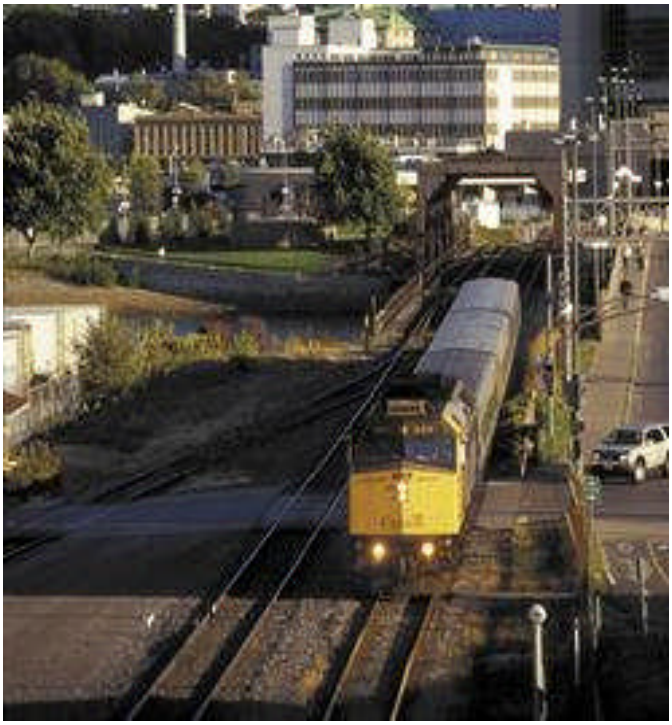
East African Railways Master Plan Study

Final Report



Prepared for:

East African Community

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CPCS

January 2009
CPCS Ref: 06089

Acknowledgements

CPCS Transcom would like to acknowledge the kind assistance granted to them by the staff of the East African Community Secretariat. In addition we wish to thank all those in the five Member States who gave so generously of their time and shared with us their insights into the future development of the railways of East Africa. Any errors of fact or interpretation are ours.

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Annexes

Glossary and Acronyms

AAR	Association of American Railroads
Ballast	The material used to for the formation of a railway track
Cape Gauge	1067 mm (42") gauge, as on the Tazara Railway
Coupler	The mechanism to connect rail wagons
CBRU	Democratic Republic of Congo, Burundi, Rwanda, Uganda
COMESA	Common Market for Eastern and Southern Africa
CPCS	CPCS Transcom International Ltd.
CWR	Continuous Welded Rail
EAC	East African Community
EAC-DS	East African Community Development Strategies
EADB	East Africa Development Bank
Gauge	The inside measurement between two rails of a railway track
INICA	Initiative for Central Africa
KPA	Kenya Ports Authority
KRC	Kenya Railways Corporation
Metre Gauge	1000 mm gauge, as on KRC, URC, TRC railway networks
NCTTCA	Northern Corridor Transit Transport Coordination Authority
NEPAD	New Partnership for Africa's Development
NTKM	Net Tonne-Kilometre
OCS	Occupancy Control System
RAHCO	Reli Assets Holding Limited Company
RVR	Rift Valley Railway
SSATP	Sub-Saharan Africa Transport Program
Sleeper	The transverse members of trackwork used to secure the rails at the correct gauge
Standard Gauge	1435 mm (56.5") gauge, as on many North American and European Railways
Tangent track	Track on straight alignments
TAZARA	Tanzania Zambia Railway Authority
TPA	Tanzania Ports Authority
TRL	Tanzania Railways Limited
TOR	Terms of Reference
TRC	Tanzania Railways Corporation
TRL	Tanzania Railways Limited
TTCA	Transit Transport Coordination Authority
UAR	Union of African Railways
UCA	Uganda Concession Agreement
UNECA	United Nations Economic Commission for Africa
UNCTAD	United Nations Conference on Trade and Development
URC	Uganda Railways Corporation

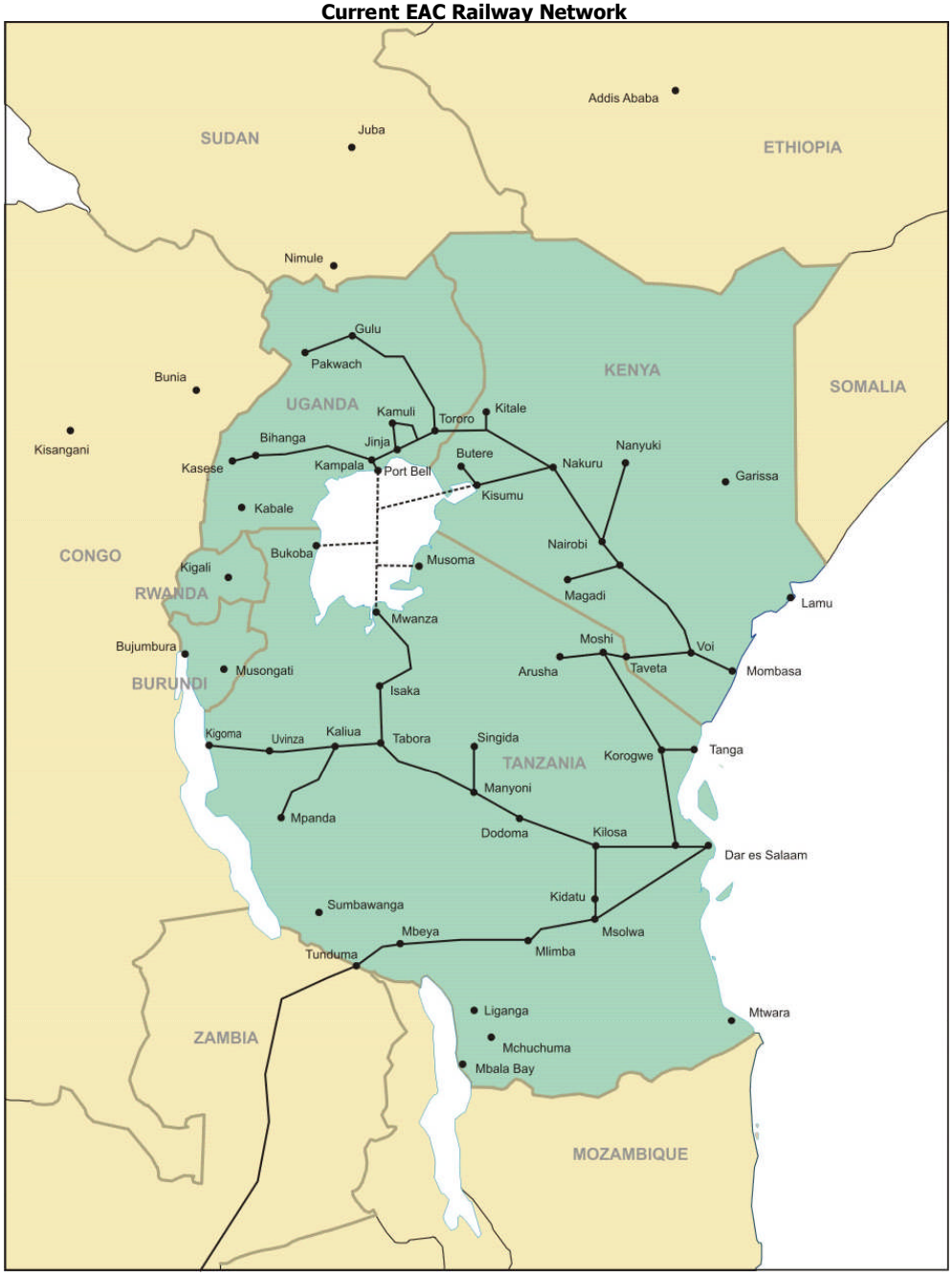
Executive Summary

The objective of this report is to present the overall results of the Master Plan study and to propose a way forward for its implementation.

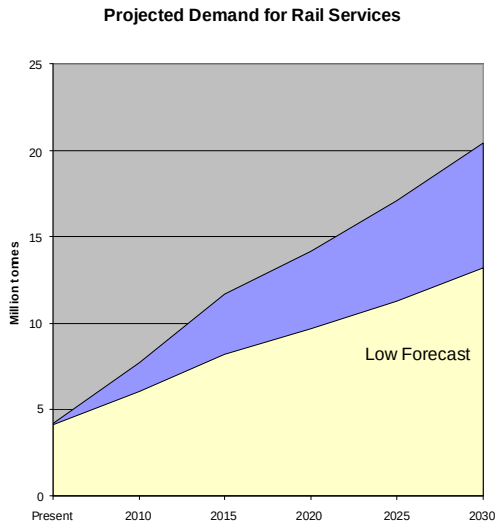
Railways can be major contributors to the development of East Africa

The study has indicated that, after many years of decline, the railway sector and associated rail marine services have the potential to play an important role in the future development of the East African Community (EAC), particularly for long-distance freight and bulk transport, but also for urban transport in major cities and for medium-distance intercity passenger transport.

Current EAC Railway Network



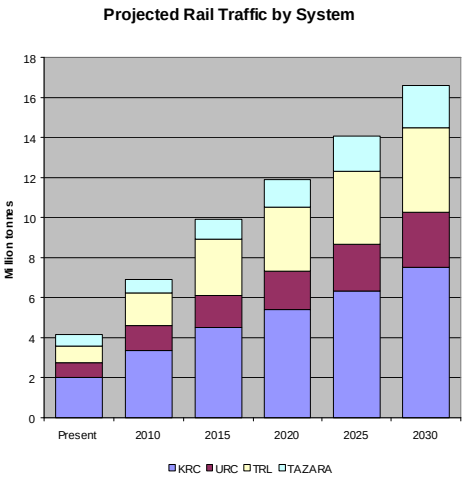
The existing networks should carry 16 million tonnes by 2030



We conclude that an efficient rail service has the potential to carry significantly greater freight traffic compared to current traffic levels. The traffic on the existing network (RVR, TRL and TAZARA) has the potential to increase from 3.7 million tons in 2007 to over 16 million tons by 2030, an annual rate of growth of 6.7%, as indicated below.

The future growth of rail traffic ranging from a high of 21 million tonnes to a low forecast of 13 million tonnes in 2030 will be driven partly by projected growth in GDP of the Member States and also by winning new traffic from mining developments, recapture of container and fuel traffic from trucks, and increased cement production. If this potential is realized, it would represent a major turnaround from historic performance of decline and atrophy.

With investment, the existing narrow gauge network can meet this demand for the next 10-20 years



The capacity of the existing railway network is limited by a number of factors, the most important of which is the low velocity at which trains can operate and limits to the permissible axle loads. This causes shortages in motive power and level of service. In the very short term, the biggest single focus of the railways should be the removal and avoidance of temporary speed restrictions so as to economically increase speeds. A secondary focus should be to increase axle loads in keeping with anticipated traffic growth. Within the next twenty years on the trunk lines, assuming that the traffic forecast materializes, plans will have to be put in place to further increase traffic capacity by installing a more effective train control system, upgrading signals and telecommunications and extending passing loops. Investments in equipment with modern couplers and higher carrying capacity will also be required in the longer term to accommodate the projected demand.

This will require investment of approximately $1.2 billion by the concessionaires and owners of the four railway systems over time.

A wider track gauge would have some direct benefits but the investment costs are high

In terms of the controversial topic of the future conversion of the East African Railways to standard gauge, we discuss the benefits in terms of higher traffic carrying capacity, better

availability and lower capex costs of equipment and (modest) potential for operating cost savings. However, the capital costs are significant (ranging from $4 billion to $29 billion – for the current active network – depending on whether the existing lines were converted or new lines built and whether the existing alignment or a new alignment is built).

The estimated development costs for a number of options are provided in the table below. More details are also provided in Appendix B1 and Appendix B2 to Annex B as well as in Annex F.

Comparison of Development Costs for EAC Active Network (US$M)

Low Estimate	Development Costs			
	Meter - existing right-of-way	Cape - existing right-of-way	Standard - existing right-of-way	Standard - new right-of-way
Fixed Infrastructure	750	1,000	3,700	13,000
Rolling Stock	490	470	400	400
Profit Loss during Construction	0	150	180	70
Total - Current Active Network (Low Estimate)	**1,240**	**1,620**	**4,280**	**13,470**

High Estimate	Development Costs			
	Meter - existing right-of-way	Cape - existing right-of-way	Standard - existing right-of-way	Standard - new right-of-way
Fixed Infrastructure	1,600	1,900	8,700	27,800
Rolling Stock	1,200	1,100	900	900
Profit Loss during Construction	100	500	620	250
Total - Current Active Network (High Estimate)	**2,900**	**3,500**	**10,220**	**28,950**

We recommend that any new rail links be developed consistent with the gauge of the network to which they will connect (in order to avoid the inefficiencies associated with lack of interchangeability of equipment and the possibility of branch lines being cut off from the main lines, as well as the cost of transhipment. However, new lines should be built with a formation that can accommodate future conversion to standard gauge. The incremental costs of so doing are relatively minor.

Conversion to electric traction is uneconomic

We have examined the benefits and costs of converting part or the entire EAC network to electric traction. This would generate savings in operating costs, but given the investment requirements, would likely produce a financial rate of return of approximately 2 per cent at the traffic levels that are forecast for the EAC network over the next twenty years. As such, the conversion to electric traction is not recommended for the foreseeable future.

A range of legal and institutional measures are required to promote the implementation of the Master Plan

There are serious overlaps of membership and functions in the multiple conventions, treaties, initiatives and partnerships in the railway sector that will need to be rectified.

The Treaty for the establishment of the EAC provides a sufficient legal basis for cooperation in the railway sector. The focus should now be on creating detailed guidelines and steps

form implementing treaty provisions. To foster a more efficient, dynamic and integrated railway sector in East Africa, the legal and regulatory should be developed as follows:

(i) Adopt uniform approach to international bodies, with specific roles for continental bodies, regional bodies (e.g. EAC), corridor committees and national governments
(ii) Adopt guidelines for common transport policy covering all modes
(iii) Increase financial efficiency in the railways sub-sector (commercial management)
(iv) Introduce market forces in the railways sub-sector (progressively open up the market)
(v) Take measures to integrate technical standards of national railway systems (e.g. railways transport equipment and facilities)
(vi) Introduce an EAC railways licensing system
(vii) Ratify important international conventions and instruments, e.g. Bern Convention on International Railway Transport (1980)
(viii) Create a Railways Unit at the EAC to provide the Secretariat and the Member States with technical assistance in order to further integrate the East African railways
(ix) Give the East African Legislative Assembly the role of overseeing the development of the common transport policy
(x) Strengthen the role of the Corridor Committees
(xi) Adopt guidelines for the railway sub-sector to cover: safety; infrastructure financing; community level certification of train crews; passenger rights; compensation in case of non-compliance with contractual requirements for rail freight services; provision of common rail statistics.

Attention to environmentally sensitive zones will be required especially for new links when the feasibility studies are undertaken

We reviewed the current environmental legislation in each of the Member States and compared the environmental impact assessment (EIA) requirements. In general these are quite similar, with differences mostly related to fee and time scheduling for the EIA process.

We also carried out a top-level summary of the environmental issues associated with the proposed extensions to the railway network. We raised "red flags" about the following links: Kasese-Kisangani (war zone); Pakwach-Bunia-Kisangani (war zone); Liganga-Mchuchuma-Mtwara (Selous Game Reserve, Greater Rovuma Wilderness (GROW) area); Mchuchuma-Mbamba Bay (Lake Nyasa); Dar es Salaam-Mtwara (GROW); Arusha-Musoma (Serengeti National Park); Dar/Tabora Line-Kaliua-Mpanda and Dar/Tabora Line-Uvinza-Kigoma (Malagarasi Wetlands); and Arusha-Natron (Lake Natron).

Based on an assessment of the links to Rwanda/Burundi, the Master Plan will yield significant benefits during both construction and operation

We assessed the economic costs and benefits of investments in the rail network using a case study approach focusing on the proposed rail links to Rwanda and Burundi. These are expected to have important net benefits during both the construction and operations phases. These include:

- Significant reductions in the costs of transport leading to more affordable imports and expansion of export markets;
- Development of economic activity, resulting in increases in GDP. In particular, mineral deposits that cannot currently be exploited will become economically feasible;

- Job creation, particularly during the construction phase.

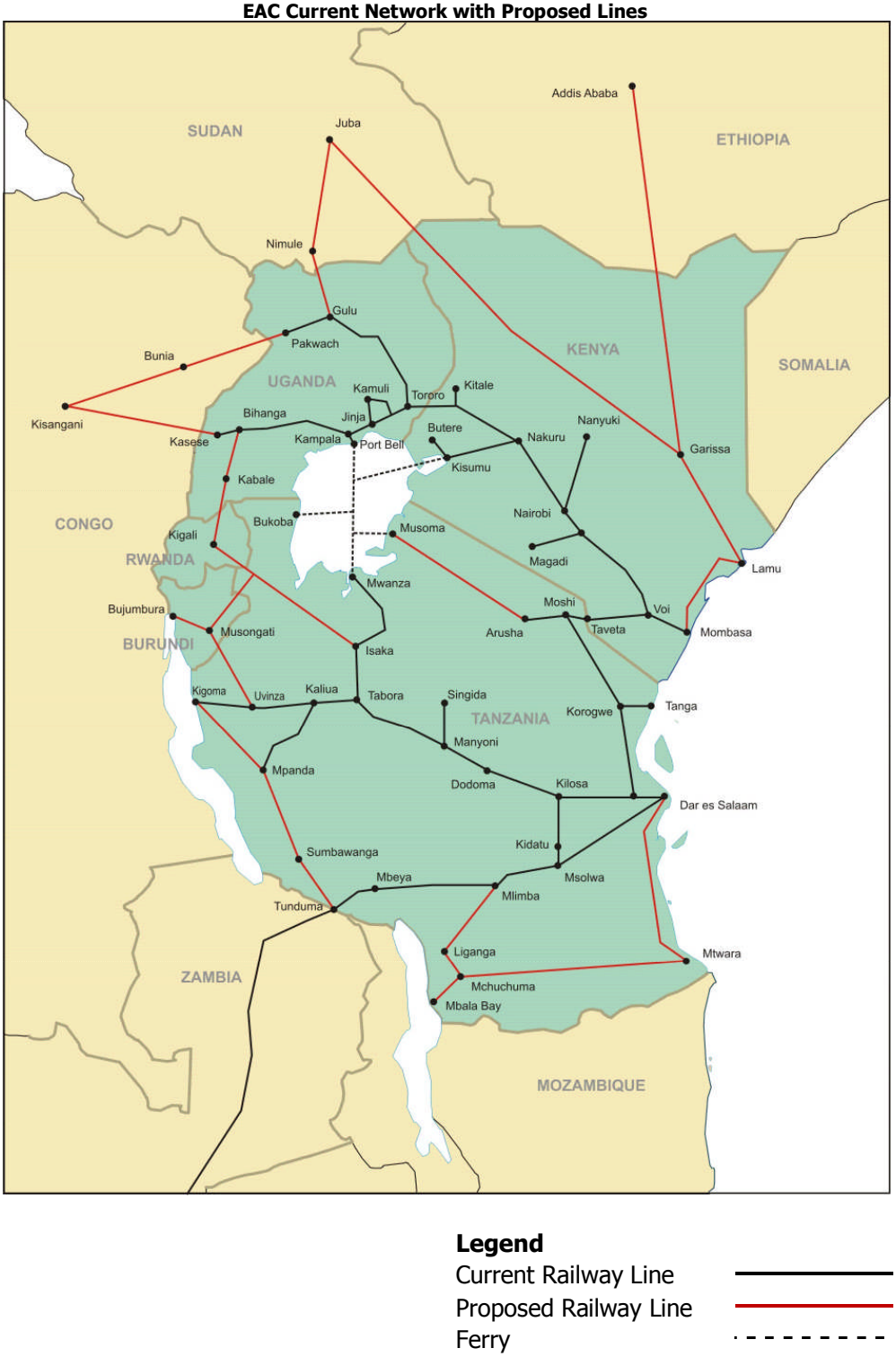
The rail network should be expanded to meet the needs of the growing economy of East Africa

By any reasonable benchmark, the railways of East Africa have not been living up to their potential as an engine of economic growth and development. The Task Force has identified over twenty new or rehabilitated links to close the gap between actual and potential contribution of the sector to the development goals of the EAC and of the Member States (see figure below).

The thrust of the strategy is, in the short term, through public-private-**partnerships**, to pull the railways back from the abyss, by restoring reliable service on the trunk lines (Mombasa-Kampala, Dar-es-Salaam-Mwanza and Dar-es-Salaam-Zambia). The medium-term strategy is to improve the level of service on the trunk lines, to extend the network to Rwanda/Burundi and to carry out feasibility studies for the other line extensions identified by the Task Force in 2004-2007. The long-run strategy is to achieve best-in-class performance on the trunk lines, successful commercial operations on the Rwanda-Burundi and other medium-term lines and further extend the network.

While a railway will never completely replace road transport, it should occupy a dominant role in important transport markets including: long-distance container markets, medium-distance bulk markets, commuter traffic in major cities and intercity passenger transport in specialized markets (e.g. where distance is sufficient to compete with buses or where air transport is too expensive or on luxury "land cruise" type markets).

EAC Current Network with Proposed Lines



Legend

Current Railway Line

Proposed Railway Line

Ferry

1 Background

1.1 Introduction

The authority for this project is the Contract dated 12 July 2007 between the East African Community (EAC) and CPCS Transcom International Limited ("CPCS") to carry out the East African Railway Master Plan Study ("Master Plan Study"). The objectives of the assignment are:

i. Evaluate the current and potential demand for railway infrastructure and services, in the context of the EAC overall Development Strategy and objective to become more competitive, through the reduction of transport and transactional cost and times, particularly in respect of trade.

ii. Review the current railway capacity and planned improvements, and establish the gap between this capacity and the requisite railway infrastructure and services that will be able to cater to future demand.

iii. Propose a railway development strategy and action plan (Master Plan) to close the gap, and develop the required level of infrastructure and services needed to make a maximum contribution in facilitating and catalyzing more robust regional trade and economic development.

iv. Prepare a suitable organizational structure necessary to implement the Master Plan[1].

This document is one of four contractual deliverables to be produced under the Master Plan Study. These are:

- Inception Report
- Interim Report
- Draft Final Report
- Final Report (this document)

1.2 Objectives for this Report

The objective of this report is to present the overall results of the Master Plan study, addressing each of the tasks indicated in the Terms of Reference. The report is based on the five studies that were carried out as part of this project:

- **Traffic Study** – this study provides an estimate of the traffic potential of the four railway systems that make up the East African Railways, plus the potential links that are being evaluated as part of this study;

[1] Project TOR, page 8.

- **Technical Study** – this study addresses the key technical issues associated with the Master Plan. The study reviews the current capacity of the railway networks and makes recommendations concerning the measures to be taken to provide the capacity required to handle the anticipated traffic demand;

- **Legal / Institutional Study** – this study:
  - Provides as overview of the current state of progress towards the regional integration of the railways of the region, in the context of Community level economic integration;
  - Identifies existing rules, regulations and policies that could act as barriers to improved cross-border transport flows, thereby inhibiting regional economic integration;
  - Recommends an institutional/legal/regulatory framework for the implementation of the East African Railways Master Plan; and
  - Proposes specific measures to improve the institutional/legal/regulatory framework for the Master Plan;

- **Environmental Study:** This study reviews the current environmental legislation in the member states of the EAC; indicates the current legal requirements to conduct environmental assessments of railway operations and investments; draws up an environmental checklist to ensure that the proposed railway investments can be carried out in an environmentally responsible way and identifies potential environmental issues that may require particular attention when project-specific environmental assessments are conducted.

- **Economic Study:** This study assesses the likely economic and social benefits and costs of investment in the rail sector, taking as an example, the proposed new lines to Rwanda and Burundi.

The report is based on extensive research on railway development in East Africa, whose data/information were collected during our field visits and interviews in September to December 2007. The bibliography, as well as detailed reports on the above-mentioned five studies (the working papers that formed the basis of the findings and recommendations presented in this main report), is appended to this Report. The documents have also been compiled on a CD-Rom, which has been transmitted to the EAC Secretariat as a railway library for the benefit of the community and the Member States.

1.3 Organization of this Report

In addition to the Executive Summary and this Introduction, the Report consists of eight additional chapters:

- Chapter 2 summarizes the results of the Traffic Study. The full Traffic Study is presented in Annex A.

- Chapter 3 summarizes the results of the Technical Study. The full Technical Study is presented in Annex B, with supporting material in Appendix B1 and Appendix B2.

- Chapter 4 summarizes the results of the Legal and Institutional Study. The full Legal and Institutional Study is presented in Annex C.
- Chapter 5 summarizes the results of the Environmental Study. The full Environmental Study is presented in Annex D.
- Chapter 6 presents the results of the Economic Study. The full Economic Study is presented in Annex E.
- Chapter 7 presents our estimates of the indicative investment costs of the Master Plan, with documentation in Annex F.
- Chapter 8 provides suggested guidelines for how the Master Plan should be financed.
- Chapter 9 presents our conclusions and recommendations.

The table below provides references within the report to indicate where the specific Tasks of the TOR are addressed:

Table 1.1: TOR Task Reference

TOR Task		Report Reference[2]
No.	Description	
1	Assess and establish current and potential demand for railways infrastructure and services, as part of demand for a competitive regional transport system that lowers total transport cost of freight and persons.	Chapter 2, Section 9.1, & Annex A
2	Review the capacity and performance of East Africa railways systems and establish their contribution to the region's integration and economic and social development, and adequacy or inadequacy to cater for the current and projected potential demand.	Chapters 3 & 6, Sections 9.2 & 9.5, Annex B & E, & Appendix B1
3	Assess current status and recommend measures to establish or enhance beneficial competition, where applicable, complementarities between corridors, between modes (rail, marine, and road) or transport within a corridor, and between operators within a mode; taking into account economic, financial and environmental issues.	Chapter 4 Section 9.3, & Annex C
4	Review literature relating to ongoing and planned railways development activities in East Africa and establish needs for medium and long-term railways development in order to cater for the current and projected potential traffic.	Chapter 2, 3, 4 & 7, Section 9.6, Annex A, B, C & F, & Appendix B1 List of literature reviewed is also provided in Annex G
5	Review and establish relationship with relevant development programmes of other regional and African organizations and initiatives such as NEPAD, COMESA, SSATP, UAR, UNECA, and UNCTAD.	Chapter 4 Section 9.3, & Annex C
6	Review and recommend issue for regional (EAC) harmonization, including policy, regulatory and overall sector governance issues so that there is unimpeded flow of railway traffic across borders.	Chapter 4 Section 9.3, & Annex C

[2] These indicate the main parts of the reports where the respective tasks are addressed.

TOR Task		Report Reference[2]
No.	Description	
7	Propose specific programmes and projects (physical asset development and facilitation, including policy, regulatory and institutional improvements) to be implemented to satisfy the recommended railways development needs.	Chapter 9
8	For each proposed programme and project, provide adequate description and an assessment and indication of the related financial and economic benefits.	Chapter 6 & 7, Annex E & F
9	Assess and propose potential sources of funding for implementing the proposed programmes and projects.	Chapter 8
10	Establish a prioritized action plan and timescale for implementing the proposed programmes and projects.	Chapter 9

Following the Task Force meeting in November 2008, we have also prepared a comparative overview of the costs to re-develop the existing EAC rail network with a number of scenarios to aid the decision-making process of the EAC Partner States. This overview of the cost implications is provided in this report as **Appendix B2** to Annex B.

2 Traffic Study

2.1 Introduction

This chapter summarizes the methodology and results of the traffic study. The full study is presented in Annex A.

2.2 Purpose of the Report

The objective of the Traffic Study was to review current railway traffic handlings, assess truck competition and forecast the future demand for railway services as an input into the Railway Master Plan report to be developed as the main output of this study.

The railways of Kenya, Uganda and Tanzania play an important role not only in the economic development and social environment of these countries, but they also provide an access to the ports of Mombasa and Dar es Salaam for the landlocked countries of southern Sudan, Rwanda, Burundi, Eastern Democratic Republic of Congo and Zambia. They are critical for these countries, ensuring the transport of goods at competitive rates, supporting the development of industries and the creation of jobs and providing safe and efficient transport of commuters and passengers.

These railways have lost significant market share to trucks over the past years as the result of a long series of problems which contributed to deteriorating services to a point where many shippers had no choice but to use trucks to get their goods to market.

The new concessionaires of the Kenya-Uganda and the Tanzania railways have the potential to more than triple the current handlings over the next 20 years while improving the railway infrastructure and rolling stock. They have the potential not only to regain market share lost to trucks with improved services, but can also grow by capturing the traffic that will be available as the result of new initiatives, industries and mining developments in their respective catchment areas which are being promoted by the Northern and Central Corridor Transit Transport Coordination Authorities.

The potential economic development of the EAC and surrounding countries could also require the rehabilitation of existing unused railway lines, the construction of additional railway lines or the extension of current lines and services to move goods to destination.

The purpose of the Traffic Study was to quantify the potential traffic forecasts for existing railways and identify potential traffic for new railway lines within the EAC countries in order to serve as input in the preparation of the EAC Railway Master Plan to be developed as the final deliverable of this study. The Study indicated that with appropriate service, considerable potential exists for traffic and revenue growth.

2.3 Study Methodology

2.3.1 Existing Railway Networks

For the existing railway networks, we developed traffic forecasts under three scenarios: Base Case (most likely), Low Case and High Case.

The starting point for the forecasts was an assessment of the existing traffic markets within the region (Chapter 2 of the Traffic Study). These consist of:

- **Domestic Markets:** this consists of bulk inputs such as petroleum and fertiliser for distribution to primary industry, together with general freight such as consumer goods and construction materials. Freight originating in inland centres largely consists of primary produce which in some cases undergoes processing prior to transport.

- **Transit Corridors:** these markets consist of traffic originating in or destined to the landlocked countries known as CBRU, Zambia and southern Sudan. This traffic, made up of general freight, industrial commodities and containers is transported along:
  - the 'Northern Corridor' which links Mombasa to Kampala where freight can travel either by road or rail over a distance of some 1,200 km;
  - the 'Central Corridor' running from Dar-es-Salaam to Mwanza and Kigoma via Tabora, where freight typically travels some 1,200 km; and
  - the 'TAZARA Corridor' from Dar-es-Salaam to Zambia, where freight travels up to 1,860 km.

While there are many sources of GDP data within the Partner States, the growth percentages are generally similar and we have chosen to use the EIU data since it provides a measure of uniformity in approach and methodology. We reviewed the recent and projected GDP by country (see **Table 2.1**) and also presented estimates of the relationship between GDP growth and the demand for transport.

Table 2.1: Recent GDP Performance and Projected GDP Growth by Country (%)

Country	2002	2003	2004	2005	2006	2007f	2008f
Kenya	0.4	2.8	4.3	5.2	5.0	6.1	5.5
Uganda	6.8	4.3	5.7	6.0	5.3	5.6	5.7
Tanzania	7.2	7.1	6.7	6.8	5.8	6.7	7.2
Rwanda	9.4	1.0	4.0	5.2	5.8	6.0	6.0
Burundi	4.5	-1.2	4.8	0.9	3.8	5.0	5.5
DRC	3.5	6.7	6.6	6.5	6.4	6.8	6.0

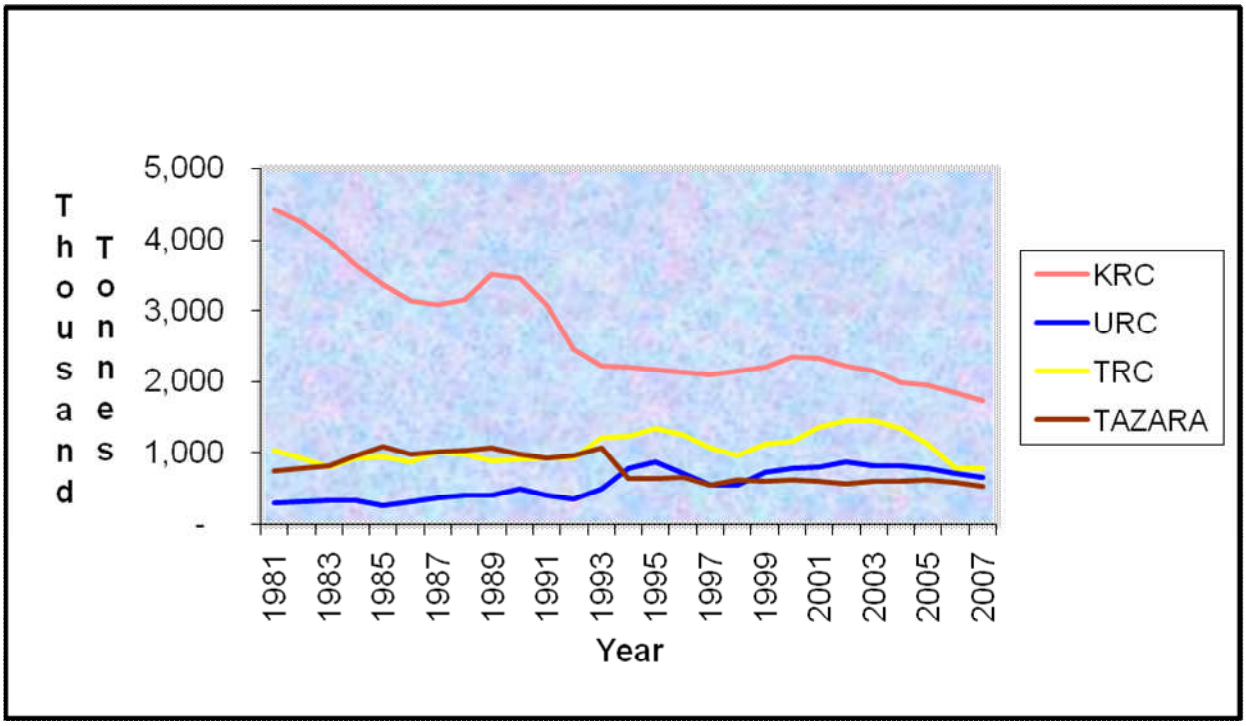
Note: f = forecast
Source: Economist Intelligence Unit

The relationship between GDP growth and the demand for transport depends on a number of factors, but normally the ratios of transport growth to GDP growth range between 1.0 and 1.5, i.e., transport growth is expected to grow by up to 1.5 times the growth of GDP. The appropriate range depends on the growth scenario and the corridor. We assumed a higher ratio for the Central Corridor on the basis that recent diversions of traffic to the

Northern Corridor, particularly to/from Rwanda, would revert to the Central Corridor as service improved[3].

We reviewed recent port and rail traffic (Chapters 4 and 5 of the Traffic Study, respectively). Our analysis of the recent rail traffic within the region was carried out in detail for each of the railway systems. Traffic volumes have decreased in recent years as a result primarily of shortages of motive power and commercial problems (see **Figure 2.1**).

Figure 2.1: Railway Tonnages



Estimates of the 2007 traffic base for each railway system were developed based on an analysis of the current customer base. Our assessment was that despite the recent decline in traffic, the customer base consists of relatively large shippers and customers who move large volumes of single commodity traffic between a limited number of origin-destination pairs, an ideal situation for the rail transport mode since it provides the opportunity to run block trains and deliver efficiencies, further improving the advantage over trucks and highways.

In developing our traffic forecasts, we also took into account the competition presented to the railways from other modes, primarily truck, but also pipeline (see Chapter 6 of the Traffic Study). This assessment took into account:

[3] See Section 4.3 of the Traffic Study in Appendix A. Based on a review of market share by country and port of entry/exit we conclude that the traffic to CBRU countries has basically been moving along the natural corridors with the exception of traffic to Rwanda for which some 70% has been moving via the port of Mombasa and the Northern Corridor although its more natural route would be via the port of Dar es Salaam and the Central Corridor. We believe that the poor performance of TRC in the past years and the fact that trucking costs are similar from both ports have been responsible for this fact and that as the new concessionaire of the Tanzania railway improves service, a larger portion of this traffic will be moving via the Central Corridor in the future.

- **Distance comparisons:** on the Northern Corridor, the rail distances tend to be more circuitous (~+15%), while in Tanzania, they are similar for Dar-Mwanza and the rail distances are considerably shorter for Dar-Tabora and Dar-Kigoma;
- **Service Comparisons:** in recent years, railway service has been woefully inadequate in terms of wagon provision[4] and duration and consistency of transit times[5]. Shippers have confirmed that if the new concessionaires are successful at improving the transit times and maintain consistency which they should achieve with the introduction of block trains and an efficient operation, most of the shippers are willing and looking forward to moving a good portion of their shipments back to the railway mode;
- **Truck axle load limits and comparison with railway wagon loads:** We reviewed existing axle load limits (and enforcement) and noted that the railways are only enjoying approximately a 25% payload advantage at best. In the short term, this advantage should increase in Kenya as a result of the forthcoming ban on 4-axle trailers;
- **Freight rates:** We compared truck and rail tariffs and assessed the future likelihood of a "tariff war". Rail tariffs are slightly below truck rates in Kenya/Uganda and considerably below truck rates in Tanzania. Our assessment is that truckers will be cautious about reducing rates in response to increasing rail competition, as they will fear an erosion of their entire revenue base.

We also reviewed previous traffic forecasts for the railways and the ports (Chapter 7 of the Traffic Study). The port utilization forecasts prepared by Kenya Port Authority and the port of Dar es Salaam indicated that significant potential growth exists for the railways.

For passenger traffic, we reviewed the recent performance of the railways and noted the contractual commitments concerning the provision of passenger service in the concession agreements covering Kenya and Tanzania (TRL network).

2.3.2 Potential Railway Links

We evaluated the traffic potential on new potential links to the rail network based on the data that were collected during the Inception Mission. More detailed feasibility studies are required in order to firm up these estimates.

2.4 Summary of Traffic and Revenue Forecasts

The traffic and revenue forecasts are presented for KRC/URC and TRL in Section 2.4.1 and for TAZARA in Section 2.4.2.

[4] Not only were customers not being provided empty wagons in a timely manner, once loaded, there was also a delay in having the wagons pulled and brought to yards for marshalling. Furthermore, because of the way trains were operated, the wagons ended up waiting in yards along the way to their ultimate destination.

[5] Transit times were not only on average two to three times that of trucks and there were very large variations in transit times from one movement to another; the fact that there was no consistency in service made shippers unable to rely on the railways to get their goods to destination.

2.4.1 KRC/URC and TRL Systems

For the KRC/URC and TRL systems, we developed traffic forecasts from separate assessments of the Base Traffic, i.e., the traffic moving on these systems in 2007 and additional specific traffic opportunities.

Base Traffic

Our estimates of the initial (2007) traffic are: URC 660,000 tonnes, KRC 1,740,000 tonnes and TRL 780,000 tonnes.

Growth Rates: The fact that the TRL traffic volumes have almost been reduced in half between 2003 and 2006 because of operating deficiencies provides the concessionaire with an opportunity to grow the traffic at very high rates in the first years by introducing additional locomotives, hence overcoming the shortage of motive power which was the main reason for the traffic reductions. We have therefore provided for high growth rates for the first 3 years of TRL's operations under concessionaire management. Although the variances in growth rates between the Low, Base and High Cases might appear to be close, one needs to keep in mind that they are annual growth rate percentages that compound one another over a 22-year forecast horizon and end up yielding significantly different tonnage forecasts as we will demonstrate later. Following are the assumed Kenya, Uganda and Tanzania Freight Growth factors we used in preparing the forecasts for KRC, URC and TRL:

Table 2.2: Projected Base Traffic Growth Forecasts: KRC/URC and TRL

	2008-2010	2011-2017	2018-2022	2023-2030
Kenya/Uganda				
Low Case	6%	5%	4%	4%
Base Case	7.5%	6%	5%	4.5%
High Case	9%	7%	6%	5%
Tanzania				
Low Case	8%	5%	4%	4%
Base Case	9%	6%	5%	4.5%
High Case	10%	7%	6%	5%

Average Haul: For KRC/URC we assumed that the average haul would remain at current levels (770 km for KRC, excluding the Magadi Soda traffic; 227 km for URC). TRL's average haul has decreased in recent years from more than 1,000 km to 870 km, because TRL is not operating its freight business between Dar es Salaam and Dodoma. As rail service is restored to Dar es Salaam, we anticipate that average hauls will increase to their historical levels.

Average Revenue per Net Tonne-Kilometre (NTKM): We have assumed the following rates, which incorporate recent increases. The lower rates for the High Case assume that the truckers would reduce their rates under this scenario:

Table 2.3: Assumed Freight Rail Rates (US cents per NTKM) and average annual % change

	Current	Year 5		Year 10		Year 15	
	Cents	Cents	*Annual %*	Cents	*Annual %*	Cents	*Annual %*
Kenya							
Low Case	4.6	4.7	*0.4*	5.2	*2.0*	5.4	*0.8*
Base Case	4.6	4.7	*0.4*	5.2	*2.0*	5.4	*0.8*
High Case	4.6	4.65	*0.2*	4.9	*1.1*	5.1	*0.8*
Uganda							
Low Case	9.8	8	*-4.0*	8	*0.0*	8	*0.0*
Base Case	9.8	7.2	*-6.0*	7.2	*0.0*	7.2	*0.0*
High Case	9.8	6.4	*-8.2*	6.4	*0.0*	6.4	*0.0*
Tanzania							
Low Case	5.4	5.5	*0.4*	6.1	*2.1*	6.4	*1.0*
Base Case	5.4	5.5	*0.4*	6.1	*2.1*	6.4	*1.0*
High Case	5.4	5.5	*0.4*	5.7	*0.7*	6	*1.0*

Additional Specific Traffic Opportunities

Additional sources of rail traffic are presented in Chapter 9 of the Traffic Study. These include:

- For KRC/URC: Magadi soda ash production expansion; clinker for Bamburi Cement to be captured from truck; additional container traffic via Northern Corridor to be captured under the High Case; Wheat traffic for the World Food Program via the Northern Corridor to be diverted from truck; additional cement traffic in Kenya and Uganda under the High Case; additional fuel oil, petroleum products and fertilizer. The forecast of additional traffic for Kenya and Uganda is summarized below:

Table 2.4: Forecast of Additional Traffic for Kenya/Uganda (In 000 Tonnes)

Country	Scenario	Year 1	Year 2	Year 3	Year 4	Year 5
Kenya	Low	150	468	318	163	50
	Base	150	613	463	283	100
	High	150	757	607	377	150
Uganda	Low		126	126	28	25
	Base		195	195	65	50
	High		270	270	95	75

- For TRL: recapture of petroleum products that have been diverted to road; capture of pozzalana traffic required by Tanga Cement; capture of additional container traffic to/from the port of Dar es Salaam; wheat traffic to both domestic and transit destinations; rail to capture some of the additional cement production forecast for Tanzania[6]. The forecast of additional traffic for Tanzania is summarized below:

[6] In addition there is the possibility of traffic from new mining projects (Kabanga nickel mine, Soa Ash mine near Lake Natron and platinum mine south of Kigoma). These have not been included in our traffic forecasts.

Table 2.5: Forecast of Additional Traffic for Tanzania (In 000 Tonnes)

Scenario	Year						
	1	2	3	4	5	6	7
Low		162	212	212	212	50	50
Base		258	333	358	348	75	75
High		350	475	475	475	125	100

Forecast Tonnage, Tonne-KM and Revenues

Putting together the Base Traffic and the Additional Specific Traffic Opportunities, the following tables summarize our forecasts for the KRC, URC and TRL systems for selected years.

Table 2.6: Forecast Traffic and Revenue for KRC System

	Scenario	2008	2010	2015	2020	2025	2030
TONNES (000)	**HIGH**	2,047	3,767	5,201	6,350	7,646	9,194
	BASE	2,021	3,388	4,503	5,372	6,344	7,509
	LOW	1,994	3,009	3,795	4,430	5,141	6,005
NTKMs (000,000)	**HIGH**	1,465	2,697	3,724	4,546	5,474	6,583
	BASE	1,447	2,426	3,224	3,847	4,542	5,377
	LOW	1,428	2,154	2,717	3,172	3,681	4,300
REVENUES (US $ 000)	**HIGH**	67,407	124,062	178,240	228,725	280,942	337,849
	BASE	66,547	111,594	160,522	205,310	247,299	292,729
	LOW	65,688	99,103	135,289	169,295	200,401	234,107

Table 2.7: Forecast Traffic and Revenue for URC System

	Scenario	2008	2010	2015	2020	2025	2030
TONNES (000)	**HIGH**	719	1,395	1,909	2,345	2,836	3,424
	BASE	710	1,210	1,602	1,932	2,301	2,743
	LOW	700	1,038	1,308	1,549	1,819	2,147
T-KMs (000,000)	**HIGH**	163	317	433	532	644	777
	BASE	161	275	364	439	522	623
	LOW	159	236	297	352	413	487
REVENUES (US $ 000)	**HIGH**	16,004	25,132	27,860	34,222	41,396	49,970
	BASE	15,784	23,030	26,094	31,468	37,468	44,667
	LOW	15,563	20,841	23,705	28,071	32,955	38,897

Table 2.8: Forecast Traffic and Revenue for TRL System

	Scenario	2008	2010	2015	2020	2025	2030
TONNES (000)	**HIGH**	850	1,863	3,456	3,985	4,582	5,296
	BASE	842	1,601	2,799	3,205	3,659	4,203
	LOW	835	1,356	2,152	2,453	2,790	3,200
T-KMs (000,000)	**HIGH**	808	1,910	3,542	4,085	4,697	5,428
	BASE	800	1,641	2,869	3,285	3,750	4,309
	LOW	793	1,390	2,206	2,514	2,860	3,280
REVENUES (US $ 000)	**HIGH**	43,615	103,122	199,056	241,256	282,972	327,030
	BASE	43,215	88,617	167,675	213,598	239,707	275,382
	LOW	42,815	75,082	128,928	157,542	182,780	209,634

2.4.2 TAZARA System

We elected to make a first cut at TAZARA tonnage forecasts using a more basic methodology than the one used for KRC, URC and TRL because we did not have the time in our initial mandate to review its markets and customer base to the same degree as we did for the other railways. We have forecast revenues using revenue per net tonne-km figures recently supplied to us by TAZARA.

The TAZARA management indicated their objective was to increase their freight traffic handlings from the current 540,000 tonnes per year range to 800,000 tonnes per year over the next 5 years. This would correspond to a compound 8.15% per year average increase. We believe that this is feasible since the main barrier to handling additional tonnages is the fact that TAZARA does not have sufficient motive power and that this problem could be overcome by leasing additional locomotives.

We have therefore used this 800,000 tonne target as the basis for elaborating a Base Case for TAZARA and have developed our initial tonnage forecasts for the High and Low Cases by adjusting the growth rates as follows:

Table 2.9: Projected Traffic Growth Rate for TAZARA

	2008-2010	2011-2017	2018-2022	2023-2030
Low Case	8%	6%	5%	4%
Base Case	9%	7%	5.5%	4.5%
High Case	10%	8%	6%	5%

The 2006-2007 TAZARA average lead was 1,472 kms and the average revenue per net tonne-km was US 3.5 cents. We have used these figures for projecting the TAZARA revenues for the High, Base and Low scenarios. The following table summarizes our forecasts for the TAZARA railway for selected years.

Table 2.10: Forecast Traffic and Revenue for TAZARA

	Scenario	2008	2010	2015	2020	2025	2030
TONNES (000)	HIGH	594	719	1,096	1,522	1,980	2,527
	BASE	589	699	1,018	1,368	1,738	2,166
	LOW	583	680	945	1,229	1,524	1,855
T-KMs (000,000)	HIGH	874	1,058	1,613	2,240	2,914	3,719
	BASE	866	1,029	1,498	2,014	2,558	3,188
	LOW	858	1,001	1,391	1,809	2,244	2,730
REVENUES (US $ 000)	HIGH	30,603	37,029	56,442	78,410	101,988	130,165
	BASE	30,325	36,029	52,439	70,498	89,543	111,587
	LOW	30,046	35,046	48,686	63,327	78,535	95,550

3 Technical Study

3.1 Introduction

This chapter presents the main conclusions of our Technical Study. The full study is presented in Annex B.

3.2 Objective

The purpose of the Technical Working Paper was to review the railways current capacity and establish the gap between this capacity and the requisite railways infrastructure and services that will be required to meet future demand. A second objective was to provide technical advice on the advisability of converting the existing track either to cape gauge (as suggested by the Union of African Railways) or to standard gauge, and the appropriate gauge for future extensions to the railway network.

3.3 Existing Condition of the Network

The total length of the rail network in East Africa is 7,363 route-km; of which 6,334 km is currently active. The systems are metre gauge for KRC, URC and TRC (the former East African Railway network) and cape gauge for the TAZARA railway. The EAR network was built between the 1890s and 1950s, while the TAZARA network was built in the 1970s. The existing railway network is shown in **Figure 3.1**. The network is described in Chapter 2 of the Technical Working Paper (Annex B).

3.3.1 Infrastructure

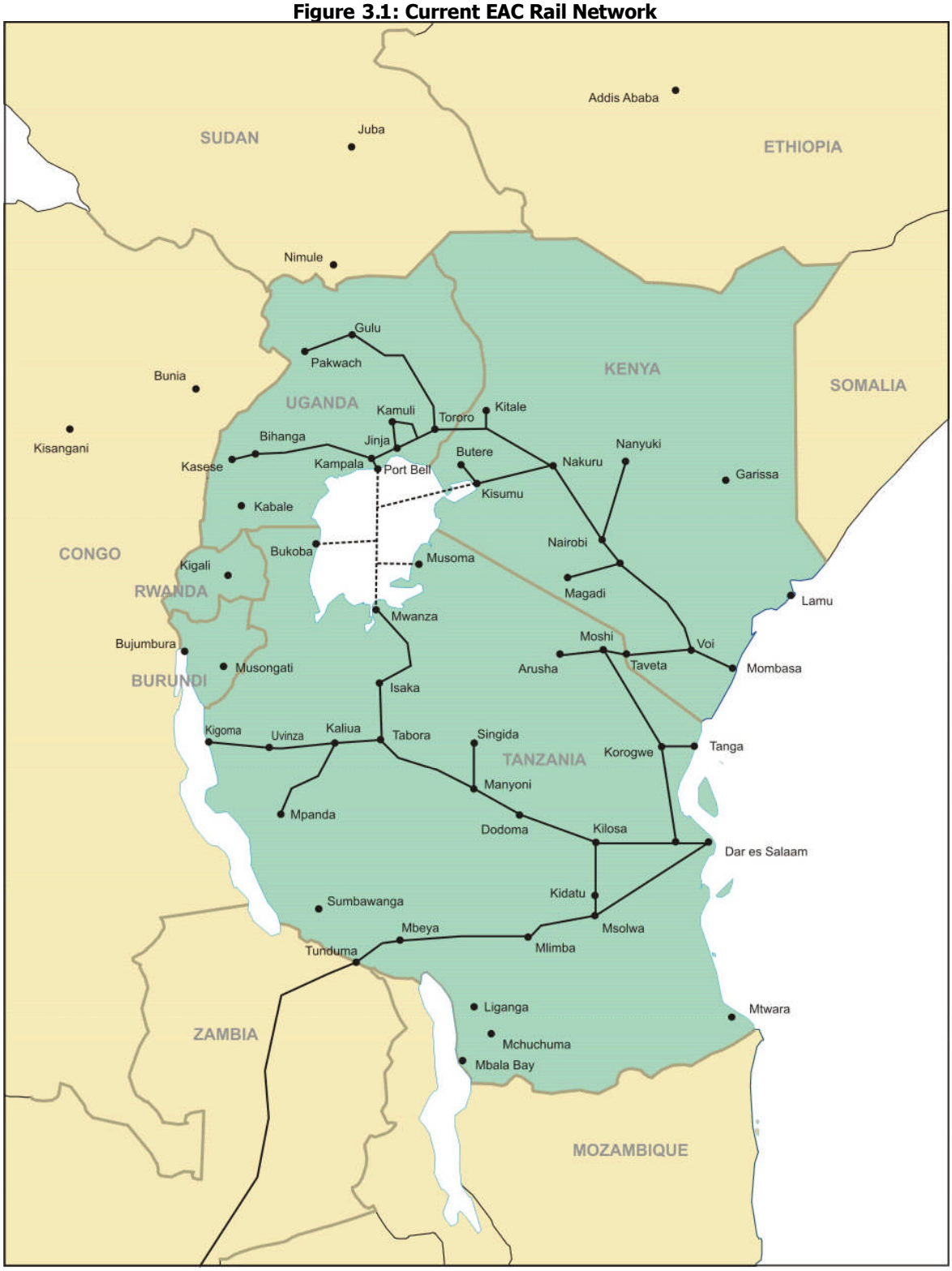
In general, the railways have lacked the necessary funds for investment and maintenance, particularly in recent years, and this is reflected in the overall condition of the fixed infrastructure. There are, however, portions of the network that are newer, have been recently rehabilitated or have had been better maintained over the years, and as a result they are in an overall superior condition.

The following table provides the details of the allowable axle loadings for trunk and branch lines for the railways of the EAC. Axle loadings are for the most part a function of track construction (rail weight and tie type and spacing) and the load ratings of bridges.

Table 3.1: Allowable Axle Loadings (tonnes)

Network	KRC	URC	TRC	Tazara
	18	18	16 – 18	20
Active Branch Lines	15	18	12 – 16	N/A

Figure 3.1: Current EAC Rail Network



Rail: The rail on the core mainline throughout the EAC is in excess of 75 lb / yard with the exception of the TRC where the trunk lines are 56 – 60 lb / yard. The heaviest rail section in the region is on the track with the highest traffic level; the trunk line between Mombasa and Nairobi.

Rails on the core lines are a mix of both CWR and jointed rail. There has been and will need to be in the future rail relay programs on these tracks on account of curve wear. With the current and projected annual tonnages, it is unlikely there will be any need to relay rail on tangent track or on low-degree curves on account of rail wear. The KRC between Nairobi and Mombasa will likely require the most aggressive rail relay program on curves on account of relatively high traffic levels and prevalence of curves.

Very few of the current temporary speed restrictions are on account of rail wear or defects.

The former East African railway standard was (and still is) 75 units, the equivalent of about 514m, with the exception of the Mombasa-Nairobi corridor which has longer loops at 80 units, the equivalent of about 548 m.

Sleepers: With the exception of Tazara, mainline sleepers on all trunk and branch lines in the EAC are, for the most part, steel except at turnouts and some bridges, where they are wood. On Tazara, mainline sleeper are pre-stressed concrete augmented with wood at turnouts and bridges. On all networks except Tazara, approximately one-third of current speed restrictions are on account of damaged sleepers or damaged, loose or missing fasteners. Wooden sleepers at turnouts and on bridges are in excessively deteriorated state throughout the EAC, and a major cause of reason for temporary speed restrictions.

Ballast: Ballast sections on most trunk lines in the EAC consist of crushed rock (normally granite) and slag. Where steel sleepers are used, the condition of the ballast section seems to be reasonable good, however, inadequate ballast section appears to be a prominent cause of temporary speed restrictions, behind sleeper / fastener condition and likely bridge-related speed restrictions.

Bridges and Structures: The current conditions of bridges are major contributors to speed restrictions on EAC railways, in the form of temporary speed restrictions. This seems to be most severe on both the TRC and Tazara, where there is an acute problem with deteriorated bridge sleepers.

Signalling and Telecommunications: Each of the four EAC railways has a very rudimentary train control system. Train control is, for the most part, train order systems used in conjunction with non-interlocked and interlocked signals. As with signalling systems, telecommunication systems are in all cases in a state of disrepair and are unreliable. Although more study is required, the most logical investment would be in current communication systems and hardware and software to effectively implement an Occupancy Control System (OCS).

Rail Marine Operations and Infrastructure: Currently only one (TRC) of the four railcar vessels on Lake Victoria is in operation. The KRC and URC vessels are not operated on account of condition and difficulties in acquiring and costs of insurance. All three terminals continue to be used for rail services, however, it appears rehabilitation is required for continued safe and efficient usage.

Other Facilities: it appears that the overall condition of workshops, depots and maintenance facilities is poor to adequate.

Temporary speed restrictions are currently prevalent on all EAC railways as documented in Section 3.1.6 of the Technical Working Paper.

3.3.2 Rolling Stock

Coupling: The AAR (Association of American Railways) system of coupling used by TAZARA is far superior to the hook & pin system used on the other three railways in that it allows for bi-directional usage and for significantly higher coupler forces.

Motive Power: Overall, the railways' locomotives are in poor condition and provide utilization, reliability and availability rates that are low relative to international standards. This is likely on account of the advanced age of the locomotives and the lack of necessary investment in maintenance and rehabilitation over the years. The performance of locomotives is sub-par as expected for a fleet of its age. The locomotive performance has been the second most significant contributor to the railways' performance (after fixed infrastructure condition) in recent years. Mainline locomotives in East Africa typically provide range between 1000 and 3000 HP.

It appears that the concessionaires have commenced and will continue programs to rehabilitate a reduced fleet of their best performing locomotives, and shelving or disposing of surplus units. It is likely that as dictated by operational requirements and capital availability, they will eventually implement program of locomotive renewal.

Wagons: The age of freight wagon fleets at EAC railways differs from railway. The KRC fleet is the oldest and has a very high percentage of the fleet inactive. The maximum gross load of most freight wagons on EAC railways is 15 tonnes per axle. The quantity, capacity and likely performance of the wagon fleets have not and do not appear to impose any limitation on each of the four EAC railways from significantly improving future railway performance, at least on a global network. However, there is and will continue to be requirements for acquiring new or modifying existing wagons to meet market opportunities. The braking system in use is the air brake, although Tazara, in both Tanzania and Zambia, uses a duel breaking system (air and vacuum).

Coaches: The average age is high for RVR (50 years), but lower for TRC (27 years).

3.4 Capacity of the Existing Networks

The capacity of a track corridor of track is a function of operating trains permitted within the corridor at any time, the speeds at which trains operate and the traffic tonnage per train. The number of trains within a corridor is for the most part a function of the number of blocks (most often determined by spacing the passing loops) and the train operating system. The speed of the trains is mainly a function of the train characteristics (power-to-tonnage ratio) relative to that required of the terrain, posted track speeds and speed restrictions (normally imposed on account of infrastructure condition). Traffic per train is limited by passing loop lengths in combination with wagon capacity and drawbar strengths, as well as the availability of locomotives and wagons.

Table 3.2 provides an estimate of traffic capacity (expressed in millions of net tonnes of traffic per year in the aggregate of the two directions) as a function of train velocity and

freight wagon capacity for the route between Mombasa and Nairobi[7]. It indicates that, particularly with improved train velocity, significantly higher annual capacity is achievable on the main lines.

Table 3.2: Annual Capacity Projections (Million Net Tonnes) as a function of axle loading and train speed – Mombasa to Nairobi

Train Speed (kph) \ Axle Loading per Wagon (tonnes)	12	13	14	15	16	17	18	19	20
20	3.8	4.0	4.1	4.2	4.3	4.4	4.4	4.5	4.6
25	4.9	5.1	5.3	5.4	5.5	5.7	5.6	5.8	5.9
30	5.8	6.0	6.2	6.3	6.4	6.7	6.6	6.8	6.9
35	6.8	7.1	7.4	7.5	7.6	7.9	7.8	8.0	8.2
40	7.9	8.2	8.5	8.7	8.8	9.1	9.1	9.3	9.5
45	9.8	10.3	10.6	10.8	10.9	11.3	11.3	11.6	11.8
50	9.8	10.3	10.6	10.8	10.9	11.3	11.3	11.6	11.8
55	10.9	11.4	11.7	12.0	12.1	12.6	12.5	12.8	13.1
60	11.7	12.3	12.6	12.9	13.1	13.6	13.5	13.8	14.1

* Based on passing loop lengths of 548 meter and spacing of 25 kilometres.

Further improvements in capacity could be achieved either by improved signalling systems and/or longer passing loops (e.g. at 18 ton axle loads, speeds of 60 kph and passing loops of 1,200 m, capacity of 30 million tons/year would be possible). As indicated in Chapter 2, under the Base Case, annual traffic on the KRC system is expected to range from 3.3 million tons to 7.5 million tons between 2010 and 2030.

We conclude therefore that:

- Train velocity is a key driver of traffic capacity
- The single biggest focus of the railways in coming years should be removal and avoidance of temporary speed restrictions, and other reasonable measures to economically maximize speeds
- A secondary focus will eventually be needed on an increasing axle loadings to meet traffic forecasts (but the impact is less than that of increasing train speed)
- In about 20 years on the trunk lines, plans will have to be put in place to increase traffic capacity by installing a more effective train control system, upgrading signals & telecommunications systems and infrastructure and / or extending passing loops. Investments in equipment with AAR couplers and higher carrying capacity will also be required for the railways to accommodate the projected demand.

[7] The results would be similar for the Dar es Salaam-Mwanza main line). The estimates are constrained by the siding loop lengths (420 meters) and spacings (25 kilometer), and the required power-tonnage ratios (1.2).The capacity estimates are not constrained, for the sake of this analysis, by the availability of motive power and wagons, or by drawbar strength limitations.

3.5 Gauge Issues

There is much discussion of not only unifying the track gauge in East Africa, but also of adoption of standard gauge for both the existing network, as well as for many of the proposed links under consideration. The UAR has adopted the position that the cape gauge (1067 mm) should be adopted as the common gauge for the Railways of the south and east[8]. The main benefits of converting the entire EAC rail network to cape gauge railways would stem mainly from the additional traffic as a result of the interchange with the rail network of the SADC and possibly in the future, to the railways of other adjacent countries.

The benefits from the conversion of all or some of the existing or proposed network to standard gauge have mainly to do with the availability and acquisition costs of rolling stock and track maintenance equipment.

3.5.1 Benefits of Standard Gauge

The main benefits of conversion to standard gauge are:

- The potential for better inter-connectivity of railways (where neighbouring railways are standard gauge) – this does not apply in East Africa;
- Better availability and lower acquisition costs of rolling stock and track maintenance equipment (typically this can reduce capital costs by up to 10%)
- Higher traffic-carrying capacity of the railway (with 100 lb rail, this can cause a 15-20% improvement in axle loads)
- Potential for operating cost savings (these require traffic levels well in excess of what is forecast for the EAC).

3.5.2 Costs of Conversion to Standard Gauge

We estimated the cost of conversion to standard gauge of the main lines of the EAC only and of the current active network (on the grounds that it is an "all or nothing" decision, as the cost of transhipment from one gauge to another would dissuade shippers from using rail. The cost estimates are presented in **Table 3.3** and **Table 3.4**.

Table 3.3: Standard Gauge Network Developmental Costs (New Right-of-way), (Millions of USD)

	Trunk Lines Only	Current Active Network
Fixed Infrastructure	10,100 to 21,700	13,000 to 27,800
Acquisition of Rolling Stock	250 to 600	400 to 900
Profit Loss during Transfer Period	70 to 250	70 to 250
Total	**10,420 to 22,550**	**13,470 to 28,950**

[8] ***Rail Development In Africa:*** Stakes And Prospects, Objectives And Missions Of The African Rail Union (ARU) as prepared by ARU General Secretariat for Conference of African Ministers In Charge of Rail Transport 10 – 14 April 2006, Brazzaville (Congo)

Table 3.4: Standard Gauge Network Developmental Costs (Existing right-of-way), (Millions of USD)

Cost Element	Trunk Lines Only	Current Active Network
Fixed Infrastructure	2,900 to 6,750	3,700 to 8,700
Acquisition of Rolling Stock	250 to 600	400 to 900
Profit Loss during Transfer Period	180 to 620	180 to 620
Total	**3,330 to 7,970**	**4,280 to 10,220**

The cost of developing a standard gauge railway with a new right-of-way is estimated to be between $13 and 29 billion, and that of developing a standard gauge railway on the existing cape and meter gauge railway right-of-way is estimated to be between $4 and 10 billion for the currently active EAC rail network.

The costs of converting the EAC network to cape gauge would be in the order of $1.6 to 3.5 billion. And the costs of converting Tazara to meter gauge would be in the order of $1.2 to 2.9 billion. These cost estimates are documented in Annex B (including Appendix B.1).

Our recommendations concerning the gauge issues are as follows:

- Conversion of the entire EAC rail networks to cape gauge would provide very few benefits relative to costs. There is little potential of significant interchange traffic with Tazara and the railways of Southern Africa, and there are no operating savings; therefore, there is no justification to convert to cape gauge.
- For the same reasons, a conversion of Tazara to meter gauge makes even less sense as it will only lead to a significant loss of traffic.
- Under the most optimistic scenarios, the current rail networks of the EAC will generate revenues less than 1000 M USD annually by year 2030. Conversion of the trunk lines is forecasted to cost at least $20 B USD. Operating savings (if any) would be insignificant. Given the ratio of capital costs to revenues, it is clear to see that the conversion is cost prohibitive.
- New rail links should be developed consistent with the gauge of the network for which they will connect to. In the event they will not connect to an existing network, consideration should be given to using standard gauge. However, it should be noted that the benefits of standard gauge to meter or cape gauge are only appreciable at relatively high traffic levels.
- Although we advocate developing rail links in meter or cape gauge depending on their location, we do recommend that they be developed with a substructure that can accommodate the future conversion to standard gauge. This would apply to the width of the formation as well as clearances on bridges and tunnels and with adjacent tracks, as well as placement of right-of-way features such as signals, switches, and structures. The incremental costs are relatively minor.

3.6 Costs and Benefits of Electrification

Electric traction has the potential to provide lower energy costs and emissions. However, a stable cost-effective electrical supply is required. In addition, implementation would require a significant investment in infrastructure and systems for the transmission and distribution of electricity; electric-powered locomotives; and modifications to track and signal systems. As such, high levels of traffic are required to justify the investment in infrastructure. In

Section 7.4 of the Technical Working Paper, we present estimates of the costs and benefits of electric traction.

We estimate that at price and productivity levels of East Africa, the cost differential in favour of electric traction is approximately $2 per thousand gross ton-kilometres.[9] Given the investment costs of converting to electrification, it is estimated that the required traffic to produce an acceptable rate of return on the investment is over 5 million gross tons per kilometre of track. At the traffic levels projected for the EAC network (between 1 and 2 million gtkm/km), the projected rate of return is around 2%. Hence, the conversion to electric traction is not recommended for the foreseeable future.

[9] A ton-kilometre equals one ton moving one kilometre. Gross ton refers to the weight not only of the payload, but of the equipment (locomotive and wagon).

4 Legal and Institutional Study

4.1 Introduction

This chapter presents the conclusions and recommendations of our Legal and Institutional Study. The study itself is presented in Annex C.

4.2 Objectives

The purpose of the Legal/Institutional Report was:

- Assess the progress toward the regional integration of the railway transport and related transit and trade facilitation.
- Identify existing rules, regulations, and policies that could act as barriers to improved cross-border transport flow and/or inhibit sub-regional trade integration.
- Recommend options and institutional/regulatory/legal framework for the successful implementation of the railway master plan and for further reform in the railway operation and management so that there is an unimpeded flow of railway traffic across borders to enhance trade development and regional integration.
- Propose specific programs and projects for improving the regulatory/legal/institutional environment for efficient railway traffic movements across borders.

To meet these objectives, the Legal specialist:

- Reviewed the historical and current legal, regulatory, and institutional framework for the operation of railways and for cross-border transit and trade;
- Assessed the current status of the integration initiatives;
- Identifying issues obstacles/barriers to coordinated railway services and efficient cross-border traffic flow within the EAC.
- Recommended options and institutional/regulatory/ legal framework for the implementation of the railway master plan and specific programs and projects.

4.3 Current Status of EAC Integration in the Railway Sector

Past integration efforts in Africa have included railway transport, in order to overcome the historical absence of connections between railway systems. Public sector railway companies have long been experiencing a deterioration of their operations and investments resulting in heavy losses of income. As part of measures for the recovery of public enterprises, measures have been taken in various African countries (including Kenya, Tanzania and Uganda) to involve the private sector in the management of railway activities through concessions. Another significant measure that has been taken to mitigate problems facing the railway sector is to promote regional co-operation. Regional co-operation initiatives have mainly focussed on joint efforts to modernize railway networks and development of an African railway network.

In the EAC, co-operation in the railway sector is one of the aspects that was agreed by Member States from the beginning and included in the treaty. The ultimate objective of EAC

Member States is to have a common transport policy covering all modes of transport, including the railways.

Our review of the legal status of railway integration covered:

- **Worldwide conventions**, either setting rules of general policy, or specific to railway transport, including the UN Charter, general international policy instruments applicable to all modes of transport and international instruments related to railways;
- **Treaties and instruments valid or projected to be valid in the whole of the African continent**, including the African Union Treaty, the Treaty of Abuja, establishing the African Economic Community, the Treaty on the Harmonization of Business Law in Africa;
- **Sub-regional instruments, conventions and treaties specific to Southern, Eastern and Central African countries**, including COMESA, SADC, the Northern Corridor Transit Agreement, the Intergovernmental Authority on Development, the Indian Ocean Cooperation Agreements, the Economic Community of Central African States and the Convention for Economic Community of the Great Lakes Countries; and
- **Partnership Based Transport Harmonization Initiatives**, including the New Partnership for Africa's Development (NEPAD), the Sub-Saharan African Transport Policy Program and the USAID East and Central Global Competitiveness Hub.

Basing on the above review, the Consultant is of the view that:

(i) There is serious overlapping of membership and functions between different legal frameworks and, unfortunately, there is no common approach by EAC Member States to different legal frameworks. There are a number of players at the national, regional, continental and international level with a direct interest in railway sector in EAC. The necessity of involving all these role players in some or other way is not disputed. However, it is clear that their relative role in respect of proximity to implementation differs. As a result, there is a need to clarify and circumscribe their relative roles.

(ii) In order to streamline the legal framework, continental based institutions should ideally co-ordinate regional economic communities' policies and strategies, observe, monitor regional economic communities' initiatives and disseminate best practices. The regional economic communities should facilitate regional policy harmonization, observe corridor and national implementation, disseminate best practices and monitor corridor committees. The corridor committees should anchor for public-private partnership across two or more countries focussing on elimination of constraints, marketing investment opportunity and improving transit efficiency and monitoring of national implementation. The national governments should develop and implement national policies and enabling frameworks. Then national co-ordinating committees should identify enablers and constraints, investment opportunities and potential efficiency gains at national level, and co-ordinate within government and with private sector

(iii) Some of the legal frameworks were not based on realistic premises. As a result, these frameworks have not been as effective as anticipated. A solid and sound legal framework should start with what is in place and not what 'will' be in place.

(iv) The Northern Corridor Transit Agreement provides a good basis for structuring legal co-operation in the railway sector in the EAC. Since its establishment, the TTCA (corridor

committee) has focussed on the reduction of transport costs on the corridor and facilitation of trade and traffic. As such, it has coordinated a number of initiatives that have reportedly resulted in improvements in corridor efficiency. Although TTCA operates under a very limited budget, it has managed to set a baseline for the preparation of corridor action plans. TTCA type institutions can be strengthened for central and southern corridors.

4.4 Legal Basis for East African Railways Master Plan

We reviewed the railway related provisions of the 1999 Treaty for the establishment of the East African Community. In particular Article 89 of the Treaty provides that in order to promote the achievement of the objectives of the Community as set out in Article 5 of this Treaty, the Partner States undertake to evolve co-ordinated, harmonised and complementary transport and communications policies; improve and expand the existing transport and communication links; and establish new ones as a means of furthering the physical cohesion of the Partner States, so as to facilitate and promote the movement of traffic within the Community. The ultimate objective is to have a common transport policy. Article 89 sets out the steps to be taken, while Article 91 provides that the Partner States agree to establish and maintain coordinated railway services that would efficiently connect the Partner States within the Community and, where necessary, to construct additional railway connections.

The Consultant is of the view that the treaty provides a sufficient legal basis for co-operation in the railway sector. The focus should be on creating detailed guidelines and steps for implementing treaty provisions.

In implementing the treaty provisions, the second EAC Development Strategy 2006 – 2010 was adopted. With regard to Railways, the main objectives of the strategy are: First; to assess the state of restructuring of railways in the three Partner States in areas of ownership, management, infrastructure, financing and investment, national legislations and human resources; and Second; to recommend a harmonised approach towards restructuring of the railways in the region and possible areas of co-operation during the restructuring process.

4.5 Barriers to Integration

We identified a number of barriers to integration.

(i) Overlapping Memberships in regional integration bodies

(ii) Slow substantive changes in national policies, legislation, rules and regulations

(iii) Absence of effective monitoring mechanisms at the EAC level

(iv) Lack of well structured financing sources

(v) Domestic opposition to integration

(vi) Differences in laws relating to railways

(vii) Different regulatory frameworks and licensing systems for railways

(viii) Lack of clear division of responsibilities between the EAC and the Member States

4.6 Recommendations for Legal/Regulatory/Institutional Framework for the Implementation of the Master Plan

Our recommendations are as follows:

(i) **Adopt uniform approach to international bodies:** in order to streamline the legal framework, the role of continental based institutions should be perceived by EAC to be limited to that of co-ordinating regional economic communities' policies. The EAC itself should facilitate regional policy harmonization, observe corridor and national implementation, disseminate best practices and monitor corridor committees. The corridor committees for Northern Corridor, Central Corridor and Southern Corridor should anchor for public-private partnership across two or more countries focussing on elimination of constraints, marketing investment opportunity and improving transit efficiency and monitoring of national implementation. The national governments should develop and implement national policies and enabling frameworks.

(ii) **Adopt comprehensive guidelines for common transport policy:** this should cover all modes. The imbalance in the development of individual modes of transport is one of the biggest challenges in achieving common transport policy. Sustainability must be the hallmark of the EAC transport policy.

(iii) **Increase financial efficiency in railways sub-sector:** For the railways to flourish, clear financial objectives and a proper division of responsibilities between the Member States and railways companies are essential. The railways must have a financial structure that allows effective, independent management. Railways companies should be run on a commercial basis in accordance with the principles which apply to commercial companies.

(iv) **Introduce market forces in railways sub-sector:** The guidelines should oblige the Member States to progressively open up the rail freight market and, in the long term, international passenger transport service market. The guidelines should aim at opening the market for the whole railway sector, including the railway supply industry and rail freight customers such as rail freight forwarders, logistics integrators and shippers, as per Article 97 (3) of the EAC Treaty.

(v) **Take measures to integrate technical standards of national rail systems:** According to Article 91(2) (k) of the EAC treaty, one of the necessary measures that need to be taken towards common policy in railway sub-sector is to 'agree on common policies for the manufacture of railway transport equipment and railway facilities' and 'establish common standards for the construction and maintenance of railway facilities'. The work of the ARU provides a good basis for technical harmonization, particularly with regard to adoption of the AAR coupler, common maintenance standards for wagons and coaches, the replacement of vacuum brakes

with compressed air brakes and common standards for platforms of new lines, maintenance of railway lines and ballast characteristics.

(vi) **Introduce EAC railways licensing system:** to realize integration in railway sector, a long run objective should be free circulation of railways services and that undertakings be treated fairly and without discrimination. The guidelines should therefore provide the criteria applicable to the issue, renewal or amendment of operating licences by Member States to railway undertakings which intends to operate in the EAC. Railway undertakings whose activities are limited exclusively within the boundaries of Member States can be excluded from the scope of the guidelines.

(vii) **Ratify important international conventions and instruments:** In particular, for the purpose of having benefit of sharing knowledge with other countries and be able to set standards in an easy way, the Consultant recommends that EAC may seek to accede to the Bern Convention on International Railway Transport, 1980. EAC may (i) enter reservations on areas where competence lies with the EAC; (ii) declare that the uniform rules on the validation of technical standards and the approval of railway equipment used in international transport will not apply where these areas are already covered by EAC legislation; and (iii) enter reservation on the right not to apply certain provisions of the Convention.

(viii) **Create Railways Unit at EAC:** The creation of an integrated rail area entails putting in place monitored common technical regulations. Given the difficulties encountered by Member States in the past, it may be necessary to create a Railways Unit at EAC level. The main objective of the Unit will be to provide the Secretariat and the Member States with technical assistance in order to enhance the level of integration of the EAC rail system.

The Unit will also coordinate the groups of technical experts responsible for finding common solutions on railway safety and will send the draft decisions to the Secretariat, which will approve them once they have been endorsed by the committees of representatives of Member States. The Unit will also facilitate communication between the various competent national authorities.

(ix) **Give special role to East African Legislative Assembly:** The East African Legislative Assembly should be given special role in overseeing development of common transport policy.

(x) **Strengthen the role of corridor committees:** At the beginning, corridor committees may start with exploring PPP options in the following areas:

- Construction of Freight Corridors
- Construction of Logistics parks and warehouses
- Construction of cargo handling at terminals
- Linking railways to ports
- Modernization and upgrading of passenger terminals
- Hospitality and catering
- Commercial Utilization of surplus land where private sector can invest in public utilities like food plazas, cyber café, rest rooms.

(xi) Adopt comprehensive guidelines for railways sub-sector to cover:

a. **safety,** including common safety rules, regulations and requirements with regard to signs, signals, rolling stock, motive power and related equipment and the transport of dangerous substances to gradually replace national standards which differ and therefore act as a barrier to community wide integration.
b. **infrastructure financing,** in the form of a railway investment fund to finance community level infrastructure projects
c. **community level certification of train crews,** to facilitate through working of trains within the Community
d. **passenger rights:** In order to make the railways more attractive, the passengers' rights need to be better protected - particularly with regard to reimbursement for train delays. The guidelines may require the railway undertakings to provide passengers with specified information prior to, during and following the journey.
e. **compensation in case of non-compliance with contractual requirements for rail freight services** consisting of compensation scheme should therefore be established to cover losses and damage to transported goods, delays in delivery and cancellations as well as breaches of any other quality requirements laid down in the transport contract.
f. **provision of common rail statistics** to ensure the monitoring and development of the common transport policy and the preparation of measures in the field of transport safety.

4.7 Changes to National Legislation

We believe that the domestic legislation which hinders integration can be amended progressively by requiring member states to harmonise their laws with the measures adopted by the East African Community. Based on the fact that the East African Community is promoting supra national law, the main focus should be to set standards and request member states to amend their laws to comply with the adopted standards.

Nevertheless, the Consultant is of the view that as a first key step, member States should be encouraged to adopt similar regulatory system in the railway sector. This will assist in building common ground. Specific recommendations are set out in Appendix C.

5 Environmental Study

5.1 Introduction

This chapter presents the conclusions and recommendations of our environmental study. The full study is presented in Annex D.

The scope of the Environmental Study was as follows:

a) Review the current environmental legislation in each of the EAC Member States, particularly those related to railway operations and railway construction projects.
b) Review the existing railway activities in East Africa and describe the current situation with respect to pre-existing and ongoing contaminations and the responsibilities of new private-sector operators.
c) Based on the review, indicate the current legal requirements to conduct environmental assessments of railway operations and rehabilitation and/or new construction of railway and related facilities.
d) Draw up an environmental checklist to ensure that the proposed railway investments can be carried out in an environmentally responsible way.

5.2 Review of Environmental Legislation for Railways

Legislation related to railway operations and railway construction projects is not specific in each member sates. Railway operations would fall into the scope of 'industrial' or 'transport' type legislation. Taking Tanzania as an example, legislation applicable for railway operations are typically generalized as:

- Occupational health and safety
- Hazardous substance, mostly included in legislation dealing with industrial installations such as factories.

There is a general trend, encouraged by the World Bank to ratify various international conventions and adapt legislation for regulating industries and sectors such as railways. In Annex D, Sections 1.1.1 to 1.1.3 we list the relevant legislation to railway operations for Tanzania, Kenya and Uganda, respectively.

5.3 Relevant International Conventions

Most member states have yet to domesticate all the relevant international conventions. In reviewing the environmental impact assessment (EIA) legislation there is specific acknowledgement of the conventions (with an implied sense that their ratification is 'wished') but with limited legal status. There are extensive conventions on transport, transboundary and waste issues in the general international transport sector. These are listed in Section 1.2 of Annex D, while regional conventions and initiatives are listed in Section 1.3. The EAC should definitely take these into consideration when developing the Master Plan.

Most of the member states have legalized many of the international conventions, usually followed by the establishment of an Environmental authority with, as one of its many responsibilities, to regulate the EIA process in the country.

Going through the exercise of providing an environmental rating for each link, it became clear that large portions of the links are "self-contained" inside the territory of one member state. The most sensitive sites, such as Dar-Mtwara, Arusha-Musoma are too important an issue for the EAC to develop separate EIA procedures. The following table lists the sensitive areas and the links they are associated with.

Table 5.1: Sensitive Areas and Associated Links

Convention	States	Links	Comment
UNESCO World Heritage Site: Old Town Lamu Old town Convention on the Protection, Management and Development of the marine and coastal environment of the Eastern African Region and related protocols (UNEP, Nairobi Convention 1985)	Kenya and Tanzania	Lamu Port (Link 5, 6) and Mtwara (Link 7, 10)	Lamu
UNESCO World Heritage Site and Biosphere Reserve (Serengeti National Park-SENAPA and Ngorongoro Conservation Area-NCA)	Tanzania	Link 16	Serengeti, Ngorongoro, Natron
RAMSAR Conventions	Tanzania	Link 25	Lake Natron
RAMSAR Convention	Tanzania	Link 12, 13	Malagarasi Muyovozi Ecosystem
UNESCO World Heritage Site:	Tanzania	Link 7, 24	Selous Game reserve (largest in Africa)
UNESCO World Heritage Site	Tanzania	Link 10	Ruins of Kilwa Kisiwani and Ruins of Songo Mnara, GROW
UNESCO World Heritage Site	Uganda and Congo	Link 1	Ruwenzori Mountains National Park
UNESCO World Heritage Site	Tanzanian and Malawi	Link 8	Lake Malawi National Park
Bamako Convention: Convention on the Ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa was adopted at the conferences of environment ministers on 30th January 1991 and signed by 51 countries including Tanzania.	All member states	Links 2, 3, 5, 6, 11, 12, 13, 15, 24, 8	Links shared by more than one country
Report on International Legal and Institutional Arrangements for the Management of Lake Malawi/Nyasa	Tanzania and Malawi	Link 8	Lake Malawi National Park
Lake Victoria Convention on (Burundi incl.) Lake Victoria Fisheries Organisation Lake Victoria Environment Management Programme 1994: Nile Basin Initiative.	Tanzania, Uganda and Kenya	Links 4, 30, 16, 22 and possibly 12	Lake Victoria
Kagera Basin Agreement 1997 Forum for cooperation between the Kagera Basin States Convention Objective to ensure that environmental conditions are taken into account in development projects	Tanzania, Uganda, Rwanda and Burundi	Links 12 and 13	Kagera Basin

Convention	States	Links	Comment
Inter-Government Authority in Development 1986	Sudan, Eritrea, Djibouti, Ethiopia, Kenya, Uganda and Somalia	Links 5, 6, 31 (war zones and famine)	Disaster areas: famine, war. Etc.

5.4 EIA Requirements

The following table summarizes the EIA requirements among the member states. These are described in greater detail in Annex D. The member states have based their EIA legislation upon international principles and templates such as World Bank standards. They hold many similarities, with differences mostly in fee and time scheduling for the EIA processes.

Table 5.2: Comparison of EIA Requirements Among EAC Member States

Regulation-Convention etc.	Tanzania	Kenya	Uganda	Rwanda	Burundi
Environmental Policy plan	Nat'l Environment Action Plan (NEAP) 1994	Nat'l Environment Action Plan (NEAP) 1994	Nat'l Environment Management Plan (NEMP) & NEAP 1995	not available	Stratégie Nationale de l'Environnement du Burundi no. 100-10 1997
Environmental Act	Environmental Management Act, 2004	EMCA no. 8, 1999	National Environment Statue (NES) No. 4, 1995	Organic Law No. 4l, 2005	l'Institut National pour l'Environnement et la Conservation de la Nature, 1989
EIA Authority	NEMC	Sec. 7 of EMCA, NEMA, Ministry	NEMA	Organic Law Art. 65, REMA	INECN no. 100-188
Authority Established	Yes	Yes	Yes	Yes	Yes
EIA Regulatory Framework	Yes, EMA no. 20	pending, 2002	EIA Regulations of 1998	Organic law Chap. 4, limited	Code de l'Environnement de la République du Burundi Decree 1/10
EIA required for Railways	Yes	Yes	Yes	not stated	

EAC environmental legislation should not re-invent the wheel. Relative to railway operations and construction, the EAC could review and consider becoming party to relevant international conventions, in particular the transport conventions, but as well the environments conventions. This report should serve as a general reference point of which to build on.

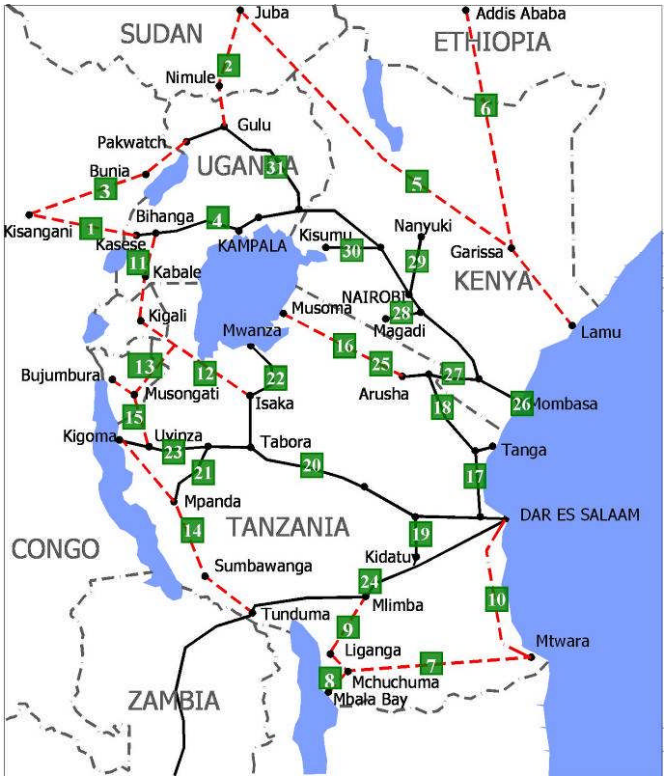
The EAC could focus on the following items that could be expended in future development phases:

- Emergency Response plan
- Resettlement plan
- Hazardous Waste plans
- OSHA

5.5 Environmental Issues of the Links under Study

Annex D contains a summary description of the environmental issues of the links under study. There is difficulty giving detailed environmental opinions as the links are, for the most part, arbitrary lines on a map. More detailed analysis will be required once alignments have been selected. The links are as indicated in **Figure 5.1**.

Figure 5.1: Schematic Map of Proposed Links



Link	Location
1	Kasese – Kisanani
2	Gulu – Nimule – Juba
3	Pakwach – Buia – Kisangani
4	Tororo – Kampala – Bihanga – Kasese
5	Lamu – Garissa – Juba
6	Garissa – Addis Ababa
7	Liganga – Mchuchuma – Mtwara
8	Mchuchuma – Mbamba Bay
9	Liganga – Mlimba
10	Dar es Salaam – Mtwara
11	Kigali – Kabale – Bihanga
12	Isaka – Keza – Kigali
13	Keza – Musongati (a branch from, and part of, Isaka – Keza – Kigali Line)
14	Tunduma – Sumbawanga – Mpanda – Kigoma
15	Uvinza – Gihofi – Nyanza – Lac – Bujumbura
16	Arusha – Musoma
17	Dar – Ruvu – Korogwe – Tanga
18	Dar – Ruvu – Korogwe – Moshi – Arusha
19	Dar – Ruvu – Kilosa – Kidatu
20	Dar – Ruvu Kilosa – Dodoma – Singida – Tabora
21	Dar/Tabora Line – Kaliua – Mpanda
22	Dar/Tabora Line – Isaka – Mwanza
23	Dar/Tabora Line – Uvinza – Kigoma
24	Dar – "Kilombero" Ifakara – Chita – Mlimba – Mbeya – Tunduma
25	Arusha – Natron
26	Mombasa MAIN LINE to Toroto
27	Mombasa – Voi – Taveta – Arusha
28	Mombasa – Voi – Konza – Magadi
29	Mombasa – Nanyuki
30	Mombasa – Kisumu (Lake Port)
31	Toroto – Gulu - Pakwach

The following table summarizes the key environmental issues concerning each link.

Table 5.3: Summary Table of Environmental Issues and Legislature Regulator

Link	Development Status	Location	Rating	EIA Regulator	Comment
1	New line proposed	Kasese-Kisangani	RED FLAG	NEMA Uganda especially for Ruwenzori	war zone, Ruwenzori NP
2	New line proposed	Gulu-Nimule-Juba	Concern	NEMA Uganda and Sudan	war zone
3	New line proposed	Pakwach-Bunia-Kisangani	RED FLAG	NEMA Uganda and Congo	major war zone
4	Existing	Tororo-Kampala-Bihanga-Kasese	Concern	NEMA Uganda	
5	New line proposed	Lamu-Garissa-Juba	Concern	NEMA Kenya and Sudan	
6	New line proposed	Garissa-Addis Ababa	Concern	NEMA Kenya and Ethiopia	
7	New line proposed	Liganga-Mchuchuma-Mtwara	RED FLAG	NEMC Tanzania	Selous Game reserve the largest in AFRICA, GROW
8	New line proposed	Mchuchuma-Mbamba Bay	RED FLAG	NEMC Tanzania and Malawi	Lake Nyasa (Malawi)

Link	Development Status	Location	Rating	EIA Regulator	Comment
9	New line proposed	Liganga-Mlimba	caution	NEMC Tanzania	
10	New line proposed	Dar es Salaam-Mtwara	RED FLAG	NEMC Tanzania	GROW
11	New line proposed to join an existing link	Kigali (Rwanda)-Kabale (Uganda)-Bihanga	caution	NEMA Uganda, Rwanda (EAC)	
12	New line proposed	Isaka (Tanzania)-Keza (Tanzania)-Kigali (Rwanda)	caution	NEMC Tanzania and Rwanda (EAC)	
13	New line proposed	Keza (Tanzania)-Musongati (Burundi) (a branch from, and part of, the Isaka-Keza-Kigali Line)	caution	NEMC Tanzania, Burundi (EAC)	
14	New line proposed	Tunduma-Sumbawanga-Mpanda-Kigoma	caution	NEMC Tanzania	large number of reserves, and a National Park, Katavi
15	New line proposed	Uvinza-Gihofi-Nyanza-Lac-Bujumbura	caution	NEMC Tanzania, Burundi (EAC)	
16	New line proposed	Arusha-Musoma	RED FLAG	NEMC Tanzania	Serengeti National Park
17	Existing	Dar-Ruvu-Korogwe-Tanga	caution	NEMC Tanzania	
18	Existing	Dar-Ruvu-Korogwe-Moshi-Arusha	Low	NEMC Tanzania	
19	Existing	Dar-Ruvu-Kilosa-Kidatu	Low	NEMC Tanzania	
20	Existing	Dar-Ruvu-Kilosa-Dodoma-Singida-Tabora	Low	NEMC Tanzania	
21	Existing	Dar/Tabora Line-Kaliua-Mpanda	RED FLAG,	NEMC Tanzania	Malagarasi Wetlands
22	New line proposed	Dar/Tabora Line-Isaka-Mwanza	Low	NEMC Tanzania	
23		Dar/Tabora Line-Uvinza-Kigoma	RED FLAG,	NEMC Tanzania	Malagarasi Wetlands
24	Existing	Dar-“Kilombero” Ifakara-Chita-Mlimba-Mbeya-Tunduma	Caution	NEMC Tanzania	
25	New line proposed	Arusha-Natron	RED FLAG	NEMC Tanzania	Lake Natron
26		Mombasa MAIN LINE to Tororo	Low	NEMA Kenya	
27	Existing (or previously existed)	Mombasa-Voi-Taveta-Arusha	Caution	NEMC Tanzanian and NEMA Kenya	Amboseli and Mkomazi
28	Existing	Mombasa-Voi-Konza-Magadi	Low	NEMA Kenya	
29		Mombasa to Nanyuki	Low	NEMA Kenya	
30	Existing	Mombasa to Kisumu (Lake Port)	Caution	NEMA Kenya	Lake Victoria
31	Existing	Tororo-Gulu-Pakwatch	Low	NEMA Uganda	

6 Economic Impact of Improved Transport Links

6.1 Introduction

The mission of the East African Community (EAC) is to widen and deepen economic, political, cultural, and social integration in order to improve the quality of life of the people of East Africa. Various initiatives are underway to facilitate regional trade, enhanced social and economic development, and regional integration, yet these initiatives can only be effective when complemented by adequate physical infrastructure that is capable of providing efficient movements of goods and persons. And railway infrastructure and services should play an important role, given the vast territory of the EAC and the consequent importance of long-distance transport.

As this is a Master Plan project and not a feasibility study project, we do not intend to conduct a detailed feasibility analysis for each proposed link, but there is a need to assess potential impact (both economic and social) of the new or rehabilitated links and/or the improved network at a relatively high level to screen and prioritize proposed investments to develop an implementable transport logistics strategy. These potential impacts are particularly important where the high investment costs of new links might not be justifiable on a pure financial basis.

Given the limited resources for this project, the focus of the economic analysis of the railway links included in the Master Plan was the links to Rwanda and Burundi. The impacts described below are indicative of the impacts for other proposed links in the Master Plan.

While there are road and waterway routes that connect Rwanda and Burundi with the other EAC Member States (Kenya, Tanzania, and Uganda), there currently exist no rail links with these two countries. Thus, there are a number of rail links currently proposed to connect these two new EAC members:

- Isaka (Tanzania) – Kigali (Rwanda) with a connection to Musongati in Burundi: A feasibility study for this link is currently ongoing
- Bihanga (Uganda) – Kabae (Uganda) – Kigali (Rwanda): A new line proposed by EAC
- Uvinza (Tanzania) – Bujumbura (Burundi): A new line proposed by EAC

6.2 Current Economic/Social Conditions in Rwanda and Burundi

Burundi and Rwanda, EAC member states since July 1, 2007, are land locked and remote from both the Indian Ocean (1500 kms) and Atlantic Ocean (1900 kms). Import and export activities are carried out through two main sea ports: Mombasa in Kenya and Dar- Es-Salaam in Tanzania, which are the outlets of two corridors, the North and Central Corridors, respectively. These comprise different modes of transport, which are lengthy, slow, difficult and expensive. These traffic constraints are linked to: (i) poor traffic and infrastructure condition, (ii) Physical and non-physical barriers, (iii) technical-legislative disparities on truck axle weights and (iv) red tape and the duration of trips. As a consequence, merchandise costs increase up to 40% and commercial exchanges amongst East African member states are penalised.

Current economic and social conditions in the EAC Member States are reviewed in Appendix E of the report. Population densities in Rwanda and Burundi are among the highest in the

world – at 284 and 349 persons per km^2 respectively, compared to 66 per km^2 for the EAC as a whole. Projected population growth rates to 2015 are 2.7% and 3.6% per annum respectively, compared to 2.9% p.a. for the EAC. The degree of urbanization in Rwanda is roughly comparable with that of the EAC, while in Burundi, it is considerably lower.

In terms of the human development indicators, the rank of Rwanda (161) and Burundi (176) is the lowest of the EAC Member States, as indicated in the following table.

Table 6.1: Human Development Indicators of the EAC Member States

Country	HDI, 2005	World Position	Life Expectancy at Birth	Adult Education Rate	Enrolment Ratio	GDP in US$/ Pop	GDP/Pop. (PPP in US$)
Kenya	*0.521*	*148th*	*52.1*	*73.6*	*60.6*	*525.3*	*1,240*
Uganda	*0.505*	*154th*	*49.7*	*66.8*	*63.0*	*301.0*	*1,454*
Tanzania	*0.467*	*159th*	*51.0*	*69.4*	*50.4*	*314.3*	*744*
Rwanda	*0.452*	*161st*	*45.2*	*64.9*	*50.9*	*239.1*	*1,206*
Burundi	*0.413*	*176th*	*48.5*	*59.3*	*37.9*	*101.3*	*699*

For all the key development indicators – life expectancy at birth, education rate, GDP per capita – Rwanda and Burundi are generally ranked lower than the other Member States. Labour force participation is low, with the employed population accounting for approximately half of the total population. The primary sector, particularly agriculture, accounts for over 90% of the work force. Largely as a result of the cost of transport, prices paid to producers are low and most mining deposits cannot be economically exploited.

Both passenger and freight traffic have been growing significantly, albeit from low levels, in recent years, as documented in Appendix E. In both countries, imports are several times more important than exports. For Burundi, there are significant mineral deposits, as per the following table.

Table 6.2: Potential Ore Deposits

Nickel in million of tons			*Vanadium in million of tons*	*Rare Earths in tons*	*Industrial Minerals in million of tons*		*Peat in million of tons*
Musongati	*Nyabikere*	*Waga*			*Cement*	*Ceramic*	
180	*46*	*35*	*11*	*5,000*	*2*	*16.32 of kaolin* *5.1326 of quartzite* *0.73 of fieldspar*	*100*

6.3 Potential Impacts of Proposed Railway Links

The new lines proposed under the railway Master Plan provide a connection to the existing lines in other countries (Tanzania, Uganda and Kenya). Once the project became operational, it will contribute to improving the social and economic conditions of countries in the EAC in general and in particular those from Burundi and Rwanda.

The economic and social impacts of each line are described below in narrative rather than quantitative terms. They will be quantified in detail through feasibility studies.

6.3.1 The Isaka - Kigali Line with a Link from Keza – Musongati

This line is currently the subject of a feasibility study. The proposed route starts from Isaka on the existing railway Dar-Es-Salaam - Tabora - Isaka - Mwanza. The catchment area of this route is Rwanda, Burundi and north-west Tanzania.

The impacts of the line will include:

- Savings in transport costs relative to the no-project case, which consists of road transport, air and lake (Lake Tanganyika);
- Stimulation of economic development as a result of new routes and transport options;
- Job creation as a result of the project;
- Improved reliability of the transport networks serving the landlocked countries as the proposed rail links in the present study will develop other access routes to the ports of the Indian Ocean.

Construction Phase

During the construction period, large numbers of workers will be required. According to the report on a study of the Kagera River Basin Railway Line construction of the new lines will need 30,000 labourers and 7,000 skilled workers[10].

This will therefore increase the incomes in Burundian and Rwandan households. In addition, land use planning will be necessary because there will necessarily be an increase of population in existing urban centres such as Cankuzo, Gitega and Rutana, but also new centres will be created mainly in the areas of mineral deposits and around the intermediate stations.

The construction of the railway will thus fuel the development of other sectors. Burundi and Rwanda will produce more to meet the needs of railway workers; especially agricultural production will increase, the trade and transport of goods and people will no doubt be developed, the construction industry in general (buildings, roads) will undergo a major expansion of development, the energy sector as well. Indeed, much energy will be needed for the exploitation of minerals and for the needs of the line (lighting of the new centres and new neighbourhoods in existing facilities, intermediate stations, new processing industries….).

The construction of this line also has some negative impacts. The spread of sexually transmitted diseases such as HIV /AIDS will occur as a result of people living on the site, also called geographic bachelors. Mitigating measures should be adopted to minimize the damage.

Negative environmental impacts such as (construction works crossings: bridges, viaducts…. etc; development of intermediate stations and urban centres) will occur. It is anticipated that mitigation and compensation mechanisms must be included in the planning and implementation of the present EAC Railway Study.

[10] KBO, The Kagera River Basin railway study, Annex 1, Regional Analysis, March 1984, p 415.

During the Operation of the Railway Line

In addition to the ores that can be exploited once the new lines are constructed, these lines will carry much of the Rwandan cargo to or from the Port of Dar-Es-Salaam as a result of the lower rail transport cost compared to road transport.

For Burundi, this line will complement or even compete with the alternative route of the central corridor: Lake Tanganyika -Kigoma and then by rail Kigoma – Dar es Salaam. Much of the cargo to or from Europe, Asia, the Oceania and America, and of course Tanzania can be transported on this line. This line could compete with the Uvinza - Bujumbura Line or transport by lake from Bujumbura to Kigoma and then from Kigoma to Dar es Salaam by rail. The main factors determining the success of the alternative routes/modes will be transport cost, delivery times and security.

It should be noted that the already identified reserves of Musongati nickel and other potential reserves of Muremera and Cankuzo, Rutovu and Makamba or other minerals are mostly located in eastern Burundi. This indicates that the economic and social impacts will be of great importance not only for Burundi but also of the entire region stretching from the eastern DRC and Rwanda as well as the western region of Tanzania.

The exploitation of minerals will potentially generate high traffic on this well-defined route and will contribute to improving the economy of these two landlocked countries and help earn foreign currency.

As a result of the reduction in transport costs because of the rail line will allow increases in producer prices and open new opportunities for sale of products in international markets. The additional revenues thus obtained will result in the improvement of conditions of production and trade.

6.3.2 The Bihanga - Kabale - Kigali Line

This line connects the Kigali to Uganda railway network, which links Kampala in Uganda to Mombasa in Kenya. The cost of transport by rail is cheaper than road transport, consequently, this line can carry traffic to both Rwanda and Burundi. Thus, a dry port would be built in Kigali to serve Burundi and the North Kivu province of the DRC.

As Ugandan and Kenyan industry is more developed than that of Rwanda and Burundi, imports will continue to flow from these countries. Rail transport will have a competitive advantage over road transport due to the limitation of axle loads currently required to minimize the damage caused by overloaded lorries on the road.

As a result of the diversion of a portion of the traffic to rail, the movement of heavy vehicles to and / or from Uganda and Kenya specifically for the transport of petroleum products and other manufactured products in these countries will be less intense on the roads. It will therefore contribute to lowering the cost of maintenance and reconstruction, and because the conditions of transport will be more favourable on this line, transport costs will also be reduced for the rest of the traffic.

Further analysis of the cross-border movement of people of the two countries shows that the number of buses (at least 20 buses a day) that take the route to Kampala is more important compared to other routes. The same applies to air travel. Almost all the planes that fly to and from Burundi and Rwanda pass through Nairobi, Kenya, and occasionally Entebbe, Uganda.

As rail transport is potentially more reliable, although slower than air transport, we can assume that some of the short-distance air transport will be diverted to rail.

This line could also be used for the transport of goods and people in the eastern DRC. The latter is rich in minerals, as well as agricultural and livestock products. Hence a large part of North corridor transport will be carried over this line.

Other economic and social impacts associated with the creation of employment, increased production, stimulating the development of other sectors… etc. are identical to those described above for the Isaka-Kigali line both during the construction and operation phases.

6.3.3 The Uvinza - Bujumbura Line

This line would connect Bujumbura to the Kigoma-Tabora railway line in Tanzania. It will stretch from Uvinza, an important station on the Kigoma-Tabora line along the Malagarazi river valley, pass through the plain of Moso, Gihofi which lies in eastern Burundi, descend to Lake Nyanza then go back to Bujumbura passing alongside the paved road which links Bujumbura to Mugina (border with Tanzania) and continues to Kigoma.

This line could join the Keza-Musongati Line which is a branch of the Isaka-Kigali line because Musongati is located approximately 20 km from the centre of Gihofi, where the railway line from Uvinza will join the network.

Economic and Social Impacts of this Line

In addition to the impacts described for the Isaka-Kigali line, the line will pass through Gihofi in Burundi on the banks of the river Malagarazi, home to large sugar cane plantations. The processing plant of the sugar cane is located in this town. The current production ranged from 17,661 tonnes in 2002 to 20,268 in the following year[11]. Of this production, much less than half is exported. Much of the sugar production is currently consumed locally rather by breweries and households.

As a result of the current expansion of the factory and the sugar cane plantation that will happen even on Tanzanian territory in accordance with agreements between the two countries, the production will double and even triple, which, in turn, will increase the quantity exported. The increased production, which will be largely made up of production in Tanzania plantations of sugar cane, will potentially be transported on this line as it passes through the urban centre of Gihofi, as indicated by the railway study commissioned by the KBO in 1984. Some of the sugar destined for Bujumbura may also be transported on this line.

With regard to the transport of other goods, the following factors must be taken into account to determine the traffic potential of the line:

[11] BRB, Monthly Bulletin, July 2007, page 32, p 105

- The cost of transport compared with that from lake to Kigoma then by rail to Dar-Es-Salaam;
- Operation of direct trains or cargo trains;
- The potential for containerization;
- Transhipment fees.

The above factors will determine the role of this railway line, i.e., the extent of its complementarity or its competitiveness with other routes/modes. It is anticipated that Bujumbura will continue to play its role in the economy linked to the provision of a port and an international airport. In other words, this railway line will instead play a complementary role. The impacts listed on the Isaka-Kigali with a connection to Musongati, are also applicable to this line.

6.4 Conclusions

In landlocked countries, improvement of transport infrastructures is critical to their economic and social development. The railway can play a key role because it can:

- Significantly reduce the costs of transport;
- Develop other sectors, and hence increase production, which result in increases in GDP;
- Create jobs; and
- Allow the profitable exploitation of ore bodies.

The railways planned in the context of the study of the master plan will have economic and social impacts in Burundi and Rwanda and even in the eastern DRC. Rail links with the ports of Dar-Es-Salaam and Mombasa will reduce:

- The length of journey and turnaround times of rolling stock as a result of the reduction in yards, time stops at the borders;
- Transhipment costs;
- The cost of damage and losses (insurance);
- The cost of security clearance and transit; and
- Financial expenses for the period of transit.

In the case of passengers, the low cost of transport and safety of this mode of transport compared to road transport will contribute to the development of tourism.

On the social side, the construction of these railway lines will create jobs both during the construction and operation periods. The railway sub-sector, despite the use of heavy equipment, is known for its labour intensity. This factor may therefore contribute to the increase in household incomes and will relieve the agriculture sector which employs over 80% of the population in both countries despite the fact that the land available for agriculture is progressively shrinking. In addition, recent severe weather conditions in both countries have seriously and negatively affected the agriculture sector.

Changes in land use are anticipated as Burundi and Rwanda are the least urbanized in EAC and consequently, a rural exodus to the new centres created as a result of the construction of the railway is expected. The positive impacts are expected, but also negative impacts

must be determined in order to prevent them, manage them if they happen or mitigate them to the possible extent.

7 Indicative Costs of the Master Plan Investments

7.1 Introduction

In this chapter, we present indicative cost estimates and discussion of potential future railway investments in East Africa, including:

- Investment requirements to rehabilitate and then maintain the existing track infrastructure to meet the base traffic forecasts (Section 7.2);
- Investment requirements to meet future track capacity requirements (Section 7.3);
- Estimated Construction Costs of proposed links (Section 7.4);
- Costs to rehabilitate and restore service on currently inactive line (Section 7.5).

7.2 Investment Requirements of Existing Network

The main focus of the railways in East Africa in the short to medium term should be increased trains speed to be achieved by progressively eliminating temporary speed restrictions, especially on core track (i.e. the main lines). This will require the rehabilitation of track, and the condition assessment and eventually rehabilitation of bridges. Rail relay will focus on worn rail on curves and high-defect rail on both curves and tangent track. Sleeper programs will initially need to focus on curves and ballast deck bridges. Assessments will need to be undertaken of bridges on all core track; likely starting with bridges with existing temporary speed restrictions.

It is critical that the railways develop planning horizons of at least 20 years. The foundations of such plans need to be a thorough and detailed condition assessment of the fixed infrastructure. This will require walking inspections of all track with detailed measurement and record keeping. Railways will need to know the rail wear measurements on each curve; and visual rail defects and defective sleepers by the kilometre. In order to accurately and cost-effectively measure track geometry, they should consider employing mechanical means such as geometry test vehicles. Consideration should be given to ultrasonically testing the rail. Equally as important, the railways must employ modern means to record and analyze the collected data.

All investment plans need also be based on realistic traffic projections. It is likely that some of the core lines will require an investment to enhance capacity within the next 20 years. In addition, it is likely that continuance of service on some lines will not make business sense, and investment should be kept to minimum until that time, unless they are to be operated under a Public Service Obligations framework. Capital investments will also be a function of the concessionaire's cash flow from operations, and this adds an element of uncertainty to our projections, which are based on condition and traffic level projections.

The estimates provided in this chapter are preliminary (+/- 25%) and based on only a cursory review of the track supplemented by information provided by the railways, in light of

the budget available for this project[12]. Details of the build up and assumptions behind these indicative cost estimates are provided in Annex F to this document. Our approach is based on the following principles:

- Initial focus (Years 1 to 5) should be on the immediate priorities on the main line network, primarily sleeper renewal on curves, curve rail relay, and bridge assessment and rehabilitation;
- Focus in early years is more based on sleepers in years 1 to 5; shifting to rail in years 6 to 10;
- Focus in years 6 to 10 remains mainly still on the main line network, but will focus more on tangent track[13], as well as an increase in capital spending on potentially viable branch lines;
- Basis for rail relay estimation is 115 lb rail on the core; and will also feature the cascade of used rail from the main lines onto to branch tracks, leading to laying of 80 lb rail on priority branch lines; Estimates are based on a high rate of mechanization of capital work activities. With lower levels of mechanization, lower equipment rents will be, for the most part, offset by higher labour cost and lower productivity. The difference will be insignificant to our estimates given the magnitude of material costs relative to labour costs and equipment rents

The following table presents our estimate of needed capital investment in the next 20 years to best meet base-level traffic forecasts.

Table 7.1: Estimate of Required Investment in Track, Bridges and S&C Infrastructure ($, Millions)

Program	Years			Total (Years 1 - 20)
	1 to 5	6 to 10	11 to 20	
Rail Relay	23	27	21	462
Tie renewal	21	15	15	332
Mechanical Surfacing	1	1	1	21
Turnout Renewal	3	3	4	74
Bridge Assessment & Rehabilitation	5	4	4	79
Formation Stabilization	4	4	3	70
Signals & Communications	4	6	6	116
Total	**62**	**60**	**54**	**1,154**

The estimates for Years 1 to 5, 6 to 10, and 11-20 are annual average requirements for the specified time periods.

In the following table, we provide estimate of required investment in fixed infrastructure by railway to meet projected base case traffic levels.

[12] For example, as the 2004 Master Plan framework produced by the EAC for the abortive investors' conference indicated the cost of a feasibility study is typically $1-2 million while the budget for this Master Plan study is ~$300k.

[13] Defined in the glossary.

Table 7.2: Required Investment in Fixed Infrastructure by Railway ($, Millions)

Railway	Years			Total (Years 1 - 20)
	1 to 5	6 to 10	11 to 20	
RVR – Kenya	13.8	13.6	12.9	266
RVR – Uganda	2.7	2.7	2.5	52
TRL	28.8	28.2	26.8	553
Tazara	16.6	15.7	12.0	282
Total	**62**	**61**	**54**	**1,154**

The estimates for Years 1 to 5, 6 to 10, and 11-20 are annual average requirements for the specified time periods.

The following table provides our estimate of required expenditure on fixed infrastructure as a percentage of base case revenue forecasts.

Table 7.3: Required Investment as a Ratio of Projected Revenue

Railway	Years			20-year Average
	2008	2015	2025	
RVR – Kenya	21%	8%	5%	**10%**
RVR – Uganda	17%	10%	7%	**10%**
TRL	67%	17%	11%	**26%**
Tazara	41%	19%	13%	**23%**
Total	**36%**	**14%**	**9%**	**17%**

The differences in ratios across the four railways are mainly a function of differences in traffic levels, and to a lesser degree current railway condition. Typically, railway capital spending on fixed infrastructure in developed countries is 15 to 25% of revenue. After the initial "capital catch-up" by the concessionaires, the figures are below this benchmark. This is explained by the low costs of labour in East Africa, and the fact that the capital assets will be in a restored condition. The concessionaires will be tasked with the significant challenge of financing needed capital investments early in the life of the concessionaire, well in advance of revenues and profits that will more aptly support them.

7.3 Investments to Meet Future Track Capacity Requirements

As discussed in Section 3.4 of this report, it will be necessary within 20 years to enhance traffic carrying capacity of some trunk lines beyond what can be handled by the existing network with its rudimentary train control system. The date at which the current trunk lines reach capacity is contingent upon not only the growth in traffic but, as well, the timing of investments in higher capacity wagons and locomotives. Options to increase trunk line capacity include installation of a more effective train control system; upgrade of signals & telecommunications systems and infrastructure; track modifications such as double-tracking or extending the lengths of passing loops.

The first step to addressing improving capacity of the railway networks will be investment in more current communication systems and hardware and software to effectively implement an Occupancy Control System (OCS). It is expected that this will be undertaken in the short to medium term in order to meet modest traffic increases while providing a high level of service.

When the capacity of individual lines under OCS is reached, analysis will need to be undertaken to determine whether to invest in a more advanced signalling and telecommunications system or to modify the network to meet the capacity requirements. The former likely offers the lower overall costs in the long-run, especially for significant traffic increases. However, the latter offers the opportunity of a more gradual investment as passing loops are strategically added or extended to meet the capacity requirements as needed. Ultimately, the option of double-tracking portions of the network is available to the railways.

It is recommended that the EAC undertake a study of train control systems on the EAC railways. Focus should be on the condition and capacity of existing systems, as well as a development of a plan to meet future traffic requirements.

7.4 Estimated Link Development Costs

Our estimates of link construction costs are based on an assessment of the terrain the railway will traverse. For each terrain type, we have estimated the unit development cost, as indicated in the following table.

Table 7.4: Unit Development Costs ($ / kilometre) by Type of Terrain

Terrain:	Development Costs ($,'000 per Kilometre)				
	Roadbed	Land Acquisition	Bridges	Track	Total
Flat / Dry	1,250	40	400	310	**2,000**
Flat / Wet	1,750	40	400	310	**2,500**
Hilly	3,000	40	400	310	**3,750**
Mountainous	5,000	40	400	310	**5,750**

The estimated link construction costs may provide guidance on the viability of links or for comparison of links providing similar purpose. However, estimates based on more detailed study are required for bankable investment forecasts.

The following table indicates how we have classified the terrain of each proposed link.

Table 7.5: Terrain Classification for Proposed Links

Link		Kms	Percentage			
			Flat & Dry	Flat & Wet	Hilly	Mountain
1	Kasese – Kisangani	600	55%	5%	30%	10%
2	Gulu – Nimule – Juba (an extension of the proposed ROOLA project)	300	90%		10%	
3	Pakwach – Bunia – Kisangani	900	40%	10%	30%	20%
4	Bihanga – Kabale – Kigali	300	20%		45%	35%
5	Lamu – Garissa – Juba	1600	60%	25%	15%	
6	Garissa – Addis Ababa	1300	60%		30%	10%
7	Liganga – Mchuchuma – Mtwara	800	40%		45%	15%
8	Mchuchuma – Mbamba Bay	200	15%		60%	25%
9	Liganga – Mlimba	250	20%		60%	20%
10	Dar es Salaam – Mtwara	600	50%	5%	45%	
11	Isaka – Kigali, including the branch from Keza to Musongati	700	65%	5%	20%	10%
12	Branch from Isaka-Kigali to Kabanga	100	90%		10%	
13	Branch from Isaka-Kigali to Biharamulo – Bukoba – Masaka	300	5%	15%	65%	15%
14	Tunduma – Sumbawanga – Mpanda – Kigoma	700	15%	40%	35%	10%
15	Uvinza – Bujumbura	300	40%		35%	25%
16	Arusha – Musoma	500	60%	5%	25%	10%
17	Lamu – Kismayu	300	20%		50%	30%
18	Garissa to Nairobi	350	80%	10%	10%	
19	Branch line to Nakuru	425	80%	5%	10%	5%
20	Gulu – Juba (an extension of the existing Uganda North network)	300	90%		10%	
21	Pakwach-Juba-Wau.	900	65%	5%	30%	

The following table presents our indicative estimate of development costs for each link:

Table 7.6: Estimated Link Development Costs

Link		Kms	Unit Costs ($ 000 / KM)	Construction Cost (Million $)
1	Kasese – Kisangani	600	2,925	1,755
2	Gulu – Nimule – Juba (an extension of the proposed ROOLA project)	300	2,175	653
3	Pakwach – Bunia – Kisangani	900	3,325	2,993
4	Bihanga – Kabale – Kigali	300	4,100	1,230
5	Lamu – Garissa – Juba	1600	2,388	3,820
6	Garissa – Addis Ababa	1300	2,900	3,770
7	Liganga – Mchuchuma – Mtwara	800	3,350	2,680
8	Mchuchuma – Mbamba Bay	200	3,988	798
9	Liganga – Mlimba	250	3,800	950
10	Dar es Salaam – Mtwara	600	2,813	1,688
11	Isaka – Kigali, with a branch line from Keza to Musongati	700	2,750	1,925
12	Branch from Isaka-Kigali to Kabanga	100	2,175	218
13	Branch from Isaka-Kigali to Biharamulo – Bukoba – Masaka	300	3,775	1,133
14	Tunduma – Sumbawanga – Mpanda – Kigoma	700	3,188	2,231
15	Uvinza – Bujumbura	300	3,550	1,065
16	Arusha – Musoma	500	2,838	1,419
17	Lamu – Kismayu	300	4,000	1,200
18	Garissa to Nairobi	350	2,225	779
19	Branch line to Nakuru	425	2,388	1,015
20	Gulu – Juba (an extension of the existing Uganda North network)	300	2,175	653
21	Pakwach-Juba-Wau.	900	2,550	2,295

7.5 Rehabilitation and Restoration of Service on Currently Inactive Lines

Most of the former URC network is currently inactive. The 333-kilometer Kampala-Kasese Line offers the potential of once again serving the Ugandan Copper Belt and also being the route to new lines to eastern DRC, Rwanda and even western Tanzania. The 500-kilometer Tororo-Pakwach line offers the potential of accessing the mineral rich region of northern Uganda as well as serving as the route to southern Sudan and eastern DRC.

The focus of this section is to present preliminary cost estimates of the rehabilitation of these lines.

Because of budgetary considerations, we were not able to undertake inspections of these inactive lines. Cost projections included in this report are again indicative (+/- 50%) and should be used only for preliminary analysis. Information on the lines was gleaned from various documents[14] and from our meetings with railway officials in East Africa. We understand that a feasibility study has been or is being commissioned on the Tororo-Pakwach line.

Tororo – Pakwach Line

This 500-kilometer line was built in 1929 to Soroti in 1929 and then extended north to Pakwach in 1964. The line has been closed for over 10 years. The following table provides a summary of condition, as well as our basis for estimating rehabilitation costs.

Table 7.7: Tororo – Pakwach Line Characteristics

Track Component	Existing	Basis for rehabilitation cost estimate
Formation	- Completely overgrown with vegetation - Washed out in a number of locations	- reconstruction of 25% of formation as well as rehabilitation of 10 bridges
Ballast	- Gravel	500 m^3 of ballast per kilometre
Sleepers	- Steel sleepers with wood sleepers on bridges - Many missing sleepers and fasteners	80% replacement
Rail	- Jointed 40lb to 50 lb - Many missing rails	Complete reconstruction with 50% re-use of existing rail

Based on the scenario in the above table, we estimate the costs of rehabilitation of the Tororo-Pakwach line to be about $150,000 per kilometre or $75 million.

It should be noted that the overall estimate is very sensitive to material costs. As an example, (based on the above scenario) approximately 75% of the estimated costs is for the purchase of sleepers and rail. Re-using 80% of both rail and sleepers, would reduce the unit cost to about $60,000 per kilometre and therefore the overall cost would be $30 million.

[14] Mainly Final Due Diligence report for URC produced by CANARAIL in association with VANNESS, Consilium Legis (Pty) and IDC

The above estimate does not include any costs for signalling and telecommunications. Requirements to start would be rudimentary and need to focus mainly on infrastructure for telecommunications.

Kampala to Kasese Line

This 333-kilometer line was built in 1956 and has been out of service for about 10 years. Reportedly, the line was built from predominantly second-hand material and this is quite evident in the condition of the sleepers. The rail is heavier than the Northern Uganda line, and is evidently in better condition. The following table provides a summary of condition, as well as our basis for estimating rehabilitation costs.

Table 7.8: Kampala to Kasese Line Characteristics

Track Component	Existing	Basis for Rehabilitation Cost Estimate
Formation	- Completely overgrown with vegetation - Likely washed out in locations	Reconstruction of 25% of formation as well as rehabilitation of 6 bridges
Ballast	- Packed dirt	750 m^3 of ballast per kilometre
Sleepers	- Steel sleepers with wood sleepers on bridges - Very poor condition - Many missing sleepers and fasteners	100% replacement
Rail	- Jointed 50lb to 80 lb	Complete reconstruction with 75% re-use of existing rail

Based on the above scenario, we are estimating a cost of rehabilitation of approximately $150,000 per kilometre, excluding signalling and telecommunications. As before, this is highly sensitive to the existing material condition and re-use ratios.

The range of costs to rehabilitate these two lines and any other in-active lines is likely between $100,000 and $200,000 per kilometre depending on the condition of the existing track components. However, it could be as low as $50,000 per kilometre if it is found that the majority of track components are intact and re-useable. However, it possible that none of the track components can be re-used and the formation and bridges are in extremely poor condition. Under such a scenario, costs could approach $300,000 per kilometre.

8 Financing the Master Plan

8.1 Introduction – Basic Principles

Without a sound financing plan, the Master Plan will remain an academic exercise. Africa has known a plethora of ambitious schemes, most of which remain "on the drawing board" to this day. No names, no pack drill.

It is therefore important to set out some realistic principles whereby the development strategy articulated in the preceding chapters can be achieved.

Principle #1: *A plan of this magnitude cannot be carried out by either the private sector or the public sector acting alone; it requires a* ***partnership*** *or partnerships between the private and public sectors.*

Principle #2: *The partners have "****comparative advantages****" (or to put it another way, different risk profiles) which will lead us to suggest, later in this chapter, some rules of thumb concerning what should be publicly financed and what should be privately financed.*

Principle #3: *The Member States do not have the resources to provide the necessary financing from general revenues, given their level of indebtedness and the pressing priorities for investment in physical and social infrastructure. There is thus a* ***role for development partners*** *to assist in the financing of elements of the Master Plan.*

Principle #4: Local ownership: *Notwithstanding Principle #3, it is important that the Community and the Member States drive the Master Plan implementation strategy in partnership with the private operators and investors.*

Principle #5: Market-driven: *Ultimately, the shaping of the railway network is too important to leave to the whims of either bureaucrats or profit-seeking investors. Each link must meet the needs of transport users, producing enhanced mobility (passenger services) or improved functioning of logistics chains (freight services).*

Principle #6: *The Master Plan must be part of a broader multi-modal transport and communications strategy – there is no sense wasting resources by duplicating investments that are made in the Road Master Plan. Links to ports, lake transport and bus feeder services must be considered.*

8.2 Who Should Finance What?

Based on these six principles of Master Plan design, we would suggest the following broad outline of the roles and responsibilities of the stakeholders in the financing of the Master Plan.

Table 8.1: Allocation Principles for Financing of Master Plan

Cost Category	Who Should Finance?	Comments/Qualifications
Core (Commercial) Network – Infrastructure, below the rails	Private – ongoing investments Public may support in case of major rehab or when damage is caused by political factors	This principle was broadly applied in EAC's 2004 estimates of required railway investments (e.g. for Uganda and Tanzania). Under concessions, these assets remain under public ownership, private sector enjoys right to use.
Core Network – Infrastructure above the rails	Private Public only if damage is caused by political factors	This includes signalling and telecommunications. Private sector is the main beneficiary of the capacity improvements that these investments make possible and should therefore finance them.
Core Network – Rolling Stock (R/S) and Other Moveable Assets	Private	These are assets that are usually owned by the private sector. Most concession agreements give public sector right of first refusal in case they are disposed of.
Core Network – Operations and Maintenance (O&M)	Private	By definition, revenues of commercial services should exceed O&M costs, leading to profits.
Commercial Passenger Services (e.g. Nairobi-Mombasa first class) – R/S investments and O&M Costs	Private	As service improves, fares can be increased to match those of "land cruise" style services, e.g. South Africa's Blue Train.
Unprofitable branch lines/publicly mandated passenger services - Infrastructure	Mainly public – degree of public investment to be determined by financial/economic analysis	The key question is which level(s) of public sector should pay: EAC, Member States, local beneficiaries of the services.
Branch Lines/ publicly mandated passenger services – O&M	PSO Contracts, magnitude of subsidy to be determined by financial analysis	These are commercial contracts. In principle, economic/social benefits of the services should be demonstrated as offsets or justifications for the subsidies.
New Lines - Infrastructure	BOTs – partial capital subsidy may be required in some cases	Decide the modalities on a case by case basis following detailed feasibility studies with clear economic justifications.
New Lines – O&M	New Lines should not be built unless they can be operated and maintained by private sector without recurrent subsidy	This principle can be "bent", but should not be "broken".
Urban Commuter Lines – New and Existing	BOTs – capital subsidy and PSO for part of O&M costs	In principle, economic/social benefits of the services should be demonstrated as offsets or justifications for the subsidies. This is not difficult to do – the economic rate of returns should generally be quite high for major cities such as Nairobi and to a lesser extent Dar-es-Salaam and Kampala. Kigali and Bujumbura may not pass the test, but this cannot be prejudged.

8.3 Implementation of the Principles

Applying the above principles to the East African Railways Master Plan, the indicative levels of financing to be arranged by the public and private sectors would be as follows:

Table 8.2: Indicative Level of Financing Requirements by Sector – 20-year Horizon ($, millions)

	Public Sector	Private Sector	Total
Existing Network Rehabilitation	**300**	900	1,200
Link Development	**26,300**	8,000	34,300
Total	**26,600**	**8,900**	**35,500**

* Indicative allocation, rounded at US$ '00 million.

Given the magnitude of the investment requirements, careful packaging and sequencing will be required – otherwise the risk is that Member States, private investors and potential development partners may be intimidated by the magnitude of the task ahead. In Chapter 7, we suggested a sequencing strategy based on attending to emergency rehabilitation requirements in the short-term, then adding capacity and extending the network in the medium- to long-term. Each stakeholder is likely to have their own sense of the order of priorities, so what is presented here is merely one of an almost unlimited number of possible future development scenarios. As indicated below, it is best to test it with the potential stakeholders rather than attempting to "cast it in stone" first.

Table 8.3: Possible Allocation of Public Investment Requirements – 20-year Horizon ($, millions)

	Short Term (Yr 1-5)	Medium Term (Yr 6-10)	Long Term (Yr 11-20)	Total
Total Investment Requirements*				
Existing Network Rehabilitation	100	100	100	300
Link Development	1,700	18,800	5,800	26,300
Total	**1,800**	**18,900**	**5,900**	**26,600**
Annual Investment Requirements**				
Existing Network Rehabilitation	20	20	10	-
Link Development	340	3,760	580	-
Total	**360**	**3,780**	**590**	**-**

* Total requirements for the specified time period.
** Average requirements per year.

8.4 Next Steps

Before the above approach can be presented to stakeholders, it is essential that a degree of consensus be achieved on the Task Force concerning: the validity of the principles presented above; their implications for the respective roles of public and private sectors; the respective roles of the EAC, the Member States and local government. We respectfully suggest that in terms of the magnitude of investments to be financed and the respective shares of public and private sectors, the most useful thing to do would be to present the indicative results and their justification to the target stakeholders in one or more workshops. Based on the

feedback that is received, the Master Plan, which after all is a "living document", can be fine-tuned.

In the following chapter we present our conclusions and recommendations.

9 Conclusions and Recommendations

This chapter summarizes the main conclusions and recommendations of this Final Report.

9.1 Traffic Study

9.1.1 Conclusions

We developed traffic forecasts for both domestic markets and transit corridors or the four railway networks of the region. They were developed on the basis of future projections of GDP and on an analysis of the strengths and weaknesses of the railways relative to truck competition, with respect to: distance (circuity); service levels (e.g. wagon availability and transit times, both averages and variability of performance); truck axle load limits in comparison with railway wagon axle loads; and freight rates. In addition to traffic expected through normal economic growth, we estimated additional sources of traffic arising from new mining development, recapture of container and POL from trucks, increased cement production, etc.

We developed tonnage, net ton-kilometre and revenue forecasts under Base Case, Low Case and High Case scenarios, utilizing different GDP forecast scenarios and assumptions concerning the elasticity of demand for rail traffic relative to GDP. The results of the tonnage forecasts are presented in **Table 9.1**.

Table 9.1: Tonnage Forecasts by Railway Systems (Tonnes, '000)

Rail System	Scenario	2008	2010	2015	2020	2025	2030
KRC	**HIGH**	2,047	3,767	5,201	6,350	7,646	9,194
	BASE	2,021	3,388	4,503	5,372	6,344	7,509
	LOW	1,994	3,009	3,795	4,430	5,141	6,005
URC	**HIGH**	719	1,395	1,909	2,345	2,836	3,424
	BASE	710	1,210	1,602	1,932	2,301	2,743
	LOW	700	1,038	1,308	1,549	1,819	2,147
TRL	**HIGH**	850	1,863	3,456	3,985	4,582	5,296
	BASE	842	1,601	2,799	3,205	3,659	4,203
	LOW	835	1,356	2,152	2,453	2,790	3,200
TAZARA	**HIGH**	594	719	1,096	1,522	1,980	2,527
	BASE	589	699	1,018	1,368	1,738	2,166
	LOW	583	680	945	1,229	1,524	1,855

We concluded that traffic had the potential to grow, under the Base Case, by a factor of 3:1 to 5:1, depending on the network, between now and 2030.

9.1.2 Recommendations

Detailed feasibility studies are required for the proposed extensions to the railway network to estimate their traffic potential.

9.2 Technical Study

9.2.1 Conclusions and Recommendations

The main objective of the technical study was to review the railways' current capacity and establish the gap between this capacity and the infrastructure and service levels required to meet the projected demand. A second objective was to provide technical advice on: the advisability of converting the existing track to either cape gauge (as suggested by the UAR) or standard gauge; the appropriate gauge for future extensions of the network; the appropriateness of conversion of the main lines from diesel to electric traction.

Capacity findings: The main findings were that significant improvements in capacity of the existing networks could be achieved through improvements in train velocity. Hence, the single biggest focus of the railways in coming years should be removal and avoidance of temporary speed restrictions and other reasonable measures to economically maximize speeds. A secondary focus will eventually need to be put in place to increase traffic capacity by installing a more effective train control system, upgrading signals and telecommunications systems and/or extending passing loops. Investments in equipment with AAR couplers and higher carrying capacity will also eventually be required for the railways to accommodate the projected demand.

Gauge Conversion findings: Conversion of the East African railways to a common gauge would lead to benefits in terms of connectivity, higher traffic carrying capacity, better availability and lower capex costs of equipment, as well as potential for some operating cost savings. However, the required capital costs are high ($3-23 billion for the main lines and $4-29 billion for the current active network if converted to standard gauge[15]).

Gauge of Network Extensions: we recommend that new rail links should be developed consistent with the gauge of the network to which they will connect (in order to avoid the necessity for transhipment). In the event that they will not connect to an existing network, consideration should be given to standard gauge. Further, we recommend that new lines be built with a substructure that can accommodate future conversion to standard gauge[16].

Conversion to electric traction: Electric traction is used extensively on higher density railways particularly in Europe and Japan. It would lead to reductions in energy costs and emissions. However, it would require: investment and maintenance costs for the transmission and distribution of electricity; investment in electric-powered locomotives; the cost of modifications to track and signal systems. The railways would also be vulnerable to possible low reliability/availability of local electric generation and distribution systems. Conversion to electric traction is therefore not recommended for the foreseeable future.

[15] If only the main lines were converted, there would be a loss of connectivity with the branch lines (need for transshipments), leading to the probable loss of all the branch line traffic to truck competition.
[16] This would apply to the width of the formation as well as clearances on bridges and tunnels and with adjacent tracks, as well as placement of right-of-way fixtures, such as signals, switches and structures.

9.3 Legal/Institutional Study

9.3.1 Conclusions

We reviewed the historical and current integration in the railway sector, in terms of conventions, treaties, sub-regional initiatives and partnerships. We concluded that there is serious overlapping of membership and functions.

We are of the view that the Treaty for the establishment of the East African Community provides a sufficient legal basis for cooperation in the railway sector. The focus should be on creating detailed guidelines and steps for implementing treaty provisions.

9.3.2 Recommendations

Our recommendations for the legal/regulatory/institutional framework for the implementation of the Master Plan are as follows:

(i) **Adopt uniform approach to international bodies:** in order to streamline the legal framework, the role of continental based institutions should be perceived by EAC to be limited to that of co-ordinating regional economic communities' policies. The EAC itself should facilitate regional policy harmonization, observe corridor and national implementation, disseminate best practices and monitor corridor committees. The corridor committees for Northern Corridor, Central Corridor and Southern Corridor should anchor for public-private partnership across two or more countries focussing on elimination of constraints, marketing investment opportunity and improving transit efficiency and monitoring of national implementation. The national governments should develop and implement national policies and enabling frameworks.

(ii) **Adopt comprehensive guidelines for common transport policy:** this should cover all modes. The imbalance in the development of individual modes of transport is one of the biggest challenges in achieving common transport policy. Sustainability must be the hallmark of the EAC transport policy.

(iii) **Increase financial efficiency in railways sub-sector:** For the railways to flourish, clear financial objectives and a proper division of responsibilities between the Member States and railways companies are essential. The railways must have a financial structure that allows effective, independent management. Railways companies should be run on a commercial basis in accordance with the principles which apply to commercial companies.

(iv) **Introduce market forces in railways sub-sector:** The guidelines should oblige the Member States to progressively open up the rail freight market and, in the long term, international passenger transport service market. The guidelines should aim at opening the market for the whole railway sector, including the railway supply industry and rail freight customers such as rail freight forwarders, logistics integrators and shippers, as per Article 97 (3) of the EAC Treaty.

(v) **Take measures to integrate technical standards of national rail systems:** According to Article 91(2)(k) of the EAC treaty, one of the necessary measures that need to be taken towards common policy in railway sub-sector is to 'agree on common policies for the manufacture of railway transport equipment and railway

facilities' and 'establish common standards for the construction and maintenance of railway facilities'. The work of the ARU provides a good basis for technical harmonization, particularly with regard to adoption of the AAR coupler, common maintenance standards for wagons and coaches, the replacement of vacuum brakes with compressed air brakes and common standards for platforms of new lines, maintenance of railway lines and ballast characteristics.

(vi) **Introduce EAC railways licensing system:** to realize integration in railway sector, a long run objective should be free circulation of railways services and that undertakings be treated fairly and without discrimination. The guidelines should therefore provide the criteria applicable to the issue, renewal or amendment of operating licences by Member States to railway undertakings which intends to operate in the EAC. Railway undertakings whose activities are limited exclusively within the boundaries of Member States can be excluded from the scope of the guideline.

(vii) **Ratify important international conventions and instruments:** In particular, for the purpose of having benefit of sharing knowledge with other countries and be able to set standards in an easy way, the Consultant recommends that EAC may seek to accede to the Bern Convention on International Railway Transport, 1980. EAC may (i) enter reservations on areas where competence lies with the EAC; (ii) declare that the uniform rules on the validation of technical standards and the approval of railway equipment used in international transport will not apply where these areas are already covered by EAC legislation; and (iii) enter reservation on the right not to apply certain provisions of the Convention.

(viii) **Create Railways Unit at EAC:** The creation of an integrated rail area entails putting in place monitored common technical regulations. Given the difficulties encountered by Member States in the past, it may be necessary to create a Railways Unit at EAC level. The main objective of the Unit will be to provide the Secretariat and the Member States with technical assistance in order to enhance the level of integration of the EAC rail system.

The Unit will also coordinate the groups of technical experts responsible for finding common solutions on railway safety and will send the draft decisions to the Secretariat, which will approve them once they have been endorsed by the committees of representatives of Member States. The Unit will also facilitate communication between the various competent national authorities.

(ix) **Give special role to East African Legislative Assembly:** The East African Legislative Assembly should be given special role in overseeing development of common transport policy.

(x) **Strengthen the role of corridor committees:** At the beginning, corridor committees may start with exploring PPP options in the following areas:

- Construction of Freight Corridors
- Construction of Logistics parks and warehouses
- Construction of cargo handling at terminals
- Linking railways to ports
- Modernization and upgrading of passenger terminals
- Hospitality and catering

- Commercial Utilization of surplus land where private sector can invest in public utilities like food plazas, cyber café, rest rooms.

(xi) Adopt comprehensive guidelines for railways sub-sector to cover:

a. **safety,** including common safety rules, regulations and requirements with regard to signs, signals, rolling stock, motive power and related equipment and the transport of dangerous substances to gradually replace national standards which differ and therefore act as a barrier to community wide integration.
b. **infrastructure financing,** in the form of a railway investment fund to finance community level infrastructure projects
c. **community level certification of train crews,** to facilitate through working of trains within the Community
d. **passenger rights:** In order to make the railways more attractive, the passengers' rights need to be better protected - particularly with regard to reimbursement for train delays. The guidelines may require the railway undertakings to provide passengers with specified information prior to, during and following the journey.
e. **compensation in case of non-compliance with contractual requirements for rail freight services** consisting of compensation scheme should therefore be established to cover losses and damage to transported goods, delays in delivery and cancellations as well as breaches of any other quality requirements laid down in the transport contract.
f. **provision of common rail statistics** to ensure the monitoring and development of the common transport policy and the preparation of measures in the field of transport safety.

9.4 Environmental Study

9.4.1 Conclusions and Recommendations

We reviewed the current environmental requirements in each of the Member States and compared the EIA requirements. In general these are quite similar, with differences mostly related to fee and time scheduling for the EIA process.

We also carried out a top-level summary of the environmental issues associated with the proposed extensions to the railway network. We raised "red flags" about the following links: Kasese-Kisangani (war zone, Ruwenzori NP); Pakwach-Bunla-Kisangani (war zone); Liganga-Mchuchuma-Mtwara (Selous Game Reserve); Mchuchuma-Mbamba Bay; Dar-es-Salaam-Mtwara (Great Rovuma Wilderness).

It is possible that in certain cases it may be possible to reduce the environmental impact of proposed routes by utilizing a common corridor for road and rail links. To resolve this issue will require detailed alignment studies that are far beyond the scope of the present study.

9.5 Economic Study

9.5.1 Conclusions

Our assessment of the economic impact of the proposed lines connecting Rwanda and Burundi to the EAC railway network indicated that there would be significant positive impacts during both the construction and operation phases.

In general, the impacts of these investments will include:

- Savings in transport costs relative to the no-project case;
- Stimulation of economic development, including the possibility of exploiting substantial mineral deposits, which are currently not economically viable because of the high costs of transport;
- Job creation, particularly during the construction phase;
- Improved reliability of the transport networks serving the landlocked countries.

In addition, there will be some negative impacts that must be managed and mitigated, notably the danger of the spread of HIV/AIDS.

9.5.2 Recommendations

Economic impact assessments should be carried out for the remaining links in the Master Plan.

9.6 Indicative Costs and Sequencing of the Master Plan

9.6.1 Conclusions

The indicative costs of the implementation of the Railway Master Plan, which includes the development of the proposed lines, are $35.5 billion, of which roughly 75% would have to be funded by the public sector. The public investments:

- Short-term costs (first five years): $1.8 billion;
- Medium-term costs (years 6-10): up to $18.9 billion;
- Long-term costs: (beyond year 10): approximately $5.9 billion.

These are very approximate at this stage of the Master Plan and are contingent upon the detailed feasibility studies to be done for each possible link as a follow on to this study.

9.6.2 Recommendations

We recommend:

(a) That the Task Force accept the proposed prioritization of the investments developed in this Report;
(b) That development partners be approached with the objective of seeking financing for the implementation of the Master Plan;
(c) That additional feasibility studies be conducted to refine the indicative costs developed above, particularly for the short-term and medium-term investments.