sized coal terminal in Southern Africa. The depth of the port and terminals is gradually being increased from 12.8 m to 14 m, with plans to increase to 16 m, which entails deepening the access channel to the port.

Durban serves as the main import and export port for the Gauteng region, South Africa's industrial heartland, and continues to serve a large portion of the SADC region despite the land transport disadvantage of up to 1000 km from the Copper Belt and the fact that the container terminal is operating at full capacity with frequent periods of congestion and delays. The terminal has recently been equipped with new container cranes, but

efficiency, compared to world benchmarks, remains a problem. The main reasons for the continued SADC regional competitiveness of Durban are the vessel calling frequency and the imbalance of trade flows between SADC and South Africa, allowing for discounted pricing of land transport on the return routes to South Africa, thus offsetting the distance disadvantage.

With a view to supporting continued growth in container traffic, Durban has embarked on a large development project with a R1.34 bn investment programme aimed at upgrading the existing facilities and expanding container handling capacity to meet the port's long-term requirements.

The depth of Durban port (at 12.8 m for most of the quays) is similar to Walvis Bay and Port Elizabeth, but less than Cape Town. This restricts the vessel size which can be accommodated at Durban to about 50,000 – 60,000 dwt, i.e., less than Panamax size. The main constraint is the depth and width of the entrance channel.

The channel is underlain by a submarine pipeline and marine defences which must be moved before the channel can be deepened. Plans are being made to remove these obstacles. In addition, new quays (the car terminal and the new container quays 206 and 207), with a depth of 14 m to allow small Panamax vessels to berth, are being built. Dredging within the port is also planned. Road access is being improved by the construction of a new railway bridge.

The main terminals at Durban are:

Durban Container Terminal (DCT**)**

The DCT handled approximately 65% of South Africa's seaborne container traffic in 2003, or 1 421,000 teu's. It is a pivotal hub for the entire Southern Africa region, serving trade links to the Far East, Middle East, Australasia, South America, North America and Europe. The terminal also serves as a transhipment hub for the SADC ports, East Africa and Indian Ocean islands.

The terminal has 2,128 m of quayside divided into seven berths with an additional three berths on Pier 1. DCT has more than 13,000 ground slots and 500 reefer points and is well connected by road and rail networks. The terminal has 16 gantry cranes in service – five Panamax, eight post-Panamax and three super post-Panamax (8,000 teu capacity). In 2005, the terminal took delivery of 60 new straddle carriers and three additional gantry cranes capable of handling container ships of up to 6,500 teu capacity.

Capacity of the container terminal is being boosted to 1.6 million teu's pa by the Pier 1 development. It will approach 2 million TEUs pa with the addition of quays 206 and 207, which will have a depth of 14 m.

The Durban container terminal is considered inefficient by world standards. A congestion surcharge of US$ 100 per teu was applied by the shipping companies because of long ship-berthing delays. This surcharge was removed in May 2005, but there are threats it may be reinstated. The berthing delays are partly due to slow container handling, often less than 15 teu's per crane per hour, which is mainly due

to poor port / road / rail interface management and quayside congestion. SAPO has started to address this issue through its SA Container Terminal Advisory Board (Sactab) initiative. Achievements brought about by Sactab to date include improved crane productivity and decreased truck turnaround time at the container terminal from 50 to 23 minutes.

Poor co-ordination between inland terminals and the harbours as well as excessive transit times between them are also issues. Transnet addressed these issues by announcing that SAPO would take over the management of the City Deep terminal in Gauteng from Spoornet, which was intended to enable SAPO to integrate the City Deep operations with those of the Durban container terminal. SAPO intend to implement Cosmos, Durban's operating system, at City Deep thereby providing an integrated management information system to manage the flow of containers from Gauteng onto the vessel and vice versa. The decision for SAPO to operate the City Deep container terminal has since been reversed. The above issues are currently being addressed by Spoornet's masterplanning process which is not yet complete (Dec 2006). Spoornet has invited tenders from consultants to address the planning of its inland freight and container terminals.

Co-operation between Spoornet and SAPO has previously led to the transit time for a container from Durban to Gauteng being reduced from 3.6 days to 1.8 days. The target for the Spoornet IMEX container service is 1.7 days which would be competitive with road transport. The actual railway travelling time is fairly consistent at 16 to 18 hours.

Durban Car Terminal

The terminal is continually being expanded and during 2003/04 handled 139,189 motor units. This was expected to increase beyond 160,000 for 2004/05. The terminal occupies a dedicated area with exclusive access to a single berth (R berth) via an overhead bridge and operates a 24-hour, 365-day-a-year service. A multilevel parking facility, commissioned in May 2004, increased the yard capacity to 7,000 motor units. A further addition to the terminal is under consideration. The car terminal is used for both exports of new cars and the importation of used cars for the SADC market from the Far East. South Africa does not allow the importation of used vehicles into South Africa.

Others

A number of other terminals in Durban are managed and operated by private companies. These include the Bluff Mechanical Appliance (sized coal terminal), the Island View oil and petroleum complex, the fresh produce terminal at the T-Jetty, the sugar terminal at Maydon Wharf, Rennies Bulk Terminals as well as several other private facilities mostly at Maydon Wharf.

2.1.2 Richards Bay Port

The Richards Bay Coal Terminal (RBCT), owned by the main South African coal exporters, was purpose built in 1976 to handle exports of more than 65 mtpa of steam

coal. The terminal is being expanded to handle up to 87 mtpa. Richards Bay is significant for the DRC and Zambia because is has bulk terminals to handle sulphur imports and copper concentrate exports.

Richards Bay does not have a dedicated container terminal but it seems certain that a major terminal will be developed to accommodate long-term growth of the Gauteng traffic.

2.1.3 Port Elizabeth / Coega-Ngqura Port

The port of Port Elizabeth has served as the main entry port for the automotive industry in the Eastern Cape as well as the export of fully built-up vehicles to the Far East and Europe. It is the main export port for the country's wool, mohair and citrus products. Port Elizabeth has also served the SADC region through the N-S railway through Botswana, but this has gradually been moved to alternative ports and routes. The development of a planned new regional container transshipment hub at the new port of Ngqura at Coega would also serve the SADC region, both via the land routes, logically through Botswana, and by sea using feeder vessels. The new container terminal has been planned to handle post Panamax vessels (see Section 2.0 above).

Port Elizabeth Multipurpose Terminal (MPT)

The Port Elizabeth MPT manages the port's breakbulk, bulk and motor vehicle cargoes. These commodities include all types of unitised, free flowing (i.e., wheat and maize) and ro-ro (motor vehicle) commodities. The MPT incorporates South Africa's main manganese-ore exporting facility. Total breakbulk and bulk cargo handled at Port Elizabeth MPT is 2 mtpa.

Port Elizabeth Container Terminal (PECT)

The Port Elizabeth container terminal is one of three specialised container-handling terminals along the South African coastline and serves the immediate hinterland of the Eastern Cape. This includes a large automotive-manufacturing region in which knocked-down motor components arrive as containerised cargo for assembly at several vehicle-assembly plants near the city. Assembled and manufactured vehicles are exported in containers to Europe, Australia and Asia. The terminal also handles an increasing volume of transshipped cargo for the other South African ports. In 2003/04, PECT handled 282,865 teu's. With the development of the new Ngqura container terminal at Coega, less than 30 km from Port Elizabeth, it is expected that a significant portion of the current PECT throughput will be moved to Ngqura.

Ngqura Port

The new Port of Ngqura will serve the new Coega Industrial Development Zone (IDZ). The Coega IDZ is being managed by the Coega Development Corporation (CDC), a company incorporated under the Companies Act of South Africa and wholly owned by Government. The original concept involved developing a 'metals-processing cluster' around a large anchor project, such as a stainless-steel plant, aluminium refinery, or ferronickel plant. Such a plant would require direct access to a port for the import of raw material and the export of products.

The port of Ngqura should become operational during 2008. The port was built by NPA as the landlord. The terminals will be operated by SAPO until a decision is made to privatise all or selected terminals. The NPA has announced that it, rather than the CDC, will develop the container terminal, presumably with a private sector partner and SAPO.

The first phase of the port consists of an 18-m-deep approach channel and turning basin and five berths, consisting of:

- Two 16.5-m-deep container berths, capable of handling vessels of up to 80,000 dwt. Such vessels can carry approximately 6,000 teu.

- Two 16.5-m-deep dry bulk berths capable of handling large 80,000 dwt Panamax size vessels

- One 18-m-deep berth at the planned oil terminal capable of handling 150,000 dwt (Cape Size) tankers.

2.2 North South Corridor

The North South Corridor, critical to regional trade, connects South African ports and Gauteng to the SADC region (see Appendix 1 Figures 2 and 4). It is a highly flexible road and rail corridor which carries all the regional trade and includes three fixed crossing points on the Zambezi River – Chirundu, Victoria Falls and Katimo Mulilo, and the ferry crossing at Kazungula. Traffic along the corridor is dominated by exports from South Africa to neighbouring SADC countries. The North South route also provides a trade route between the south and the Great Lakes Region (Rwanda / Burundi) through the Zambian port of Mpulungu on Lake Tanganyika. There have been proposals to extend the railway line along this route but the economic viability of this doubtful. Focus should rather be given to a road / lake multimodal operation. A railway service cannot be operated over such short distances with low and unscheduled traffic flows.

The main constraints to the operation of this transport corridor are the delays at the various key border posts attributable to congestion and documentation issues (Beit Bridge, Chirundu and Kasumbulesa). The implementation of 'one stop' border posts would address these problems: by allowing each of the two existing border posts to deal with traffic flowing in one direction only, one can eliminate 'no mans land' between posts. It is almost always more difficult for freight operators to enter a country than to leave it, hence the problem of congestion and gridlock between border posts

The roads along the route are generally in good condition except for sections between Beit Bridge and Harare and an 80 km stretch north of Kazungula and Livingstone. The border problem of congestion at Beit Bridge and Kasumbulesa presents a serious constraint in the form of delays and poor resource utilisation.

Railway services are generally unpredictable and require substantial investment and improvement to be more competitive with road.

As mentioned previously, the bulk terminals at Richards Bay are important for the DRC and Zambia imports of sulphur and exports of copper concentrate. The port of Durban

handles more than 30 mtpa of freight of which less than 2% is transit traffic to the SADC countries, including containerised copper metal exports.

2.3 Port of Maputo (see Appendix 1 Figure 38)

Maputo Port, including the adjacent bulk port of Matola, was, prior to 1975, the largest port in Southern Africa. The port was effectively isolated during the Mozambican civil war and the Southern African regional conflict, but has gradually recovered since 1995 and was fully privatised during 1999 – 2002 with ownership being retained by CFM. This port concession is unusual because the port authority function has also been privatised.

Maputo port has 12 berths up to 12 m depth, including a modern 100,000 teu pa capacity container terminal (MIPS) and specialised sugar, citrus and ferrochrome terminals. In late 2006, Maputo started attracting direct vessel calls to and from the east. A car terminal is being planned for Maputo.

Maputo serves as the natural port for the Mpumalanga province in South Africa, via the Ressano Garcia railway and the TARC toll road. Traffic is gradually being won back from the Durban route, because port efficiency and road access has significantly improved and because of a distance advantage of more than 400 km from agricultural areas around Nelspruit and the mining operations at Phalaborwa. Spoornet and CFM are planning a 'road show' on 15 Feb 2007 to present the newly upgraded railway line from South Africa to Maputo – an indication that Spoornet is finally committing to sending general freight traffic to Maputo.

The north south railway in Swaziland was built during the 1980's in order to bypass Maputo Port, but this route will gradually become less used as volumes increase and customers regain confidence in Maputo port. Maputo serves as the preferred port for Zimbabwe's ferro-chrome and sugar exports, and is an alternative route to Beira for international trade with the DRC along the Limpopo railway. There is no direct rail route between Beira and the Copper Belt and rail traffic to and from both Maputo and Beira is routed through Bulawayo. Because the Limpopo railway has a severe freight flow imbalance in favour of sugar and ferrochrome exports (see Appendix 1 Figure 18), it should be possible to offer a reduced tariff for imports to Zimbabwe and Zambia / DRC. An obvious constraint is the status of Maputo as a feeder port to Durban. This may change as the volume in the port gradually increases and Maputo receives more direct and more frequent vessel calls. The Limpopo line has been largely rebuilt within Mozambique, but has been prone to flooding. In such instances its traffic is re-routed through Beira.

It is unlikely that Maputo will ever be able to compete with Durban for container traffic to and from Gauteng because of economies of scale. The future prospect for substantial growth is clearly with the expansion of the Matola bulk port. The Mozal aluminium smelter has a dedicated terminal for the importation of alumina, and an increasing volume of bulk minerals is being exported through the Matola coal terminal, which is operated by API, a division of the South African Grindrod Group. The Matola terminal is currently exporting about 2.5 mtpa of coal and magnetite, and is currently undergoing expansion with the planned additional of a second berth to cater for increased volumes as well as for phosphate exports from Phalaborwa, currently routed through the much longer distance to Richards Bay.

An important element of the future expansion and growth of Maputo / Matola is the operation and upgrading of the short 80 km railway corridor from the South African border to the port. This appears to have moved forward in 2006/7, according to both Spoornet and CFM who are actively campaigning for more business along this route. This railway was concessioned to the NLPI / Spoornet consortium in 2005 but was cancelled in 2006. Operational improvements are now in the hands of CFM. Required track improvements appear to have been completed, but there is a regional shortage of rolling stock and locomotives. Spoornet has an agreement to operate through to Maputo / Matola as a seamless service. No locomotive switches are required at the border.

2.4 Port of Walvis Bay (see Appendix 1 Figures 11 and 42)

The Walvis Bay port and corridor primarily serves Namibia but has been promoted by Namport for many years as a regional gateway for the SADC region for trade to and from the west based on time savings compared with the use of the east coast ports. The development of the TransKalahari Corridor (TKC) to serve the Gauteng region has received much attention, with Grindrod being chosen as the logistics partner to develop a business plan for the concept. It was, however. announced in January 2007 that Grindrod had withdrawn from the project. The TKC road through Botswana is in excellent condition, but traffic volumes remain low with many transporters still choosing the longer route through Upington for South Africa / Namibia trade. This trade is highly imbalanced in favour of exports from South Africa and road freight tariffs are generally cross subsidised in the ratio of 1:2. Recent initiatives to motivate the construction of a Trans Kalahari Railway for coal exports from Botswana and as a cheaper route for South African intermodal traffic to compete with Durban seem unlikely to be bankable at this stage due to the high infrastructure costs and the difficulty of obtaining commitments from enough new customers to secure the necessary income stream.

The Walvis Bay Corridor Group has also supported the development of the Trans Caprivi Corridor which provides a road or multi-modal transport route from the DRC and the Zambian Copper Belt via the new bridge at Katima Mulilo. Despite the long distance of 2620 km by road from Lubumbashi, it appears to be an attractive route for trade with the west because of time saving as compared with the use of east coast ports. Traffic levels have not yet increased sufficiently to provide a reasonable level of return haul for trucks and the route is expensive. The central portion of the route, the 940km from Grootfontein to Livingstone, is only served by road and traffic levels are too low to justify a railway link.

Walvis Bay is expanding and becoming a hub port for Angola, gradually overcoming the problem of infrequent vessel calls. Until two years ago, the Walvis Bay container terminal handled approximately 40,000 teu's pa, with Maersk as the terminal operator. Maersk decided to introduce new container routes with direct calls from the USA and South America, serving Walvis Bay and West African ports. With the increased congestion at the Angolan ports, transshipment is now taking place at Walvis Bay, and container volumes have increased to more than 100,000 teus pa. This may not be sustainable and is dependent on development in Angola.

The port of Walvis Bay has a depth of 12 m and was recently upgraded. It is regarded as an efficient port, operating at about 50% of design capacity. A new development master plan for Namibian ports is currently being carried out with KfW funding.

2.5 Port of Beira (see Appendix 1 Figures 7, 8, 9, 10, 16 and 31)

The Beira Corridor serves as the natural route for most of the imports and exports from Zimbabwe and southern Malawi. It also offers the shortest route – by a significant 600 km margin – from the Zambian and DRC Copper Belts to any regional sea port by road. Despite the significant distance advantage by road, Beira has not been able to attract high levels of traffic to and from Zambia. This is mainly due to the fact that Beira port has a limited draft due to siltation and is unable to handle large or even medium-sized vessels. The current maximum is probably 15,000 dwt fully laden, compared to the 30,000 dwt design capacity. In addition, Beira serves mainly as a feeder port to Durban with infrequent direct calls. Road transport directly between Durban and Zambia is therefore more often quicker and cheaper.

The coastal container feeder vessels from Durban call at Maputo, Beira and Nacala, but more recently an additional vessel has been introduced which turns around at Beira. There is a problem securing land transport return hauls to and from Zambia and DRC. Transport costs to Beira are therefore high, despite the shorter distance. The route passes through Kafue, Chirundu, Lions Den, Harare and Mutare. It is a road route only.

A possible 300 km railway connection between Kafue and Lion's Den, providing Ndola with the shortest railway distance to any port by far, has been planned for many years but has never been implemented mainly due to difficult topography and high capital costs. It was once again revived by the Zambian government in 2006 as a possible railway project for study, but it is unlikely that the relatively low levels of traffic will justify the construction and operating costs without substantial subsidies.

Beira is a river port, and has traditionally suffered from access limitations due to siltation and the inability of CFM to maintain the design depth of the quays and access channel through regular and planned maintenance dredging. The port therefore has a poor reputation and presently has a draft restriction of the order of 8 m to 9 m. Beira has a tidal range of more than 5m and access to and from the port is only during high tide, twice per day.

A dredging contract has been put out to tender with financing from Holland to carry out emergency dredging during 2006 to restore depths in the 40 km long access channel to a depth of 8m, allowing vessels with a draft of 12m to enter the port. Unfortunately the tenders have shown a funding shortfall of about 50% or US$ 18 million. There have been offers from the private sector to make up this shortfall. These offers have been linked to participation in the operations or to an equity stake in the port.

In addition to the existing dredger a smaller maintenance dredger will be supplied by Japan in July 2007 which should allow the channel depth to be maintained. Danida has also agreed to provide a new dedicated capital dredger by August 2008 with a capacity of 2,500 m3 and 2.5 million m3 per annum. The port should be able to handle vessels of 50,000 to 60,000 dwt, depending on the depth at the quays. At present it can handle vessels of between 15,000 and 30,000 dwt, the latter only partly loaded.

The increased use of the port of Beira for Zambian imports and exports could offer reduced transit times and costs but the port upgrade, planned for 2008/9, will first have to be completed and vessel calling frequency significantly increased to allow a good balance between import and export volumes (backhauls).

A major development for the port could be the decision by CVRD to export Moatize coal, up to 15 mtpa through a new dedicated coal terminal at Beira, using the reconstructed Sena railway line, due for completion in March 2009. The feasibility study for this project was completed in November 2006 and is currently under consideration by Mozambican authorities. The Government of Mozambique, with World Bank funding, has appointed consultants to carry out a due diligence process on the CVRD proposals, to be completed by May 2007. The future of Beira port therefore looks more promising with increased traffic from the mining developments at Moatize and elsewhere in Manica and Tete provinces. It is likely that the planned Moatize coal exports will justify private sector financing for the dredging programme.

Beira appears to be well placed in future to become Zambia's main international trading port, either as an all road route or as a multimodal road-rail route through Lions Den in Zimbabwe, providing the quickest and cheapest logistics solution. The choice of Beira, rather than Nacala, for the development of the coal export terminal, and the consequent upgrading of the port, will most likely provide a much better economic return for Mozambique given that Beira has larger catchment area and serves as a regional port.

Road transport to and from Beira is affected by the fact that Mozambican road user charges are significantly higher than the SADC recommended US$10 per 100 km. This further limits traffic to the port of Beira and affects its competitiveness. It also means that the Mozambican truckers are similarly penalised in other countries because the higher charges are applied to Mozambican registered trucks operating in the region..

Further, Mozambique is not a member of Comesa and the Comesa yellow card insurance, normally valid for regional travel to and from the Copper Belt, is therefore not valid on this route. Separate Mozambican insurance must be taken out for foreign trucks using the Beira corridor. Truck transit times between Beira and Ndola are of the order of four days with a further three days to Lubumbashi because of border delays at Kasumbulesa which is frequently very congested, with long processing times. The DRC has not yet concluded bilateral transport agreements with the other SADC countries, which means that procedures are not yet established.

2.6 Port of Nacala (see Appendix 1 Figures 10, 31 and 35)

Nacala port serves the northern Mozambique agricultural sector and sections of Malawi. Prior to 1980, about 60% of Malawi's imports and exports were routed through the port of Beira. There is no viable road connection from Malawi directly to Nacala. The railway and port services in Malawi and northern Mozambique have been privatised and are operated by CEAR and CDM respectively, with the same commercial shareholding.

Traffic volumes are low, less than 300,000 tpa, and competition from the port of Beira for the Malawi traffic will increase when the Sena railway line to Beira is re-opened in 2009. Nacala port is served by a weekly container feeder service to Durban also calling at Beira and Maputo.

CVRD were planning to build a dedicated coal terminal at Nacala for the export of coal from Moatize but this appears to have changed in favour of the shorter route to Beira. There has been some talk about developing a large regional container transshipment hub at Nacala, but the absence of a base load form a developed hinterland would

question the viability of such a project. Nacala is often promoted as a natural deep sea port, although access to deep water is more than 1,5 km from the shore and terminals for large vessels have not been built. Nacala has limited hinterland and the long railway distances means it cannot attract large volumes of low cost bulk goods, with the possible exception of Moatize coal, now destined for the shorter route to Beira.

2.7 Port of Dar es Salaam (see Appendix 1 Figures 5, 15 and 34)

Dar es Salaam offers the DRC, Zambia and the southern great lakes region the most competitive port for international exports and imports and serves as a hub port with direct vessel calls – 900 deep sea vessel calls per annum. Cargo throughput is about 6,5 mtpa, of which about one third is petroleum (POL) products. Imports far exceed exports by a factor of about 4:1 (Reference: THA statistics).

There is direct rail access to the Zambian and DRC Copper Belts via Tazara and RSZ, operators of RSZ are also the operators of the BBR route in Zimbabwe. They are not keen to hand over traffic to Tazara and would rather channel the traffic south to their own lines. Tazara therefore has a road serviced dry port at Kapiri Mposhi from which the DRC and Zambian Copper Belts are served. It is understood that an agreement is being drawn up with a Chinese company to operate the Tazara line on a concession basis, with new investment. About 75% of Konkola Copper Mines (KCM) exports are now sent via this route, none by rail to Durban (Reference: KCM statistics, confidential.)

The Tazara railway was built in 1975 to provide Zambia with railway access to a regional port at a time when the routes through Angola, Zimbabwe (Rhodesia) and Mozambique could not be used. Since reopening of the traditional trading routes to South Africa, traffic along the Tazara railway has fallen, although the regional economic justification for the line can still be defended, serving both Tanzania and Zambia / DRC transit traffic. Tazara is jointly owned by the Zambian and Tanzanian governments and has always operated at a loss and well below its design capacity. It seems unlikely that a private concessionaire could operate this line without continued support and subsidies from both governments. The original Chinese financing of about US$ 600 m for the construction of the line and the supply of wagons and locomotives has never been repaid. During the 1980's and 1990's, USAID supplied Tazara with 29 GE U30c mainline locomotives, mainly to carry drought relief. None of these locomotives are currently operating due to lack of funds for repairs and maintenance. Current traffic levels do not require more than six to eight locomotives and, in hindsight, it would have been better for USAID to provide fewer locomotives but include a long-term maintenance and spares provision contract with the supplier.

The port of Dar es Salaam also serves the great lakes region and Uganda via the lake ports of Mwanza and Kalemie via the 1000 mm gauge TRC railway line (see Appendix 1 Figures 6 and 26). This system was recently concessioned to Rites of India and includes a transshipment facility at Kidatu, between the 1067 mm and 1000 mm systems.

The road route along the corridor, about 1800 km from Kapiri Mposhi in Zambia, is in the process of being upgraded with European and Chinese support and contractors. It is generally well maintained although narrow and uneven in many places. The 800 km Zambian section is in excellent order, having recently been upgraded. See Appendix 1 Figure 21.

Refer to the Copper Belt Section 2.10 below.

2.8 Port of Lobito (see Appendix 1 Figures 14, 27 and 43)

The Lobito (Benguela) rail corridor was, prior to 1975, the natural transport route from the Southern DRC. The 1,290 km Angolan section has been closed since 1975. It is now being rebuilt with Chinese financing and equipment, for scheduled completion in 2009. The Angolan railway, CFB, has not yet co-ordinated the construction programme with SNCC, their DRC counterpart. However, the Zambian government has requested the Angolan government to consider the inclusion of a 900 km link directly to the Zambian railway system to 'provide direct access to the west' (Reference: direct communication with Angolan Ministry of Transport). This project is unlikely to be bankable for the foreseeable future due to the absence of sufficient freight traffic.

This route previously carried the copper and manganese exports from the DRC but the newer Tazara route to Dar es Salaam offers a slightly shorter land transport distance from Lubumbashi (2190 km) and more direct access to the main markets in the East.

From Kolwezi, the distance to Lobito is 1,700 km and to Dar es Salaam 2,420 km. Lobito could therefore provide a realistic alternative port for a large section of the DRC Copper Belt. In view of the several alternative transport corridors to the east from Lubumbashi, from where the distance to Dar es Salaam is closer (see Appendix 1 Figure 3), freight volumes may be too low and it may be difficult to achieve financial viability for the Lobito Corridor without substantial state subsidies. For current levels of traffic from the Copper Belt, railway transport costs to Lobito are likely to exceed US$120 per ton from Lubumbashi, which would be more than to Dar es Salaam. It should also be noted that most copper exports are destined for the east.

The port of Lobito has recently been surveyed by a Japanese team with JICA funding. It is (and was) considered to be one of the best natural harbours on the African west coast, with protected water in the bay up to 20 m deep within 130 m of the coast line. The port has six deep water berths with a depth of 10.5 m – about 30,000 dwt. The corridor is planned to be reopened by 2009, although there has been little co-ordination between the CFB and SNCC. This corridor, like the Nacala Corridor, does not offer a competing road route.

Due to war related sabotage, the CFB stopped most of its operations in the 1990s. Of the total line length of 1,304 km only the link from Benguela to Lobito (34 km) and the link from Sta. Iria to Caala, at Huambo, (47 km) are currently operated by scheduled trains.

The Benguela to Lobito link is in a very poor state and consists of worn 30 kg/m rails and a mix of severely corroded steel and rotten wooden sleepers resulting in low train speeds. Emergency rehabilitation works have been completed for the Negrão to Cubal section (about 154 km from Lobito). These works, costing about US$ 8.5 m, have been funded by the GOA budget (Orçamento Geral do Estado – OGE). Train operations on this section were scheduled to commence in September 2004. These initiatives have been overtaken by a Chinese program to reconstruct the whole Lobito /Benguela line to a high standard using 50 kg/m rails and a wider formation to accommodate a double line.

In 2003, approximately 3.4 million passengers were transported by the CFB. About 37,000 tons of cargo was transported on the Lobito to Benguela link. The poorest sections of the populations mainly use the train as transport as the cost is less than half that of the competing road based bus and minibus transport providers. Upgrading on the Lobito line therefore also has potential social and economic impact to rural poor communities.

The Port Authority does not currently require Government subsidies. Berth occupancy rates are low (around 45%), illustrating the port's considerable potential for handling possible additional cargo resulting from renewed access to the hinterland, the DRC and Zambia. A Port Development Master Plan prepared in the 1980s exists but more recently a detailed survey and study of all the Angolan ports was carried out by Japanese consultants with financing form JICA. The following port rehabilitation and extension project components have been identified:

- conversion of the grain silos from the current import function to both import and export (estimated cost: US$ 600,000);
- rehabilitation of the illumination system;
- additional yard pavement (about 80,000 m2);
- rehabilitation of approximately 25 km of railway track and 2 km of crane rails;
- southern quay extension (about 300 m);
- construction of a container dry port at about 3 km distance to ease port congestion.

The grain silo conversion has priority as it will facilitate the export of the increasing cereal production from the hinterland and will reduce storage losses.

2.9 The Northern Corridors – DRC East and West

The northern corridors serve the southern and eastern DRC. The SNCC railway network connects Lubumbashi and Kolwezi with the lake port of Kalemie (1,200 km), from there 135 km by ferry to Kigoma, and 1250 km by TRC along the central corridor railway to Dar es Salaam. The railway line is understood to be open and this route offers an alternative for the eastern DRC but not for the southern DRC as transshipment time and costs would be prohibitive.

The northern corridor through Uganda via Arua provides a route for the north-west DRC but the 600 km northern Ugandan railway has not been operational for some years. There exists a possible route from the Katanga region – 1,400 km by rail to the port of Ilebo on the Kasai, and from there 798 km by river to Kinshasa and 367 km by Onatra rail to Matadi but it is not a viable commercial route for projects in the southern DRC as none of the transport systems operate on a scheduled basis.

2.10 The Copper Belt

The transport market in the DRC and Zambia is very buoyant, less so in the other SADC countries outside South Africa, with a high demand for services due to the growth in mining (copper) and agricultural sectors. Transport services are competitive because of the response by road transport companies to demand and due to the entry of new companies from the sub-region.

Competition from railway services is being provided by RSZ and SNCC at the same cost as road but with much longer and less reliable transit times. However, judging by the performance of the KCM exports through Dar es Salaam, the Tazara railway multi-modal service, through close collaboration with customers, now offers a more competitive service than the all road service. KCM assisted Tazara with wagon maintenance and the provision of fuel and consumables, allowing transit times to be more consistent and less than the target of seven days, which has also reduced costs to less than the all road mode. It must be assumed that RSZ and SNCC will eventually offer improved services and will recapture some of the road traffic to and from the south. If they are unable to do so, the private concession will eventually fail because current railway volumes are insufficient to ensure financial sustainability.

The southern DRC transport sector is very poorly serviced. The railway services operated by the state owned SNCC suffer from a shortage of operational locomotives and wagons and most of the track requires repair and upgrading. Most of the system, however, remains operational with restrictions on speed and train lengths.

Because of the poor road conditions, the railway offers the only transport service to many remote areas during the rainy season. The service from Zambia through Sakania is the most frequent service but it is currently (2006) used very little. In 2005 use was estimated at about 150,000 tpa, i.e., one to two trains per week in each direction.

The 490 km service from Lubumbashi to Kolwezi and Mutshatsa is electric and operational with restrictions on speed and train lengths. The diesel services to Kalemie, on Lake Tanganyika, and Ilebo, on the Kasai River, are open but barely operational. Kalemie connects to the Tanzanian central transport corridor to Dar es Salaam, and Ilebo connects by river to the Kinshasa – Matadi Corridor. Neither of these routes currently provides realistic alternative access to or from southern DRC but there are no alternative all weather land transport routes to these areas.

The 790 km from Lubumbashi to the Angolan border along the Lobito Corridor remains open on the DRC side (SNCC reported a weekly passenger and parcel service to the border in 2003) but the 1,290 km Angolan section to Lobito has been closed since 1975. Reconstruction by the Chinese is due to commence in 2007. Prior to 1998, the SNCC service was operated on a concession basis by a Spoornet subsidiary, Sizarail, which was subsequently cancelled with the change of government. It is doubtful whether the SNCC service could ever be financially viable or remain operational without substantial government subsidies because of low volumes, long distances and competition with road.

Road services within southern DRC are also very problematic with the only all weather tarred roads extending from Kasumbulesa at the Zambian border to Lubumbashi (in reasonably good condition) and to Kolwezi (in very poor condition). Many of the gravel roads serving the copper mines both within the DRC and cross border to Zambia are managed and maintained by the mines effectively as private toll roads. These are informal roads serve the mining industry only, by arrangement with local authorities. The Kasumbulesa border post between Zambia and DRC, through which all road traffic to and from the south passes, is estimated to handle about 340,000 tpa of imports and 235,000 tpa of exports. Border crossings typically take up to three days.

There have been negotiations to construct private roads between the DRC and Zambia serving the mining sector in at least three different locations west of Chingola and Lubumbashi, connecting to the Zambia road system. These are currently tracks and not accessible during the rainy season.

DRC registered trucks are increasingly being seen on the regional transport routes despite the absence of bilateral transport agreements. Zambian truck operators have reported that a major problem is a charge of about US$ 3,000 for fees, export documentation and road user fees at the Kasumbulesa border with Zambia (Reference: Rainbow Transport).

By contrast to the DRC, the Zambian transport sector is generally in good order with an excellent national road system and an operational but problematic privatised railway system (June 2006). The national road system has been largely rebuilt over the past 10 years to high standard. The last 20 km section to the DRC border was until recently in very poor condition, and virtually impassable, but is now being rebuilt (2006). The 80 km section north of Livingstone, however, remains in poor condition and is overdue for reconstruction. Regular road maintenance has always been a problem in Zambia and, although the roads are relatively new and in good condition, large potholes are often left for long periods. (Refer Figure 21.)

The Zambian trucking sector has an estimated 1,600 large combination trucks currently registered, operated by more than 20 larger trucking companies and several hundred smaller operators. These are used for both domestic and cross border regional transport. Axle load control has been tightened on the main corridors, although the regulations still differ slightly in the different countries. For example, while Tanzania does not permit the use of 56 t GVM seven axle combination trucks, Zambia and the DRC do. This means that Zambian interlinks cannot enter Tanzania. Operators must use 6 axle trucks (Reference: World Bank Zambia Transport Liberalisation Study, 2006).

The Zambian Railway system was recently privatised and concessioned to NLPI and Spoornet. Spoornet pulled out of the agreement, citing lack of capacity to provide the necessary assistance. The traffic carried by RSZ has fallen significantly because of lack of locomotives and wagons. Spoornet is short of locomotives and wagons for its own customers in South Africa, but it is understood that they have nevertheless provided assistance to RSZ because of (previous) contractual commitments. KCM has not used RSZ for their copper exports since July 2005. The main focus of RSZ is therefore the international traffic generated by the copper mining industry, including the export of refined copper and copper concentrates, and the import of sulphur. It is also the export of agricultural products, including export of sugar, and the import of grain. RSZ has not released traffic statistics but the records of other regional railways (NRZ statistics) indicate that regional transit traffic is currently of the order of 600,000 tpa, of which 105,000 tpa is traffic to and from the DRC (2005).

3.0 COMPETITIVE ENVIRONMENT

Following deregulation of the regional transport sector from the mid-1980's, allowing private road transporters to compete openly with rail services, there has been a marked shift in general freight volumes from rail to road. This was a wholly predicted development, as rail services were no longer protected and could not compete with road

for higher value goods and 'just in time' services in terms of delivery time and price. The overall benefit to the regional economies was a lowering of transport costs through increased competition.

The result of deregulation and liberalisation was that the regional railways lost a large proportion of their general freight within a relatively short period and consequently suffered from overcapacity in terms of infrastructure and equipment and became grossly overstaffed in relation to the decreasing volumes of traffic. This, in turn, resulted in higher operating costs, falling revenues, and lack of investment and modernisation – a common problem with all the regional railway systems. This trend has continued, with the railways' share of general freight typically falling to the 20% to 30% levels, and with road services taking an increasing share of the bulk freight which is traditionally carried more competitively by rail. The movement of bulk freight from rail to road has mainly been brought about by lack of railway capacity (lack of investment and poor maintenance) and a declining market. While there appears to be sufficient wagons, they are always in the wrong place. Repositioning of railway wagons is a difficult and expensive process, unless it is on a fixed schedule basis, with dedicated equipment. Mines located in remote areas are more vulnerable. For example, railway service for Xstrata's ferrochrome exports from Lydenburg were withdrawn rather than renegotiated. In Zimbabwe and Zambia, lack of capacity has seen a large proportion of coal move to road transportation over long distances. Railway operators have not responded to changing market conditions.

The dramatic increase in road freight, and the consequent high cost of road infrastructure provision and maintenance, has prompted most regional governments to consider strategies for reversing this trend and to support the return of a portion of bulk and general freight to rail. Roads are particularly vulnerable to heavy, repetitive loads (used as the basis for road pavement design) and the damage caused by heavy trucks can be seen clearly on roads which provide access to mining operations – the direction of the full trucks deteriorates far quicker than the empty direction. The extent of deterioration has been studied in detail by South Africa's Department of Transportation and the CSIR. *The question is whether a process of reversal can be achieved by open competition, by making rail services more competitive, or whether direct intervention is needed, such as an increase in road user charges or toll fees for certain categories of traffic*. Railway services, being an inflexible system with generally single dedicated operators, carry the full cost of the transport infrastructure. It is often argued that road transporters do not pay the full costs and that private motorists subsidise road transporters on toll roads – the damage caused by heavy trucks, compared to light vehicles, is not adequately compensated for in the setting of toll fees.

DURBAN to GAUTENG – 600 km – Toll Rates applicable for the period 01-03-2006 to 28-02-2007									
Toll Fees, inclusive of VAT USD 1 equivalent taken as ZAR 6.5	***Mooi Plaza Mainline**	**Mooi South Ramps**	**Mooi North Ramps**	**Mooi Treverton Ramps**	***Tugela Plaza Mainline**	**Bergville Ramps**	**Tugela East Mainline**	***Wilge Plaza Mainline**	***De Hoek Plaza Mainline**
	R 23	R 16	R 7	R 7	R 33	R 10	R 21	R 31	R 23
	R 57	R 40	R 17	R 17	R 55	R 12	R 34	R 54	R 35
	R 80	R 56	R 24	R 24	R 87	R 22	R 51	R 72	R 54
	R 109	R 76	R 33	R 33	R 120	R 33	R 71	R 102	R 77
*These apply to road users traveling the N3 Toll Road between Johannesburg and Durban. Approximate distance: 600 km.									

The ratio of toll fees for heavy trucks to light cars is given as less than 5 to 1, considerably less than the ratio of the damage caused.

Regional governments have sought ‘quick fix’ solutions by opting for full scale railway privatisation or concessioning, supported and in some cases demanded by the World Bank as a precondition for continued financial support. This process has often been problematic, because very few of the regional railway operations are financially viable in an open market competing with road. Railways usually have a competitive advantage in the transport of heavy loads – typically 30 t to 60 t. Southern Africa has the heaviest permissible road gross vehicle mass (GVM) in the world (56 t plus 5%), allowing a load of about 35 t to be carried. This has significantly reduced the competitiveness of rail. While most of the railway systems are considered economically viable, very few are financially sustainable without ongoing central government support or subsidies.

Rail is more capital-intensive and less flexible than road transport. In order to be cost competitive, rail must realise a high degree of asset and resource utilisation. This can most effectively be achieved through long-term transport contracts for large volumes on a fixed schedule basis. The time taken to load and unload wagons is taken as unproductive time and rail generally needs to carry greater volumes over longer distances to compete with road transport. This is illustrated conceptually in Figure 3.1 below.

Rail has an advantage over road for heavy loads and large volumes. A typical bulk wagon can carry between 43t to 64t (or up to 104t on the bulk lines), whereas road is limited to a 35t payload. GFB (general freight business) train lengths generally range from 40 wagons (vacuum braked) to 100 wagons (air braked), giving trainloads of between 1 700 t and 6 400 t.

Rail transportation is also generally much cheaper than road for large volumes of bulk materials over long distances. This is demonstrated by the successful and profitable operation of the Coallink (545 km) and Orex (860 km) lines in South Africa where the unit tariffs are about US$ 0.005 and US$ 0.008 per tkm on an empty return basis

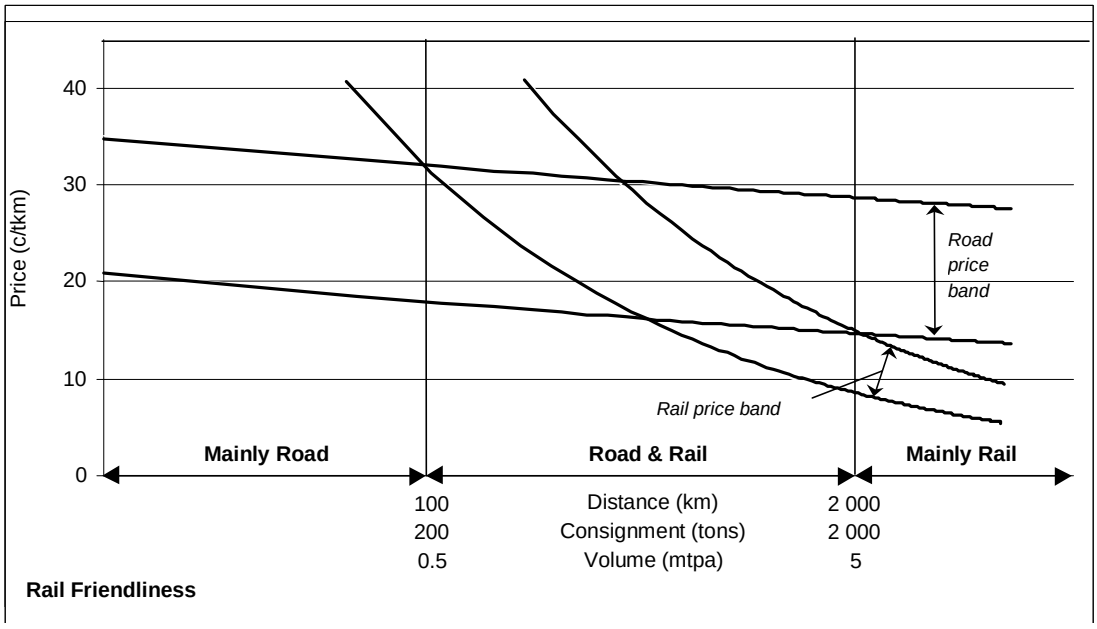
(Spoornet 2006). Road transport prices are about 10 times higher on a balanced return load basis, at about US$ 0.04 – US$ 0.05 per tkm. While general freight by rail costs about US$ 0.03 to US$ 0.04 per tkm, the service offered is very poor with longer transit time and no 'door to door' service.

Over the past decade, Spoornet has lost much traffic to road hauliers partly due to relatively high rail tariffs and unreliable service, and the increase in permissible road GVM. This loss can be attributed to poor management, inadequate use of assets and poor costing practices. Nevertheless, Spoornet has recently shown, through collaborative ventures with some bulk customers such as Eskom, that rail transportation over short distances of less than 100 km can be cost competitive with road, even when the return leg is empty.

However, one could argue that many traffic categories fall naturally to either road or rail (heavy / light, high value / low value, time sensitivity, consignment sizes, and so on) and that the real competition is over a fairly narrow band. The USA has more than 500 small private railway 'branch line' operators, all profitable, otherwise they would not be in business, and one would think that it should be possible to improve the general freight operations of the African railways. The concessionaire of the Nacala railway is one of these American companies, but success does not yet appear to have been achieved.

Figure 3.1

Indicative Road - Rail Competitive Relationship
(SA cents per tkm) (ref internal, Spoornet cost study)



The question is whether rail can recapture some of the general freight previously lost to road. There are good environmental reasons why this should be promoted. Besides congestion, safety and pollution, the energy consumed by a diesel-driven train, compared to a diesel road truck, is about 1:2.2 (45%) per net tkm. This becomes all the more important with rising fuel prices.

▪ South African split in road / rail (all freight traffic in ntkm)	64% / 36%
▪ Spoornet GFB traffic split electrical / diesel in terms of ntkm	58% / 42%
▪ Avg diesel fuel consumption for road haulage per 100 ntkm	1.6 litres
▪ Avg diesel fuel consumption for rail haulage per 100 ntkm	0.7 litres
▪ Energy consumption for rail transportation diesel : electrical	Ratio 4:1
▪ Avg railway infrastructure investment for diesel : electrical	Ratio 3:4

Source: DOT and CSIR / bg

In order to be significantly cheaper, rail needs to operate on a fixed schedule basis with block or unit trains. This applies to all rail services. This has been done elsewhere in the world for inter-modal freight (containers), but requires railway customers to commit to fixed volumes on a contract basis. This can only be achieved for a portion of the traffic and requires improved freight management systems. The promotion and development of rail sided warehousing would also allow rail to offer a 'door to door' service with reduced logistics costs.

Competition between the regional railway companies is generally open and unregulated and linked to the relative performance of the regional ports. The choice of railway route is generally governed by the shortest distance and not necessarily by the lowest cost. This has led to some unfair and uncompetitive practices by private sector railway concessionaires. For example, the Beit Bridge to Bulawayo railway operated by BBR / NLPI / Spoornet, has been designated as the chosen route for all north south railway traffic despite a much higher cost than the alternative traditional Botswana route, in order to maximise railway operating profits. Direct government intervention was necessary in order to achieve this (see Appendix 1 Figure 55). The railway tariff between Bulawayo and Plumtree was artificially raised to prevent use of the Botswana route. A similar situation developed in Zambia where the same concessionaire, NLPI, discouraged the use of the Tazara route to Dar es Salaam and fed the traffic south to its concession in Zimbabwe. Railway traffic on the Tazara route is therefore road hauled within Zambia to and from the end terminal at Kapiri Mposhi. These practices highlight the need for an effective regional economic transport regulator.

Virtually all the regional ports have undergone a degree of privatisation, with selected terminals concessioned to private operators. In the case of Maputo, the port authority function (but not the ownership) has also been privatised**.** Privatisation of the railway operations in South Africa appears to have been rejected although a degree of future private sector participation has been indicated. Many of the South African port terminals have traditionally been privately operated, but privatisation of the port authority or the container terminals is not planned.

Regionally, the operations of the container terminals have been privatised in the ports of Mombasa, Dar es Salaam, Nacala, Beira (together with the general freight terminals), Maputo, Walvis Bay and Luanda.

Railway concessions are operational in Zimbabwe (BBR), Zambia (RSZ), Malawi (CEAR), central Mozambique (CCFB), northern Mozambique (CDN), Tanzania/TRC (Indian?), and Tanzania/Tazara (Chinese?). Of all these, the CCFB operations in the Beira corridor appear to be the most promising because of the prospects of exporting large quantities of coal.

The port selection for exports or imports is most often dictated by the buyer. The ports and terminals compete openly with each other for regional traffic with very little interference, but for many customers located within the port 'catchment areas,' the ports effectively enjoy a monopoly and are able to set high tariffs. For that reason, the regional ports are generally profitable, are able to finance upgrades and maintenance, and are able to set their tariffs on a 'cost plus' basis. Again, there is some justification for having a degree of regional economic transport regulation or an improved regulatory system or possibly recommendations or guidelines for a fair pricing mechanism.

The competitiveness of the South African ports to serve the SADC area, despite their distance and locational disadvantages, is influenced by the regional trade flows dominated by exports from South Africa and the ability to offer a discounted price on the return hauls to South Africa.

4.0 REGULATORY ENVIRONMENT

The regulation of the safety and environmental aspects (including oil spillage, disposal of dredged material, handling of dangerous cargoes and dealing with distressed vehicles) of the regional transport sector are generally well defined and covered by international conventions and national legislation and procedures. Ideally, the regional transport sector should function in a manner which requires the minimum amount of economic regulation or is to a large extent self regulating in a truly competitive and harmonised environment.

To a certain extent, this is the case for regional road transport where there is open competition from a multitude of regional operators but with a degree of protection still existing in the application of cabotage rules (the transport of goods on the domestic market by foreign registered operators) and restrictions on third country operators (the transport of goods along routes which do not pass through the country of registration). The continued application of these rules requires performance monitoring and regulation. The SADC Trade and Transport protocols have stated objectives of removal of all these constraints or barriers, but a high degree of harmonisation of regulations and policies will be required before this can be implemented. Import regulations, duties, fuel prices, operating conditions, and so on, must all be similar if all barriers are to be removed, otherwise competitive advantages will arise.

Regional railway and port operations and the competition between different transport routes and corridors are partially monopolistic and require a degree of national and regional economic regulation, which does not take place at present. Situations such as the artificial closure of the Botswana railway transit route could not be dealt with by the existing institutions such as SARA and SADC. Both lacked the political authority and

were ignored. Regional economic regulation could also serve the function of approving concession agreements and tariffs to avoid the danger of private sector exploitation and monopolistic behaviour as described in Section 3 above. SADC has spent much effort preparing guidelines and model legislation on concessioning and regulation.

5.0 INFRASTRUCTURE AND RESOURCE UTILISATION

Transport operating costs, and consequently pricing, are highly sensitive to the degree of asset and resource utilization. This is illustrated by the wide range of transport tariffs charged for similar goods over similar distances, but in different locations or circumstances. For example, coal exported via Coallink to Richards Bay is transported by Spoornet at less than US$ 0.01 per tkm, as a profitable operation, whereas the coal transported to Durban via the GFB operation costs about US$ 0.03 per tkm and is generally loss-making (Reference: Spoornet cost study). Coallink loads wagons more than 10 times per month, whereas GFB only loads wagons about three times per month. The obvious question is, what can Spoornet do to make the GFB operation similar to that of Coallink? The same question can be asked for most of the regional railway operations. The answer probably lies in the contractual relationship with the customer and the division of responsibility. If the poor asset uitlisation is mainly caused by the operating condition imposed by the customer, such as variable demand and inefficient loading and unloading, then the customer should be provided with an incentive (reduced tariffs) to improve these conditions.

Optimum asset utilisation is less critical or sensitive for road transportation because road users are flexible and the capital and maintenance cost of the fixed infrastructure is carried on the basis of economic rather than financial return. Only the heavily trafficked main routes are suitable for concessioning, where toll fees are able to cover capital and operating costs. Within SADC, only South Africa and Mozambique (along the Maputo Corridor) operate toll roads. The other SADC countries charge road user fees to foreign vehicles on the basis of approximately US$10 per 100km for HGV's. One exception is the road bridge across the Limpopo River at Beit Bridge which was privately financed from Zimbabwe and is tolled. This is a monopoly service as there no alternative route.

Railway operations are very sensitive to asset utilisation because of their low degree of flexibility. Single operators, difficulty of moving the equipment to other regions and competition with road all limit the extent to which tariffs can be raised. Virtually all the regional railways, with the exception of the South African heavy haul freight lines, operate well below their design and installed capacity, and are generally loss making and sometimes cash negative. This is mainly because of low volumes, low operating speeds and long equipment turnaround times, further compounded by poor maintenance, shortage of operating funds, low equipment availability, high failure and accident rates. An example is the 29 large GE U30C locomotives owned by Tazara, all newer than the equivalent mainline locomotives operated by Spoornet, and all out of service because of the inability to finance the periodic overhauls. As a result, Tazara has had to hire locomotives from Spoornet while having non revenue earning assets to the value of about US$100 million. These assets could be disposed of or leased to potential customers including Spoornet, even in their non-operational condition. The planned concessioning of Tazara will eventually resolve this problem. The National Railways of Zimbabwe are in a very similar position.

Ports and terminals are less sensitive than rail to optimum asset utilisation because the ports often provide an effective monopoly service and tariffs are determined on a cost plus basis.

6.0 BALANCE OF TRADE (TRADE FLOWS)

The SADC Trade Protocol, signed in the year 2000, has the following main objectives:

- Market integration through the establishment of a SADC Free Trade Area (FTA), a SADC Customs Union, and a SADC Common Market
- Macroeconomic convergence
- Monetary cooperation

Specific targets articulated at the SADC Windhoek Conference in April 2006 include:

1. Free Trade Area by 2008
2. SADC Customs Union by 2010
3. SADC Common Market by 2015
4. Diversification of exports with more value added by 2015, export growth of 5% per annum, regional trade growth of 85% by 2008, manufacturing percentage of GDP of 25% by 2015
5. Macroeconomic convergence on inflation, ratio of budget deficit to GDP and public debt
6. External reserves / import cover restrictions, CB credit to government, savings targets, domestic investment targets, currency convertibility, dual and cross listing on regional stock exchanges, and so on.
7. SADC monetary union by 2016. Launch regional currency by 2016.

Most of these targets are interrelated and interdependent. On the face of it, the targets seem unrealistically ambitious and unlikely to be met. It could lead to several categories of SADC membership, depending on the degree of convergence or compliance. One cannot have liberalisation without convergence and harmonisation. A further constraint to progress is the membership of many countries to both SADC and Comesa (Refer Fig 58).

To date, progress has been disappointing. Intra- regional trade has increased from 20% to 25% of total regional trade between 2000 and 2006 and is dominated by exports of manufactured goods from South Africa to other SADC countries, despite the fact that South Africa has removed duties on about 90% of goods from SADC countries.

The value of exports from South Africa to SADC countries during 2005 was R 32 billion, whereas the value of the imports into South Africa, including SACU, was about R 8.5 billion, an imbalance of 3:1. The SADC North South corridor, as well as the Maputo and Walvis Bay Corridors, are dominated by this trade imbalance, both in value and volume. Trade between the other SADC countries remains very low primarily because they produce similar goods. Foreign trade therefore remains dominated by international trade through the regional sea ports: long distances, relatively low volumes and consequently high transport cost component relative to the value of the goods.

The main inland productive centres in SADC are:

- Windhoek – Okahandja;
- Gaborone – Francistown;
- Bulawayo – Harare;
- Blantyre – Lilongwe;
- Lusaka – Ndola;
- Lubumbashi – Kolwezi.

See Appendix 1 Figures 1 and 2.

7.0 FREIGHT FLOWS

As indicated by the regional trade flows, the volume of freight transport by road and rail on the regional corridors is dominated by exports from South Africa on the North South Corridor, and by international trade on the West East routes, with the volume of imports (generally manufactured goods) exceeding the volume of exports (generally raw materials or primary processed goods). Estimated freight flows are presented for some of the key SADC transport corridors in Appendix 1 Figures 15 to 19 and tabulated below.

The focus of the regional freight flows is very much on the Zambian and DRC Copper Belts and the North South connection to Gauteng because that is where most of the growth is currently taking place and this is what is driving the recent increase in transit traffic and demand for transport services. The stated motivation for virtually all the regional corridor projects is to capture a large proportion of the Copper Belt traffic. The problem is that there is not sufficient traffic to support these various infrastructure expansion projects.

Table 7.1

Estimated Freight Flows to and from the Copper Belt (2005/6)
(including transit traffic)

To / from Lubumbashi & Ndola	Distance (km)	Mode	Est. Volume (mtpa)	Est. Transit Time (days)
Dar es Salaam	2,190 - 1,970	Road	0.48 (incl. DRC)	8.5
Dar es Salaam	2,250 - 2,000	Rail	0.21 (incl. DRC)	18
Dar es Salaam	520 / 1,800 300 / 1,800	Road/rail multimodal	Incl. in 0.21 above	8-12
Harare	1,020 – 800	Road	0.3	2-3
Gauteng / Durban	2,630 / 3,220 2,410 / 3,000	Road	2.1	7-9
Gauteng / Durban	2,750 / 3,450 2,500 / 3,200	Rail	0.6	21
Beira	1,620 – 1,400	Road	Nominal	4
Walvis Bay	2,620 – 2,400	Road	Nominal	4-5
Lobito	2,280 – 2,500	Rail	0	n/a

The following general observations can be made:

- Road freight tends to achieve balanced freight flows in both directions because of flexibility of operations and the general practice of cross-subsidising and discounted pricing.

- Road freight is faster than rail and generally considered more predictable for general goods. Road is also cost competitive with rail if the freight flow is balanced. Rail is characterised by severe imbalances in freight flows and generally priced on a one-way basis because it is most often more cost effective to return wagons on a fixed schedule basis than to reposition them to new locations.

- Road freight operates on a 12-hour day basis because of single drivers and border operating hours. Average speeds for the long routes, which take several days and involve border crossings, are approximately 30 km/hour on a 12-day basis. Maximum speeds are 80 km/hr with average operating speed approximately 60 km/hr, depending on conditions.

- Rail should operate on a 24 hour/day basis, but frequent stoppages and absence of scheduling for general freight result in an average traveling speed of less than 15 km/hour. This does not apply to the Spoornet dedicated heavy freight lines.

- Rail freight services are not affected by customs procedures at border posts but are frequently required to switch locomotives due to railway operating procedures, which can cause severe delays - hence the desire to implement ‘seamless’ services.

- There is an increasing tendency to transport general goods as break bulk by road rather than being containerised. This is an attempt to increase load capacity and avoid the cost of returning the empty container, particularly when freight flows are not balanced. It is estimated that only about 10% of general freight on the regional routes is containerised.

- The imbalance of trade between South Africa and the SADC region attracts return traffic from SADC to the South African ports. Another influencing factor is that Durban serves as the regional 'hub' port, with most container traffic from the smaller regional 'feeder' ports being taken to Durban for transshipment into larger vessels.

Table 7.2

Estimated Road Freight Flows In and Out of Zambia
('in' denotes import from and 'out' denotes export to)

Estimated Numbers of Operating HGV's between Zambia and the SADC region

Road Route / Corridor	**Approximate number of HGV's operating on the road transport corridors, in both directions, at any one time**		
	Zambian Reg	**South African Reg**	**Other Reg**
Zambia – Zimbabwe – South Africa, via Chirundu	350	900	350
Zambia – Zimbabwe – via Chirundu / Kariba	80	0	150
Zambia – Botswana – South Africa, Via Kazungula	150	350	200
Zambia – Tanzania, via Nakonde	100	0	300
Zambia – DRC via Kasumbulesa	250	100	200
Zambia – Namibia, via Katimo Mulilo	50	0	20
Zambia – Malawi via Chipata	50	0	30

These trucks carry a total of about 3 mtpa on the various road routes. The main regional border posts (Chirundu, Nakonde, Kasumbulesa, Beit Bridge) appear to be operating at the limit of their capacity.

8.0 TRANSPORT COSTS AND PERFORMANCE

The Southern African regional freight transport sector is characterised by long distances and relatively low volumes which have led to relatively high railway tariffs. The sector is also characterised by long transit times. While the overall transport cost component of imports and exports remains high, road tariffs in US cents per tkm remain very low because of the unregulated and highly competitive nature of the road sector.

Railway tariffs are highly variable, with large volume bulk movements on the Spoornet iron ore and coal lines in line with international benchmarks, but with lower volume

general freight tariffs similar to that of road haulage and often unprofitable for the railway operating companies.

Transport costs and tariffs are negotiated and are not published or regulated. Road transport for a 56 tonne combination horse and double trailer is charged at about R11 per km (2006), or US$1.50 per km, and US$ 0.044 per tkm for a full 34 t load If there is no return haul, the price will be correspondingly higher, so the price of unscheduled just-in-time deliveries could be twice as much. A recent study by the World Bank on the performance of African railway concessions showed that railway tariffs were generally higher than US$ 0.044 per tkm (i.e., higher than the Southern African road tariffs for full return loads). However, railway freight flows are often severely imbalanced, and railway tariffs are most often given for one way traffic. The main reasons for the highly variable railway freight tariffs are the difficulties of achieving a high degree of asset and resource utilisation for variable freight flows and of negotiating long-term fixed contracts for general freight. The tariffs therefore vary from one contract to the next, and if there is no negotiated long-term contract, the tariff will be high.

Transit times on the main corridors vary greatly with road generally being significantly faster than rail. Rail transit times are affected by interchanges between the systems and the unavailability of locomotives at the border changeover points. Road transit times are affected by delays in border crossing and opening times, single driver operations, and an average road operating speed of about 60 km/hr. Average transit times for longer trips are typically based on about 30 km/hr. Road operators from the DRC and northern Zambia manage about 2.1 trips per truck per month with a turnaround time of about 15 days for a distance of 2,500 – 3,000 km. This performance is fairly consistent and indicates an annual distance traveled by regional trucks operated by the larger companies to be of the order of 140,000 km which is reasonable by international standards.

Efforts to reduce regional transport costs should therefore focus on reducing road transport transit times and on finding ways to improve railway planning and scheduling with the ideal being long-term contracts on ‘take or pay’ basis (i.e., customers pay whether or not they make full use of the fixed service in exchange for lower tariffs).

The main cost drivers for road and rail are summarised below. Detailed information on road and railway costing and pricing can be found in Appendix 5.

Cost Driver	Road Transportation	Rail Transportation
Capital cost of infrastructure	Not directly related to the road transport tariffs, except for toll roads, where some cross subsidisation from private cars takes place.	Initial capital expenditure mostly written of, but new high capital expenditure difficult to justify and incorporate into tariffs except for very high freight volumes – more than 2mtpa - which is rare in SADC.
Condition of infrastructure, maintenance and availability	Direct implication for transit time, safety, capacity, reliability and hence operating costs.	Critical for rail because of severe consequences of accidents. Speed restrictions, common on most SADC railways, direct implication

		on asset uitilisation and costs.
Capital cost of equipment and degree of utilization	Direct operating cost implication. Can be reduced by purchase of used equipment. Flexibility leads to higher utilisation and lower unit costs.	Very expensive, needs very high utilisation, most often not achieved in general freight due to loading and unloading time, particularly on short distances. Needs to be kept moving and earning revenue.
Condition of equipment	Implications for safety, reliability and hence costs.	Critical because of safety and the need to inspect and give clearance before each trip. Inspection failure means transshipment of goods and serious delays.
Cost of fuel (diesel)	Direct cost implication, accounting for more than 30% of operating costs.	Direct cost implication, but less than road (15% of operating costs). Increase in the price of diesel makes rail more competitive.
Topography and gradients	Steep gradients decrease speed and safety leading to increased operating costs.	More severe implications for rail. Significantly increases cost of infrastructure, increases length of track, reduces speed, sharper curves significantly increases maintenance costs, wagon and locomotive wheel wear.
Consignment size / weight	Maximum load 34t. Large volumes have infrastructure capacity implications. Suitable for break bulk, which is often cheaper than containerised because of savings in weight and permitting larger bulk for light goods, e.g., tobacco, cotton.	Max loads from 45t to 80t, able to handle more than 30mtpa on a single track with loops. Not cost competitive for light goods. Pricing based on stencilled capacity of wagon. Not suitable for most break bulk because of security and handling.
Freight scheduling	Flexible service, able to respond quickly. No major cost implications, assuming favourable market conditions.	Scheduling is very important and has significant cost implications because of lack of flexibility and importance of planning. Absence of scheduling could increase the railway tariff several fold.
Balanced freight flows	Direct cost implication. One-way transportation costs almost twice as much as two-way flow. Pricing is based on return distance.	Not as sensitive to road because of time taken to reposition and load the return wagon. It is often more efficient to return the wagon as quickly as possible to pick up the next contracted load (refer profitable heavy ore lines). Railway tariffs are almost always based on one way traffic.
Long-term contracts	Useful, but not critical, depending on market conditions. Will attract some discount of	Very important for rail for planning and could significantly reduce costs, particularly if the freight flows

	prices.	are constant.
Freight volumes	No significant savings on cost. Maximum volumes limited on road because of capacity and congestion.	Very important for reducing costs. Large volumes allow optimum resource and asset utilization and low tariffs.
Distance of route	Directly affects costs in relation to distance.	Long distances, more than 500 km, less sensitive than road. Short distances require sophisticated management of loading and offloading operations.
Operating speed	Affects turnaround time. Fairly constant except for traffic congestion which increases costs.	Important to achieve quick tunaround times, but more important to avoid standing still. Speed costs money on rail because of higher infrastructure costs, higher specifications.
Transit and turnaround time	Direct cost implication. Copper Belt – Gauteng return is typically 15 days	Direct cost implication. Number of wagon loadings per month should be maximized.
Border post delays	Major cost factor. Unproductive time could double turnaround times.	Freight not affected by immigration and customs, but rather by delays due to change of locomotives and train crews. Need for regional seamless service.
Door-to-door services	No cost implication.	Additional cost for distribution if customer is not rail serviced. Develop rail sided warehousing.
Cargo tracking and info systems	Normally part of service because of access to single operator.	More difficult and requires the services of a logistics company not a freight forwarder.
Just-in-time services	Part of normal service.	Not suitable. Too expensive because of lack of flexibility.

9.0 BORDER POSTS AND DOCUMENTATION

Border post operations mostly affect road transportation because of the immigration and customs procedures.

Railway freight is normally customs cleared at the point of arrival or pre-cleared on departure. Procedures at the border post are only related to railway operational issues, namely changing of locomotives and train crews. This practice affects rail transit times and competitiveness because locomotives and crews are not always available at changeover points. This is primarily due to operating regulations and issues relating to safety inspections that are carried out. The changeover of locomotives at the borders is gradually being phased out. Ideally railways should provide a seamless service and trains should be inspected and passed at point of departure, and should remain intact. This may require changes to the Railway Safety Regulator Act because the train crew would be foreign and not employed by the national operator (responsibility in the event of accidents).

For road freight, border crossings can be a major cost factor. The HGV traffic flow volumes at the key regional border posts including Beit Bridge, Chirundu, and Nakonde are considered to be close to the practical capacities, with processing and waiting times generally being one day (24 hours) except in seasonal peak periods and except for those trucks or operators who do not have their documentation in order (or for break bulk with multiple documentation). The frequent reports of severe delays at border posts are usually linked to specific problems, such as incorrect or insufficient documentation, inability to pay duties, or customs disputes. Border post processing and waiting time is considered to be partially self regulating in that the average daily arrivals must be processed within one day, otherwise the delays would escalate beyond control. Border post officials and staff are therefore required to process the daily arrivals (on the average) on a daily basis, whether they have the capacity or not. Severe delays are often experienced during peak periods, but are followed by a period of recovery. Severe and ongoing problems will also cause operators to choose alternative routes – i.e., Chirundu vs Kazungula, or Durban vs Dar es Salaam or Beira. *Lack of human resources and infrastructure at congested border posts do not necessarily lead to inefficient or longer processing times, but more likely to inefficient control, security and revenue collection – i.e., capacity constraints do not allow the proper procedures to be followed*. Typical border post documentation procedures are illustrated in Appendix 1 Figure 52.

SADC and USAID have assisted with the development of a single administrative document, SAD 500, to be used throughout the SADC region. It was successfully piloted on the Trans Kalahari Corridor, and was adopted by SARS in 2006 for the SACU countries. There are many other issues to be addressed such as transferable bonds for transit traffic, regional insurance cover, visa regulations, uniform scanning procedures and charges, uniform axle load controls (weigh bridge certificate should be required for border crossings), and extended and uniform border operating hours for customs and immigration.

The concept of one-stop border posts has been promoted for many years, and it appears it could implemented at selected border posts in the near future. Several initiatives are being promoted by SADC. This would essentially allow both exit and entry procedures to be handled by the exit border post, thus avoiding the congestion in the

area between the border posts. Frequent traffic gridlocks are experienced in this area at the larger border posts such as Komatipoort, Beit Bridge and Chirundu because the processing time for imports is normally more lengthy than for exports.

10.0 Characterisation of the Eastern and Southern Africa Transport Sector

There is a general acceptance in Governments and the private sector that the region's ability to realise its economic potential, integrate into the world economy and alleviate poverty is closely linked to the efficiency of its economic infrastructure, including its transport system. Infrastructure is critical to the region's competitiveness and poor or inefficient transport is seen as an important constraint to business growth.

Eastern and Southern Africa is characterised by relatively dispersed and isolated areas of population and economic activity, hence the efficient functioning of the interconnecting transport routes and corridors is vital to achieve increased trade and economic growth. Traffic is characterised by exports of mining and agricultural products from Botswana, Zimbabwe, Zambia, Malawi and the DRC and imports of manufactured goods mainly from and through South Africa. The main operating feature of the regional road transport routes, which affects transport efficiency, costs and tariffs, is the severe imbalance of freight flows on some of the routes, leading to empty return hauls, or waiting for return hauls. An empty return haul by road effectively means that the transport cost almost doubles. This freight flow imbalance is partly due to the importation of manufactured goods from South Africa and Europe / Asia, and that many SADC countries are still focussed on the export of primary or semi-processed goods. Balanced freight flows are less critical for rail, because of the inflexibility of the system and the cost and time of repositioning wagons and the breaking up of unit trains – it is most often more efficient to return the wagon (trains) as quickly as possibly to pick up the next load on a fixed schedule basis to achieve optimum equipment utilisation (for example, the highly efficient operation of the bulk ore lines).

Southern Africa as a whole has a physically well developed and flexible road, rail and port network, providing landlocked countries with several alternative and competing transport routes serving both regional and international trade. Some areas such as northern Mozambique, southern Tanzania and Angola, by comparison, have limited interconnectivity and flexibility and a higher degree of vulnerability.

The transport system as a whole operates at well below its original design capacity, although some sections, particularly key roads, railways and port terminals, require refurbishment and upgrading and improvement in operations, and consequently suffer from poor efficiency and hence capacity constraints – speed restrictions on both road and rail, shortage of operational railway wagons, availability of locomotives, lack of operating capital for the purchase of spares and fuel. While current trade volumes do not in all instances justify infrastructure investment, there are several current initiatives to further expand the network and regional interconnectivity. Inappropriate investment could lead to increased rather than reduced transport costs and inefficient expenditure by governments. On the other hand, targeted and well considered investment in upgrading and operational improvements of the sub-region's corridor transport infrastructure could bring costs down and optimise expenditure and investment.

The trucking industry is characterised by relatively few large and highly competitive private trucking operators in addition to a larger number of small firms operating one or two vehicles. The road transport sector is largely liberalised and while trucking assets and capacity may not be used to their full potential, it is generally considered to be competitive within its own constraints and in relation to rail transport. Road freight transport costs could be reduced by implementation of a range of measures that remove delays and make better use of assets and operating capacity.

With the exception of the South African dedicated bulk lines, the Southern African regional freight transport sector is characterised by long distances, relatively low volumes and relatively high railway tariffs as compared with most other comparative regions internationally – measured in terms of the transport cost component of imports and exports, which in some countries such as Malawi has been quoted as high as 40 percent. It is also generally characterised by inflexibility, in relation to schedules and poor inter-modality and resulting in delays and unreliability. The availability of rolling stock is still low compared to other regions of the world and disjointed railway operations together with poor tracks and rolling stock results in delays, unreliability and increased transport costs (Assessing Regional Integration in Africa (ARIA), 2004).

The regional road transport sector is characterised by a highly competitive, deregulated private road transport system competing openly with rail services which has led to a marked shift in general freight volumes from rail to road resulting in lower transport costs. The shift in traffic is also partly due to relatively high rail tariffs and unreliable service, both attributed to poor management, inadequate use of assets and poor costing practices. The permissible gross vehicle mass of 56t is the highest in the world, and has the effect of increasing the competitiveness of road against rail, and also of significantly increasing the cost of road maintenance – not fully compensated for in the setting of road user charges and toll fees. There is also a degree of cross subsidization of road freight from passenger vehicles and directly from government. The regional bilateral transport agreements include some elements of regulation in that they do not permit cabotage or third country operations – the operation of foreign hauliers on the domestic market and the operation of trucks on routes which do not include the country of registration. The ultimate aim of the SADC transport protocol is to do away with these regulations and the South African CBRTA already issues cabotage permits to foreign operators. It is expected that there will be resistance to complete deregulation from other SADC countries because this will allow South African operators to practise cabotage with low tariffs while waiting for a return haul, rather than returning empty, thus unfairly competing with domestic truckers.

Rail's loss of traffic to road has led to overstaffing which in turn resulted in higher operating costs, falling revenues, lack of investment and modernisation. Railway operators have not responded to changing market conditions and the service they offer is very poor with longer transit times and no 'door to door' service.

In order to be cost competitive, rail must realise a high degree of asset and resource utilisation. Virtually all the regional railways, with the exception of the South African heavy haul freight lines, operate well below their design and installed capacity, are generally loss making and sometimes cash negative. This is mainly due to low volumes, low operating speeds and long equipment turnaround times, further compounded by poor maintenance, shortage of operating funds, low equipment availability, high failure and accident rates.

Most of the railway systems and operations in Eastern and Southern Africa have undergone or are in the process of undergoing restructuring, in many cases with private sector participation in operations through fixed period concessions. These concessions have all been vertically integrated (infrastructure and operations), and include commitments for investment and upgrading to be financed by the concessionaire. While many systems are in need of capital investment, the priority is to improve the management of rail operations and coordination. While full scale railway privatisation or concessioning processes have reduced government losses, it has often been problematic because very few of the regional railway operations are financially viable in an open market competing with road. In some instances, these have led to increased transport costs because of restricted competition. For example, the Beit Bridge Bulawayo railway BOT project and operating concession required government guarantees for minimum and increasing freight volumes and tariffs, payment in foreign exchange to offshore accounts, and government intervention to close or curtail competing routes. Similarly, the Zambian railway concession does not permit access by the competing TAZARA railway for railway services to the Copperbelt. It will be interesting to see whether the Beira railway concessionaire will be allowed to compete with the Nacala railway concessionaire and whether the interests of the concessionaires will be put above the regional and national objective of reducing transport costs.

The dramatic shift from rail to road and the resulting high cost of road infrastructure provision and maintenance has prompted Governments in the region to consider strategies for reversing this trend and to support the return of a portion of bulk and general freight to rail.

It is often argued that the competitive playing field is tilted toward road transport in that railways have to invest in their own infrastructure and take care of the debt payments and road users are subsidized in that the charges they have to pay do not cover the full cost or even the marginal cost of using the roads.

Maritime transport is often considered the only SADC transport sub-sector that performs satisfactorily compared to the SADC countries' medium-term needs. This is partially due to the region's natural harbours with deep-water and good access from the sea. Virtually all the regional ports have undergone a degree of privatisation with selected terminals concessioned to private operators. Container tracking facilities and advanced management information systems are generally lacking in the regional ports, and the interfaces between the ports and the road and rail services are not well managed – this is where most of the delays occur. Several ports in the region do experience bottlenecks and require investment in infrastructure and improvement in operations. The economic cost of congestion is measured in increased shipping costs (congestion surcharges on each container to compensate for waiting for berth access) increased container dwell times (time spent in the yard, delayed payments) and increased land transport costs (unexpected delays, poor scheduling).

Ports and terminals compete openly with each other for regional traffic with very little interference, with customers most often dictating the choice of port. Because many ports effectively enjoy a monopoly within their geographical catchment area, and are therefore able to set relatively high tariffs compared to more distant competing ports, they are generally profitable and are able to finance upgrades and maintenance. The port of Walvis Bay provides a good example of this, but is still regarded as a cost

effective and efficient port because of the desire to compete with the South African ports for the Gauteng traffic. The regional ports are generally able to set their tariffs on a 'cost plus' basis for what is considered to be captive freight. The competitiveness of the South African ports to serve the SADC area, despite their distance and locational disadvantages, is influenced by the regional trade flows dominated by exports from South Africa and the ability to offer a discounted price on the return hauls to South Africa. The port of Durban also serves as the main freight hub for Southern Africa, with frequent direct vessel calls. Most of the general freight (containers) to and from the regional east coast ports such as Maputo, Beira and Nacala is shipped to Durban for transhipment to larger vessels at an additional cost. As volumes increase, the vessel calling frequency and vessel sizes will increase, and the feeder ports will gradually start operating as hub ports with lower port and shipping costs. It appears that Walvis Bay and Maputo are gradually receiving more direct vessel calls which will attract more traffic.

The region would benefit from a study of overall regional optimisation of port resources.

Transport costs in Africa are among the highest in the world. A report by UNCTAD shows that the freight cost as a percentage of total import value was 13 percent for Africa in 2000 compared to 8.8 percent for developing countries and 5.2 percent for industrial countries. Eastern and Southern Africa's freight cost as a percentage of total import values is 15.2 percent (UNCTAD 2002). Assessing Regional Integration in Africa (ARIA, 2004) shows that transport costs are high in Africa in general and in landlocked African countries in particular, with Malawi averaging 56 percent of the value of exports compared to 8.6 percent for all developing countries. The percentage cost of transportation for imports will be lower because of the higher value of the imported manufactured goods. These high costs undermine the competitiveness of exports and jeopardise the region's participation in international trade. "It is therefore not surprising that Africa in general and sub-Saharan Africa in particular has the highest cost rates in the world and also has the lowest share of international trade. In 2000, Africa's share of world export was only 2.7 percent and sub-Saharan Africa's share of export of goods fell from 1.9 to 1.4 percent during the 1990s (African Development Bank 2003)."

The USAID Rapid programme concluded that "halving transport costs could stimulate an increase in trade by five times."

The main constraints to lowering transport costs and improving efficiency in Eastern and Southern Africa's transport sector are indicated below. This is not an exhaustive list. These issues will be further elaborated on and expanded on in the Final Report, including contributions and input from interviews and the planned workshop:

- Inefficient road transport operations, due to low operating speeds, freight flow imbalances, high capital and maintenance costs, poor infrastructure conditions leading to high vehicle operating costs and low vehicle utilization. This varies considerably from one area to another, e.g., Angola and DRC vs South Africa and Namibia.

- Customs and border delays, due to customs and immigration procedures, documentation, capacity constraints and poor knowledge of procedures. This varies considerably from one border post to another.

- Inefficient regional railway operations, due to low and decreasing volumes, high costs and staffing levels, lack of investment and maintenance, financially non viable operations (lack of government support) and inability to compete with road for general freight due to the high permissible GVM on roads. This does not apply to the South Africa heavy mineral lines.

- Inefficient port operations, due to lack of investment, poor infrastructure and equipment condition, low equipment utilization and low vessel calling frequency, leading to high port costs. This varies considerably from one port to another.

- Inefficient modal interchanges: transshipment or transfer of goods from one mode to another - port, road and rail, poor planning by both operators and customers, leading to delays and increased costs.

- Poor cargo tracking systems leading to difficulties with scheduling and planning, poor equipment and infrastructure utilisation, delays and increased costs.

- Inadequate processing and value adding of exports, leading to a high transport cost component, particularly for exports of primary products.

- Lack of implementation of agreements and protocols, absence of follow-up and monitoring.

- Financing structures: general lack of knowledge of procedures for developing and financing transport infrastructure projects.

- Poor coordination and planning of infrastructure studies and projects by various institutions, donors and associations, leading to duplication and possibly incorrect investment decisions, wasted resources.

- Poorly defined project selection criteria, leading to the promotion of projects which may be inappropriate and economically non viable.

APPENDIX 1

REGIONAL TRANSPORT DIAGRAMS

Regional

1. Geographical Catchment Areas
2. Southern African Transport Corridors and Ports
3. SADC Regional Transport Routes – Rail and Road Distances
4. SADC North-South Corridors and Regional Linkages – Regional Transport Flexibility

Transport Corridors and Routes

5. Dar es Salaam Corridor
6. Great Lakes Transport System
7. Beira Corridor
8. Zambezi River transport System
9. Beira Corridor – Sena Line
10. Malawi Transport Corridors
11. Trans Kalahari Corridor
12. South African Corridors serving Gauteng
13. City Deep Durban Intermodal System
14. Angolan Transport Corridors

Trade and Freight Flows

15. Dar es Salaam Corridor Volumes
16. Beira Corridor Volumes
17. Zambia Road and Rail Volumes
18. Zimbabwe Rail Volumes
19. Gauteng Durban Corridor Volumes

Road Systems

20. DRC
21. Zambia
22. Botswana
23. Mozambique
24. South Africa

25. Railway Systems

26. DRC
27. East African Railway Systems
28. Angola
29. Zambia
30. Zimbabwe
31. Malawi
32. CFM(c) and (n) Nacala and Sena Lines
33. South Africa

Regional Ports

34. Mombasa
35. Dar es Salaam
36. Nacala
37. Beira
38. Beira Coal Terminal
39. Maputo
40. Maputo/Matola
41. Richards Bay
42. Durban
43. Walvis Bay
44. Lobito
45. Luanda

Border Posts

46. Chirundu Border Post Zimbabwe
47. Chirundu Border Post Zambia
48. Machipanda Border Post Mozambique
49. Forbes Reef / Machipanda Border Post Zimbabwe
50. Beit Bridge South Africa
51. Beit Bridge Zimbabwe
52. Ressano Garcia – Komatipoort Border Post
53. Border Post Documentation Process
54. (Blank)

Project Organisational, Equity and Loan Structures

55. TARC
56. BBR
57. TKC
58. City Deep

Regional Institutions

59. Membership of SADC and Comesa

PLEASE INSERT POWERPOINT FILE

APPENDIX 2

DEVELOPMENT AND FINANCE AGENCIES AND INSTITUTIONS
(Database work in progress)

TRANSPORT RELATED ASSOCIATIONS, DEPARTMENTS, COMPANIES
(Database work in progress)

PLEASE INSERT
2 X INSTITUTIONS SPREADSHEETS

1. **DEVELOPMENT AND FINANCE AGENCIES AND INSTITUTIONS**

2. **TRANSPORT RELATED ASSOCIATIONS, DEPARTMENTS, COMPANIES**

APPENDIX 3

REPORTS DATABASE
(Work in progress)

PLEASE INSERT REPORTS DATABASE (SPREADSHEET)

APPENDIX 4

CURRENT PROJECTS AND STUDIES

Various initiatives and developments such as Nepad, the South African government's regional SDI programme and the recent substantial price and production increases of many minerals and commodities, have brought a fresh impetus and focus on the development of new infrastructure projects, particularly within the transport sector. Transport infrastructure has been neglected or damaged in conflict situations in a number of countries and regions and the rehabilitation of roads, railways and ports is seen as the key to drive intra-African trade and economic growth. Many infrastructure and transport planning studies have been and are currently being undertaken, and many projects are being developed or are under consideration for funding and being promoted by various institutions.

Given the poor state of transport infrastructure in some regions, these developments are encouraging. However, it appears that there is very little co-ordination between the promoters of these projects and the authorities undertaking the studies, which has led to duplication and repetition of work carried out by consultants.

A preliminary list of current studies and projects with a brief description has been compiled. It is far from exhaustive and excludes the extensive range of transport upgrade and expansion projects being undertaken by Transnet in South Africa. These and others will be detailed during the next phase of this study.

Sena Line Rehabilitation

In progress by Rites Ircon with World Bank funding. Will provide rail access to the Zambezi Valley and to Malawi from the port of Beira. Will capture some of the traffic from the Nacala rail corridor. Includes Beira Zimbabwe rail concession

Tazara Railway Concessioning

Currently being negotiated with Chinese operator. Will provide financing and improved railway services from Dar es Salaam to the Zambian and DRC Copper Belts.

Tanzania Railway Corporation Concessioning

Being concluded with Rites Ircon. Will provide improved railway service from Dar es Salaam to great lakes region, Uganda and Kenya.

Angolan Railway Projects

Currently under construction, including Benguela line to DRC, being financed by China and undertaken by Chinese contractors.

Angolan Port Project

Study undertaken by JICA in 2006 for the planning and rehabilitation of all the Angolan ports.

Nacala Railway Repair

The repair of the poor 77 km of the Nacala railway from Cuambo to Entre Lagos, and the repair of Nacala port. US$ 26 m, financed by OPIC.

Zambian Railway Projects

Several ambitious new railway projects being promoted by the Government of Zambia, including linking the Tazara line with the Nacala line (300km) to provide rail access from Nacala to the Copperbelt; linking the RSZ services with the Zimbabwe rail system between Kafue and Lions Den (300km), providing improved access from Beira to the Copperbelt; linking the Tazara line with the port of Mpulungu on Lake Tanganyika (about 160km) to provide rail access to the great lakes region; extending the existing railway from Chingola to Solwezi (200km) to provide rail access from the new copper mining areas to the smelters at Chingola / Kitwe; extending the planned Solwezi line to the Beguela line in Angola (about 900 km) to provide an alternative rail access from Lobito to the Copperbelt. Given the severe operational and viability difficulties experienced with both Zambian railways and Tazara, Zambian Government support for these projects is surprising. The private sector is expected to provide the funding.

Chirundu Border Posts

The Governments of Zambia and Zimbabwe have commenced the expansion and renewal of the Chirundu border posts with a new bridge financed by JICA. The project, half completed, has stalled for several years due to the shortage of funds. Re-planning to provide one stop border post is being considered with support from SADC.

Trans Caprivi Corridor

A comprehensive study was undertaken to develop the Walvis Bay route to the Copper Belt through the Caprivi as a feasible alternative import-export route. The WBCG has opened a representative office in Lusaka.

Ngqura Port and Coega IDZ

The port of Ngqura, linked to the Coega IDZ, has been built to accommodate a deepwater container berth to handle post Panamax vessels and to serve as a southern hemisphere container transshipment hub. The port has been completed but the container terminal will not be operational before 2008 and will require the participation of the major shipping companies. Transnet is currently planning to expand Durban to handle larger vessels and is planning container terminals at the deep water ports of Richards Bay and Saldanha Bay.

Spoornet Freight Terminals

Spoornet has initiated a project for the planning of intermodal freight terminals at the major South African sea and inland ports with the objective of winning freight back from road. The project studies will commence in early 2007.

TransKalahari Corridor

The Walvis Bay Corridor group concluded a contract with Grindrod to develop and manage a multi-modal transport corridor from Gauteng to Walvis Bay along the TKC through Botswana to offer a faster route for trade of high value goods between Gauteng and the west, possibly commencing with imports using the discounted road tariffs. The intention was to have rail shuttle between Windhoek and Walvis Bay. The Walvis Bay Corridor Group recently announced (January 2007) that Grindrod has withdrawn from the project.

TransKalahari Railway

This project has been investigated for many years, but more recently promoted by Falcon Resources, a small Namibian company, to export coal from Botswana through a new port at Shearwater, north of Luderitz. The project is unlikely to meet normal private sector investment criteria, and will be wholly dependent on long-term international coal prices and the mining feasibility.

Department of Transportation – Durban

The South African DOT has initiated a transport study for the planning of the interface between Durban and the port operations. Commencing in early 2007.

DOT Transport Costs Study

South Africa's DOT has initiated a study on the structure of national transport costs. Current status of this study is unknown.

SADC SDI Study

SADC has announced they will commence a study on the status of the regional SDI's commencing 2007. Expressions of interest have been invited from consultants, closing 13th Feb 2007, to be financed by Belgium.

Angola SDI

The SDI unit at DBSA commenced a scoping study of the Angolan SDI's in 2005. The project was held back pending approval by Government of Angola. It is expected to proceed during 2007.

Central Corridor SDI Scoping Study

The SDI has received proposal for a scoping study on the mining sector in the Northern Corridor in Tanzania, planned to commence in Dec 2006.

Nepad – AfDB

Comprehensive planning study for Nepad transport projects in all regions - in progress. Commenced in 2006. Study being carried out by SCET-Tunisie, Louis Berger International, Afro-Consult and Stewart Scott.

CFM – Sena Line Cost Study

World Bank funded study to carry out economic analysis and determine rail costing and pricing on the Sena Railway.

Moatize Coal Mine and Transport Infrastructure

The Government of Mozambique, with financing from the World Bank, has commenced a due diligence process of the proposal received by CVRD for the development of the Moatize coal mine and the transport infrastructure, including the railway and port operations, for the export of more than 12 mtpa of coking coal through the port of Beira. This project will have a significant impact on the Mozambican economy and the regional transport sector (Malawi, Zimbabwe, Zambia and DRC).

Botswana ITP

Integrated Transport Planning Study for Government of Botswana. Under preparation, completion mid-2007.

Botswana Cargo and Logistics Study

Terms of Reference for freight terminal development in Botswana issued by BEDIA. Tenders closed late January 2007.

One Stop Border Post

Study to establish a one stop border post between Namibia and Angola. Funded by JICA, proceeding in January 2007.

Beira Port Dredging

Project to return Beira to it's design depth of 12m and capacity of about 45,000 dwt vessels. Tenders received indicate a US$ 18 m funding shortfall. Project delayed.

Beira Coal Terminal

New offshore coal terminal up to 15 mtpa (fed by barge from Beira port) to be developed by CVRD for the export of Moatize coal.

Shire River Project

Recent German funded feasibility study to reopen the Shire River for navigation from the sea via the Zambezi River. Justification doubtful with reopening of the Sena line.

Zambezi Barging Project

Project under consideration, mainly by private interests with Government support, to barge coal exports down the Zambezi. Unlikely to be bankable from an environmental perspective.

Kazungula Road Bridge

Project under consideration by Government of Botswana to provide a fixed road crossing over the Zambezi to assist north south transit traffic. Initially promoted by JICA. SADC has given notice of the commencement of the procurement process.

Uniform Customs Document and Bond Guarantee

Nepad short-term action plan (STAP) Comesa/SADC. High priority.

Establishing One Stop Border Post

Nepad STAP – Comesa. High priority.

Implementation of Overload Control Along Corridors

Nepad STAP – Comesa. High priority.

Nacala Port Rehabilitation

Nepad STAP – SADC. High priority.

Institutional Support for Concessioning of Railways

Nepad STAP – SADC. Medium priority.

APPENDIX 5

BASIC PRINCIPLES OF SADC FREIGHT TRANSPORT COSTING AND PRICING

Table 1

Indicative Range of Transport Tariffs in Southern Africa

Transport Mode / Bulk Freight Volume	Indicative Transport Cost 2006 (US cents / ton km, fully laden)
Road transport, full return load, contract basis	4 to 5 US cents
Road transport, no backhaul, contract basis	8 to 9 US cents
Rail transport, one way, large volume - + 20mtpa	1 to 1.2 US cents
Rail transport, one way, medium volume 2mtpa	2 to 2.5 US cents
Rail transport, one way, low volume, - 100,000tpa	5 to 8 US cents

Note: For road and rail transport, ad hoc JIT 'last minute' services could be much higher. For railway transport, services should be on a fixed schedule basis.

Unit freight rates for both rail and road traffic, expressed on cost-per-ton-moved, are derived from fixed and variable costs.

Fixed costs consist mainly of the amortisation of capital costs, as freight transport by both road and rail is capital intensive. Other fixed costs include head office and workshop costs. Typically, the fixed component will account for 50 - 65% of the freight rate for rail and 30 - 40% of the freight rate for road. The key to reducing this rate is to increase the use of the capital items so that the fixed cost can be spread across a greater tonnage. A greater level of resource utilisation is particularly critical for rail freight.

In most Southern African countries, a large proportion of the heavy goods road trucks are imported from the USA and Europe as three to four year-old used vehicles with substantial savings on capital costs. While maintenance costs are therefore higher, labour costs are relatively lower. However, South Africa does not allow the importation of used vehicles. Similarly, for the railway general freight business, which includes the export of 2 – 3 mtpa of coal through the ports of Durban and Maputo, it is generally not cost effective to acquire new locomotives and wagons. The business cannot carry the high amortisation costs and the general rule is to use older refurbished equipment. The same rule applies in the USA, where the many privately operated and profitable branch line operations make use of cascaded equipment from the mainline operations.

The essential parameters to reduce the capital component on a unit charge basis are:

- **Volumes** – the larger the volume of goods transported, the lower the unit cost because of the lower unit-capital-costs (fixed-costs) component, subject to capacity limitations.

- **Equipment use** – expensive transport equipment and infrastructure must be used as much as possible to reduce unit operating costs. The focus should be on reducing equipment turnaround times. This involves limiting the time that equipment awaits discharge or loading (generally inexpensive), rather than focusing on speed of movement (generally expensive).

- **Distance** – generally the longer the distance, the lower the unit cost, because of better equipment utilisation. However, the longer distance increases total transport costs because of distance-related operating costs such as fuel.

- **Balanced traffic flows** – scheduling freight movements so that back-haul cargo can be carried on what would otherwise be non-revenue-earning return trips.

Fixed costs are typically related to infrastructure provision, leases, rentals, administration, management and permanent staff salaries – overheads that are not directly linked to the movement of freight.

Variable costs include:

- **Energy costs –** In the case of rail, this can be diesel or electrical. Typically, diesel accounts for 10 - 15% of the cost of transporting large volumes of bulk goods by rail. The energy costs of electric locomotives are much lower and generally amount to 25% of that of diesel-powered locomotives. However, the use of electric locomotives requires a high capital investment in the provision of the electrical distribution system (R1,1 million per km for 25 kV (ac) plus cost of feeder lines at R0.35 million per km). Consequently, electric locomotives are only used on high-density routes. Outside South Africa, there are short sections of electrical railway lines in Zimbabwe and the DRC. Diesel costs for road transportation are often more than 30% of total operating costs.

- **Labour –** train operators and truck drivers.

- **Maintenance –** the replacement of consumable items, such as tyres and air filters, are large operating costs for road operators. Wagon and locomotive maintenance costs are significant for railway operators.

- **Other –** access fees, tolls and licence fees.

RAILWAY COSTING AND PRICING

Basic Costing Principles

Rail costs can be estimated from basic principles such as fixed and variable infrastructure and equipment costs, taking into account the train transit and turnaround times.

Current capital/leasing cost indicators are as follows:

- **A new mainline diesel locomotive –** The purchase cost is approximately $3 million per locomotive. The current lease costs are about $1,000 per day plus fuel at 0.7 litres per 100 tkm. The normal lifespan is 25 to 30 years, but is often extended beyond 50 years by upgrading.

- **A new mainline electric locomotive –** The purchase cost of a new-generation dual-voltage 3 kV (dc)/25 kV (ac) electric locomotive is approximately US$ 4 m. The normal lifespan is 25 to 30 years.

- **A new bulk open wagon –** These can range from US$ 50,000 to US$ 100,000, with specialised wagons costing much more. For example, a CR-13 wagon, suitable for iron and manganese ores, with a 30-t axle load and 100-t payload, costs approximately US$ 100,000. Current lease costs range from US$ 12 to US$ 25 per day. The normal lifespan is 40 years.

- **Cost of new single track –** All included from R2 m to R6 m per km, depending on the specification (between 18-t to 30-t axle loads). For example, the cost of the trackwork for a new heavy-duty 60-kg/m line (rail, sleepers, fastenings and ballast) is approximately R2.3 million per km.

The current operating cost indicators are as follows:

Maintenance

- **Track maintenance** – This typically accounts for 15% of total operating costs, depending on distance, load, and the number of trains per day. It is measured in cents/tkm. Spoornet estimates that the maintenance costs for Orex for 2006 will amount to R302m (labour R160 m and materials R142m). This equates to a cost of R 0.012 per tkm, or R350,00 per km per annum for a volume of about 30 mtpa and track length of 850 kms. By contrast, a recent study on the TKC railway project which would carry 1,6 mtpa used a figure of R 0.019 per tkm or R30,000 per km per annum. The City of Johannesburg currently spends R20,000 per km on maintaining its 14km of exchange yards, feeder lines and sidings in the City Deep area (low track utilisation). The indicated range is therefore R 0.01 – R 0.02 per tkm, or R30,000 to R350,000 per km per annum for mainline traffic, depending on the traffic volume and specification.

- **Electrification** - This typically equates to 3% pa on capex, depending on 3KV or 25Kv.

- **Signalling and Communications –** This typically equates to 5% of capital expenditure.

- **Locomotive** – This typically equates to 3% pa of the purchase price.

- **Wagons –** This typically equates to 3% pa of purchase price.

Operating

- **Personnel -** This covers the cost of drivers, train controllers, shunters, management, etc. Typically amounts to 3 - 5% of total operating costs.

- **Fuel Costs –** Fuel consumption is approximately 0.35 l/100tkms for long distance heavy haul diesel. Short haul diesel can be double. Fuel costs typically account for 10 - 25% of the total operating costs.

- **Railway access fees for a private operator –** These range from R0.02 to R0.04 per tkm, depending on volumes. Spoornet and other Southern African railway operators, including the private concessionaires, do not yet allow private operators access to its lines.

Spoornet is by far the largest railway operator in Southern Africa and their pricing policies affect and influence those of the other regional railway operators.

Most are cost-plus systems, which ignore market conditions and competition. These policies have led to the recent severe price increases for Spoornet services.

Spoornet's standard GFB (general freight business) contracts provide agreed fixed tariffs based on volume commitments, with volume and prices revised annually. The tariff covers haulage only. All other services (such as shunting, measurement and adjustment) are charged separately. Penalties are charged for wagon delay and non-use.

Historically, Spoornet has based its GFB pricing policy on a flawed costing model called SCAP (Spoornet Cost and Profitability System, also known as the Standard Cost and Performance System) with the target of achieving between 120 - 130% SCAP; this equates to a 20 - 30% operating profit. The system is used by the GFB to determine operating costs for each of its business units. The SCAP methodology is based on average costs and does not provide individual business units the incentive to improve their performance.

In 2004, Spoornet commissioned consultants (a consortium of firms comprising Khulisa Management Services, PriceWaterhouseCoopers, RRL and Portfutures) to review its pricing methodology; they recommended that the SCAP approach to pricing be scrapped. Since then, Spoornet has started implementing a collaborative pricing strategy which includes establishing performance criteria and setting targets on individual contracts. The approach allows for a degree of private-sector financing and participation.

Typical railway unit-pricing varies from R0.035 to R0.05 per tkm for the high-volume ore lines to between R0.20 and R0.30 per tkm for the GFB contracts. Private operators on some of the recently privatised SADC railway systems charge as much as R0.50 per tkm, which is often uncompetitive with road transport.

The average Spoornet train speed is about 28 km/h, but this is not the most significant delay. The time spent waiting to load or discharge cargo is more important. For example, the IMEX container train between Durban and Gauteng has a turnaround time of five to six days, of which only 25 - 30% is spent travelling. The wagons are loaded about 10 to 14 times per month on Orex and Coallink. By contrast, GFB wagons are loaded only about three times per month. It is therefore the loading and unloading operations rather than the train operating speeds which need to be improved. By comparison, Botswana railways load their wagons less than twice per month on average.

The calculation of an indicative railway tariff can be difficult because of the many variables involved. At one extreme, there are the relatively uncomplicated long-haul, high-volume, fixed-schedule, 'hook-and-haul' operations, such as Coallink and Orex. At the other extreme lie the services provided by GFB to many smaller customers with variable volumes requiring a few wagons per week on a low-density line. The Spoornet tariffs quoted on a cents-per-ton-kilometre basis therefore vary widely. This is also the reason for describing traffic as 'railway friendly' and 'non railway friendly'. Indicative railway tariffs can be estimated with reference to existing contracts and by using general guidelines for adjustment to suit circumstances. Some general examples are given below.

Table 2

Comparitive Rail Tariffs (2004/5)

Route	Product	Volume (mtpa)	Length (km)	Turnaround (days)	Wagons/ train	Tariff (R/t)	Tariff (cents/tkm)
Orex	Iron ore	29	860	2.1	200	35.00	4.07
Coallink	Coal	67	545	2	200	40.60	7.45
Swaziland	Phosphates	2.0	175	3	80	13.00	7.50
Sishen – Gauteng	Iron ore	7	900	5	100	120.00	13.30
Sishen – PE	Manganese	2.1	1 009	4	100	139.91	13.87
Typical GFB	Bulk	*0.1*	*500*	*10*	*10 - 20*	*100 - 150*	*20 - 30*

The main features of each contract shown in the table are:

- **Orex –** It is efficient and has low tariffs. It is comparative with world standards in respect of price and is still profitable for Spoornet

- **Coallink –** This line is efficient and highly profitable for Spoornet (56% of its operating profit). It has relatively high tariffs compared to Orex.

- **Sishen-PE manganese ore –** This is a typical bulk haul operation for Spoornet. It could be more efficient with reduced transit times and with tariffs reduced to about R0.095 / tkm.

- **Sishen-Vanderbijlpark iron ore –** This is similar to the Sishen-PE manganese operation. The tariff could be reduced by increasing the turnaround times, focusing on loading and unloading times rather than train operating speeds.

- **Swaziland Phosphate –** This is an efficient 'hook and haul' operation, which involves the switching of locomotives on each end of the 175-km run, but does not involve loading or unloading of wagons. It is a profitable operation for Swaziland railways and could set a benchmark for some Spoornet operations. The indicative breakdown of the tariff is as follows:

Table 3

Indicative Breakdown of the Swaziland Railways Phosphate Tariff

Cost item	**SA cents / tkm**
Line access – infrastructure provision, all incl	4.45
Locomotive hire (full maintenance)	0.75
Wagon hire (full maintenance)	0.55
Fuel – diesel @ 0,35 litres / 100 net km	1.75
Total	**7.50**

The Coega Development Corporation commissioned a study in 2004 to evaluate the feasibility of building a new line parallel for the transport of 15 mtpa – 21 mtpa of iron ore and manganese. The study estimated the cost to be R0.085 per tkm for 15 mtpa.

Table 4

Estimated Tariff for a New Sishen-Coega Line

Cost item	**SA cents / tkm**
Infrastructure capital provision, 7.5% over 25 years	4,3
New locomotive and wagon capital provision	1,4
Maintenance, infrastructure and equipment	1.0
Operations	0.2
Fuel	1.6
Total tariff	**8.5**
R/tonne	67.07

ROAD COSTING AND PRICING

Basic costing

Unit road transport costs are low in South Africa because of the competitive market and are highly cost competitive with GFB railway services. Road transport unit costs are linked largely to equipment use – the total distance in kilometres travelled by the truck in one year.

The large interlink or superlink trucks have the following characteristics:

- They are limited to 22 m in length and 56 t GVM (gross vehicle mass)
- They have a maximum payload of about 35 t
- They are limited to maximum operating speed of 80 km/h, giving an average speed of about 60 km/h, but an average regional transit speed of about 30 km/hr on a 12 hour day basis
- Typically, these trucks travel between 120,000 and 250,000 km per year, the longer distances giving lower unit costs.

Costs are calculated on round trips and are currently (2004/05) in the region of R7 to R9 per km (R0.20–R0.25/tkm, or about US$ 0.04 per tkm on a one way basis). The loads carried are often smaller than the permissible load size and trucks often return empty. Typical operating costs for a large truck combination, costing about R1 million, covering about 250,000 km per annum, would be:

- Fixed costs - R650,000 pa (capital/finance, depreciation, insurance, road tax, overheads, staffing)
- Variable costs - R900,000 pa (fuel @ 1,7 km/*l*, lubricants, maintenance, tyres)

The current pricing, on highly competitive routes, is based on about R11.00 per km (R0.28/tkm). Most often rates are adjusted and cross-subsidised for the return leg, so that the effective price could be of the order of R20 per km for an empty return. This gives a unit price of R0.57 / tkm for a 35 t bulk load on a one way basis. On the Gauteng-to-Windhoek route (about 1 800 km), the traffic flow imbalance gives a 1/3 to 2/3 price split.

Despite the current high demand for transport services in the Zambian and DRC Copper Belt area, the transport market remains highly competitive between different Zambian and foreign operators and between road and rail. Road transport tariffs are currently (June 2006) based on between R9 and R11 per km per unit (US$ 1.35 per km for the Ndola to Durban route, with 100% backhaul), depending on the back haul, and depending on the competitive situation at the time. This translates into a unit tariff of between **R 0.26 per net tkm, and R 0.39 per net tkm, or US$ 0.037 and US$ 0.056 per tkm respectively, with the lower figure for a full 34t load and a 100% backhaul.** This is considered to be a low tariff for road transport and railway services have great difficulty in competing on price, and even greater difficulty in competing on service levels (transit time). Actual contracted tariffs or prices are considered highly confidential by both the truck operator and the customer because it is normally the result of intense negotiations with conditions that only apply to that particular contract. A recent pre-feasibility on the construction of the North West railway extension from Chingola to Solwezi used a railway tariff of US$ 0.15 per net tkm as a competitive tariff with road, clearly off the mark by a large margin, indicating that the railway project cannot compete with road transport. Railway tariffs in the SADC region, for general freight on lines carrying 500,000 to 1 million tpa, are typically of the order of US$ 0.033 – US$ 0.045 per tkm, but sometimes up to US$ 0.10 when there is competitive interference or government intervention (BBR Zimbabwe). It appears from the NRZ 2005 freight statistics, that rail transport is more cost competitive than road for one way haulage.

This could be because railway does not charge on the basis of the actual cost of transportation and their tariffs are based on what the market can bear.

Road freight tariffs are often cross-subsidised by as much as 1/3 to 2/3, depending on the ability to secure back hauls. The larger trucking companies have an advantage in this respect because of their larger customer base and greater degree of flexibility. The smaller operators may have to wait for a return haul and the ability to obtain a cabotage permit during the waiting period becomes a key issue.

The cost of diesel fuel is the major cost element in the transport tariff. In Zambia, the June 2006 price of diesel fuel was 4700 ZMK per litre, equivalent to US$1.50 per litre. In South Africa and Zimbabwe the equivalent price is about US$ 1 per litre, depending on the prevailing exchange rates. In Botswana, the July 2006 cost of diesel was equivalent to US$ 0.8 per litre. Trucks entering Zambia will therefore always enter on a full tank of fuel. HGV's can typically carry about 800 litres of diesel, giving a range of 1400 - 1600 km. Many of the trucks now carry additional fuel tanks of up 2000 litres, allowing the trucks to travel from Botswana to DRC return without refueling . A fully laden 56t HGV uses approximately I litre of diesel for every 2 km. On the basis of a full 34t payload and a cost of fuel of US$ 1 per litre, fuel costs amount to R3,5 per km (US$ 0.43 per net tkm) or about 35% of the average road tariff. The South African RFA April 2006 Vehicle Cost Schedule records the fuel and lubricants cost for a seven axle interlink to be 32.6 % of total operating costs. Within Zambia, because of the higher fuel price, the fuel cost component will be more than 45% of the total operating costs. The South African RFA April 2006 (copyright) reports the total operating costs for a seven axle drop sided interlink, typically operated on the Zambia – South Africa route, to be R9.80 per km. This ties in with the Zambian operators' tariffs being in the R9 – R 11 per km range for a truck with an average payload of 33.9t. The RFA costs are based on (approx US$):

- Horse cost price — US$ 141,000 (US$1 = ZAR 6.5, April 2006)
- Cost of 2 trailers — US$ 48,600 (10 year life)
- Residual value after 5 years — 25%
- Distance — 140,000 km pa
- Cost of capital — 10.5 % pa
- Utilisation — 75 %
- Days pa — 265
- Payload — 33.9 t = 34 t

The costs are broken down as follows (US$ 0.044 per tkm for a fully laden vehicle):

1.	Finance	4.7 %
2.	Depreciation	11.3 %
3.	Insurance	6.2 %
4.	Vehicle staff	19.3 %
5.	Overheads, licence, permits	9.1 %
6.	Fuel and Oil	32.6 %
7.	Maintenance	11.3 %
8.	Tyres	5.4 %
9.	Total US$ 1.51 / km or US$ 0.044 / tkm	100 %

The equivalent costs of operating in Zambia (or any other SADC country, not cross border) will be different, due to the following factors:

- Lower capital costs of the horse – typically a landed cost of US$ 30,000 to US$ 40,000 instead of US$ 141,000
- Lower depreciation costs because of lower purchase price and longer service life
- Lower finance costs in many instances where tariffs are in US$, allowing for US$ based interest rates to be used
- Lower comprehensive insurance costs
- Higher fuel prices for Zambia, by as much as 50%, but probably not affecting cross border traffic. Fuel will be purchased from the cheapest supplier.
- Higher maintenance costs, due to higher service distances and older trucks, and cost of keeping own spares stock
- Other costs are assumed to be similar. Based on a 10-year operating life, the breakdown is estimated as follows:

1.	Finance	1 %
2.	Depreciation	2 %
3.	Insurance	3 %
4.	Vehicle staff	18 %
5.	Overheads	9 %
6.	Fuel and oils	45 %
7.	Maintenance (confirmed by Whitehorse/Rainbow)	16 %
8.	Tyres	6 %
9.	Total assumed at US$ 1.59 per km or US$ 0.047 per tkm	100 %

For the Zambian-based cross border operator, fuel costs are lower and this should reduce costs to US$ 1.35 per km and US$ 0.04 per tkm respectively, i.e., less than a South African-based operator. As long as there is a domestic motor industry, it is unlikely that the importation of used vehicles will be permitted in South Africa. If used truck imports were permitted, operating costs would be similar to Zambian operating costs except for the cheaper fuel. Fuel prices, particularly diesel, may increase in South Africa in the short-term because South Africa's fuel production from coal is short of the heavier diesel fuel. Fuel prices in Zambia are also highly speculative in the short-term because it is linked directly to the exchange rate to the US$.

Zambia has for many years had very high fuel prices, in the upper quarter of African countries, because of the high transport costs and unreliability of the Indeni Refinery, fed by the TAZAMA oil pipeline from Dar es Salaam. With the recent strengthening of the Zambia Kwacha, fuel prices at 4700 ZMK per litre, about US$ 1,50 per litre, it is probably the most expensive in Africa (refer KFW World fuel price survey, 2006).

APPENDIX 6

SUMMARY OF SOUTHERN AFRICAN RAILWAY AND PORT OPERATIONS

All the regional railways operate on 1067 mm gauge with the exception of the northern Tanzanian system (TRC) and the system in Uganda and Kenya. This is unlikely to change in future, except for dedicated high volume services.

SOUTHERN AFRICAN RAILWAY SECTOR

Key Comparative Data 2000 – 2003 – 2004 (*Indicative Extrapolated Values)*

Country	Route Length (kms)	Freight Volume (mtpa)	Tonne Kms (millions)	Mill Tonnes kms per route km	No of Loco's	No of Wagons	No of Employees
1. Angola	2767	--	--	--	--	--	8750
1a. CFL	510	?	--	--	--	--	2100
1b. CFB	907	0,25 ?	--	--	22	1760	5100
1c. CFM	1348	--	--	--	11	110	1550
2. Botswana	888	2,0	1200	1,35	35	1000	1000
3. DRC SNCC	3621	0.20 ?	--	--	130	5000	--
4. Malawi	763	0,25	45	0,06	18	350	900
5. Mozambique	2543	4,0	--	--	63	3000	9000
5a. CFM –N	877	0,40	130	0,15	19	600	1500
5b. CFM –C	970	0,60	170	0,175	16	1000	3700
5c. CFM –S	606	3,0	500	0,72	28	1400	3800
6. Namibia	2382	1,4	800	3,0	44	1600	1800
7. South Africa	20765	175	100000	4,8*	3500	130000	48 000
8. Swaziland	300	4,0	650	2,17	14	170	650
9a. Tazara	1860	0,6	700	0,37	60	1370	4000
9b. TRC	2982	1,0	1100	0,37	95	1650	10 000
10. Zambia	1273	1,5	800	0,63	66	3300	1600
11. Zimbabwe	2759	6,0	3000	1.09	140	13 000	7 000
11a. BBR	310	2,0 ?	600 ?	2,0	--	--	--

Sources: SADC, World Bank & Internal ? = Estimate *PFA / bg*

For the regional SADC sea ports, the main operating criterion is the depth of the access channel and quays. With the increasing size of container vessels on international routes, ports have been designated as feeder and hub ports, depending on the depth and volume of traffic. The previous standard of about 10 m has in the past 15 years been raised to 12 – 12.8 m and the current tendency is toward a depth of at least 14 m to cater for the newer generation of post Panamax vessels. Durban is currently 12.8 m, but being increased to 14 m. Maputo and Beira are theoretically at 10 m, with plans to increase to 12 m.

SOUTHERN AFRICAN PORTS

Key Comparative Data 2000 – 2003 – 2005 Major Ports from East to West

Port	Country	Depth at Quayside (m)	No of Berths	Container Berths	Freight Volume mtpa	Container teus pa x 1000	Operating Capacity % (Indic)
1. Mombasa	Kenya	10.36	16	3	11	500	100% **
2. Dar es Salaam	Tanzania	11.5	11	3	6.3	200	
3. Nacala	Moz	14	5	1	0.7	7	35%
4. Beira	Moz	10 – 12	12	2	2.7	45	50%
5. Maputo/Matola	Moz	8 – 12	16	2	4.5	40	30%
6. Richards Bay	S. Africa	18	4	0	65	0	100%
7. Durban	S. Africa	12.8 / 14m	51	7	25	1500	100% **
8. East London	S. Africa	10.6	9	2	1.1	90	70%
9. Coega	S. Africa	16m	4	2	0	0	0
10. Port Elizabeth	S. Africa	11,2 – 12m	12	3	5.0	300	30%
11. Cape Town	S. Africa	13.78	27		7	450	90%
12. Saldanha Bay	S Africa	22.95m	5	24	0	0	90%
13. Luderitz	Namibia	8.15	4	1	0.2	1	80%
14. Walvis Bay	Namibia	12.8 m	8	2	2.4	100	50%
15. Namibe/PSaco	Angola	10.3	6	0	0.7	-	20%
16. Lobito	Angola	10.4	6 / 8	0	0.3	30	30%
17. Luanda	Angola	10.4	8	1	2.1	90	100%
18. Matadi	DRC	9.14	10				

Sources: SADC, World Bank & Internal *PFA / bg*

** = Delay surcharge by shipping lines