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Nacala Corridor Assessment: Strategy-Based Transport Logistics and Supply Chain Efficiency

Final Report

30 April 2010

Acronyms and Abbreviations

ACID	African Country Infrastructure Diagnostic
AfDB	African Development Bank
ANE	Administração Nacional de Estradas
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditures
CDN	Corridor de Developmento do Norte
CFM	Portoes e Caminhos de Ferro de Mozambique, E.P.
CFS	Container Freight Stations
CPI	Investment Promotion Center
COMESA	Common Market for East and Southern Africa
CTA	Confederacion das Associacoes Econimicas do Mozambique
EDI	Electronic Data Interchange
FAN	Forest Association of Niassa
FEU	Forty Foot Equivalent Unit
GAZEDA	Nacala Special Economic Zone
GOM	Government of Mozambique
GDP	Gross Domestic Product
HSH	High-sided Hoppers (wagon)
ICD	Inland Container Depots
ICT	Information and Communications Technology
Kms	Kilometers
Kph	Kilometers per hour

LFC	Less than Full Container
LSH	Low-sided Hoppers (wagon)
MOF	Ministry of Finance
MOPD	Ministry of Planning and Development
MOTC	Ministry of Transport and Communication
MRA	Mozambique Revenue Authority
NEPAD	New Partnership for African Development
OPEX	Operating Expenditures
PMAESA	Port Management Association of East and Southern Africa
POL	Petroleum, Oil and Lubricants
PPP	Public Private Partnership
SARA	Southern Africa Railway Association
SATCC	Southern Transport and Communications Commission
SSATP	Sub-Saharan African Transport Program
THC	Terminal Handling Charges
TEU	Twenty Foot Equivalent Unit
TKMS	Tonne Kilometers
TTF	Trade and Transport Facilitation
USAID	U.S. Agency for International Development
USD	United States Dollar
VOC	Vehicle Operating Costs

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Executive Summary

Background and Objectives

This report assesses the transport logistics and supply chain efficiency of the Nacala Corridor. The assessment came about following a request by the Provincial Governor of Nampula Province to the USAID-funded AgriFUTURO competitiveness project. The purpose and objective of the assessment are to: (1) implement studies and develop enabling environment action plans based on the findings; and (2) propose a plan for increasing investment to improve efficiencies. The scope of the assessment involves transport logistic and supply chain efficiency and encompasses: the enabling environment; corridor infrastructure; the transport industry; and the corridor users or stakeholders. Of particular interests to the Provincial Governor in initiating the assessment request were to use the results as a planning tool to assist in developing the strategic plan for Nampula Province and the broader northern Mozambique region. The results will also to be used to inform a broader assessment of the agribusiness competitive strategy.

Although the Nacala Corridor extends from the Nacala Port on the India Ocean and well into the Malawi, the geographical delimits of this study only encompasses the breath and length of corridor that is contained within Mozambique. The Nacala Corridor cuts through Nampula and Niassa Provinces in east-west direction of approximately 800 kilometers. Only about 80 percent of the corridor's road and railway network, infrastructure asset base, and transport services, etc. is included in this assessment. Additionally, because of the special interest, this assessment focuses on primarily on containerized cargo originating in Nampula and Niassa Provinces to the Nacala Port, and not on bulk cargo such as coal shipments from Tete Province, or transshipments from Malawi and Zambia.

Key Findings

The inter-relationship between the enabling environment, i.e., road, rail and port transport infrastructure; transport industry services, and the level of services available to corridor users have all combined to have an adverse impact on transport logistics services in the Nacala Corridor. Presented below are the main findings of this assessment that amplify this point.

Enabling Environment

The enabling environment plays an important role in corridor development especially regarding the institutional and governance arrangements; the legal and regulatory framework, and indeed, public policy itself. These areas were the main focus of the enabling environment assessment. The key findings relating to the enabling environment, which are presented below addresses four important areas: corridor strategy, institutional structure, and regulatory framework and trade facilitation.

- ***Lack of a corridor development strategy:*** Ample opportunities are available at the national level through bilateral cooperation and coordination with regional institutions to address broad policy issues affecting the development of the Nacala Corridor. Similarly, at the provincial level, regular meetings of the Provincial Governors offer the same opportunity. However, it appears that no single Mozambique government agency or institution either at the national or provincial level has the primary responsibility for strategy development and strategy execution for the Nacala Corridor.

- ***Lack of an institutional structure:*** In addition to the lack a strategy for corridor development, another compelling issue is the lack of a clear institutional structure with the mandate to lead, manage and develop the Nacala Corridor as a leading logistics corridor. And for this reason, the corridor has not benefited as it might otherwise have, despite its national and regional importance. Nor has the Corridor develop its infrastructure assets to take full advantage of the strategic location of its port, its railway network and road system linkages that extends for more than a 1,000 kilometers.

- ***Lack of a regulatory structure:*** The current institutional structure whereby, CFM as an agent of the Government of Mozambique and partner to CDN in the Nacala Port and CDN North Railway concessions is unlikely to be sustainable in the long run. This is because it places CFM in an inevitable conflict of interest situation. Potential conflicts arise because CFM provides regulatory oversight to of CDN's concessions while at same time participating in business operations and policy decisions as a partner. However, a more compelling issue is what is the appropriate institutional structure to regulate concessions, whereby the ports and railways exert monopoly power in rate setting, service levels, etc. The absence of an independent regulator for ports and railways leave service too many decision in the hand of the concessionaires and does not provide Corridor users with a forum to lodge formal complaints or adjudicate dispute that might arise between the users and the port or rail operators on matters such as terminal handling charges, rail freight tariffs and service levels.

- ***Trade facilitation:*** A robust enabling environment can enhance logistics in the Nacala Corridor through improved trade facilitation. Customs documentation and

inspecting export and import cargo are a major component of the logistics chain. This process can and often does contribute to considerable delays and costs in the movement of goods at the Nacala Port. Users are expressing increasing consternation with long container dwell times, and the prospects for added costs of weighing and scanning containers. Little or no communications between the corridor users and Mozambique Revenue Authority (MRA) have been initiated to discuss the procedures of scanning and weighing containers or the justification for stetting the charges at certain rates.

Road Sector

The main constraint to transport logistics in the road sector is the poor condition of the road network, particularly the secondary and tertiary roads. Almost 35 percent of the road network is in poor condition—further compounded by the fact that major sections of the road network are practically impassable during the rainy season. The impact of these logistics constraints is inefficiencies that arise from higher vehicle operating costs (VOC) for road freight operators, especially during the rainy season. Such costs are reflected in higher transport costs to producers and consumers.

- ***Poor road surface condition:*** The classified road network in Nacala Corridor is generally not in the condition necessary to facilitate export or import trade. Poor condition of the road network in effect imposes a tax on trade. Less than a third of the total classified roads are in good condition, and the situation gets progressively work when considering the secondary and tertiary road network. The results are poor operating conditions for vehicles, regular breakdowns of vehicles, high cost for vehicle repair, and inadequate road safety.

- ***High transport costs:*** The Nacala Corridor road network by all reasonable measures are unsatisfactory, and is major constraints to transport logistics. Poor quality roads result in inefficiencies from slower speeds, and thus, longer travel times, which further increases costs to road freight operators. Road freight companies have indicated that due to the poor condition of the roads, which limits their market penetration, they often charge three to four times their normal transport rates, which are passed on to producers and consumers in terms of final demand.

Railway Sector

Railway freight logistics are constrained by a myriad of interrelated problems, among which are: the physical condition of the track; the lack of rolling stock and equipment; and sub-optimal train operations. These constraints result in a downward spiral of low traffic volumes caused traffic diversion, as in the case of Malawi's transit traffic of due to low

service level, lack of service, low speeds, long transit times, low productivity, poor locomotive and wagon availability and utilization. The net effect is a change in modal share from rail to road, and in turn low operating and financial performance for the railway in the Nacala Corridor.

- ***Physical infrastructure:*** Key sections of the Nacala railway's track (e.g. Cuamba-Lichinga some 267 kms and the Cuamba-Entre Lagos section some 77 kms) are in poor condition, which adversely affect rail freight logistics. Poor track conditions have reduced train speeds to an average of less than 25 kilometers per hour, whereas when the track is in good condition trains can achieve the maximum average design speed of 6o kilometers per hour. These two sections alone account for 31 percent of CDN's entire railway network in Mozambique, and require extensive rehabilitation. This has had a direct impact o the railway's ability to provide efficient railway freight services.

- ***Lack of rolling stock and equipment***: The lack of rolling stock and equipment such as mainline diesel-electric locomotives for traction and high sided wagons and flatcars also the constrains CDN's ability to meet rail freight demand. Insufficient equipment to align with current and projected commodity volumes results in less freight being transported. CDN's current inventory of rolling stock and equipment are not adequate to sustain a viable railway operation and meet the projected demand.

- ***Sub-optimal train operations:*** Both its infrastructure and rolling stock and equipment directly impact how CDN makes-up and operates trains. The condition of the track, the number of passing loops and stations affect train speeds. They also affect the ability of trains to pass through sections of track. CDN's offers a dedicated rail container service that consists of double heading locomotives and a trailing load of 1,000 tons loaded on 25 wagons/flatcars. A more efficient train operation, assuming the existing physical constraints and the availability of locomotive traction power, would be using double-stacked containers on flatcars, thus effectively doubles the trailing load.

- ***Limited line capacity:*** Another constraints to railway efficiency are line capacity. Line capacity is affected by design limitations such as track configuration. CDN's railway line capacity needs to be significantly improved given the forecast demand for rail freight, i.e. coal, forest products and transit traffic consisting of wheat from Malawi and copper from Zambia, as well as imports of fertilizers and POL products and fertilizers. CDN will easily exceed its theoretical line capacity of an estimated

9 million tons by year 2020. This suggests that an additional track might be needed after 2020 to address the increased freight volumes.

Nacala Port

The Port of Nacala needs to address a number of interrelated challenges to improve its performance and meet the projected port demand. Among these are the high costs of terminal handling chargers; low productivity of container operations; lack of port equipment; and long container dwell times.

- ***High Terminal Handling Charges:*** Nacala Port's terminal handling charges are high relative to other regions such as Asia, Europe and North America but are in line with other ports in sub-Saharan Africa. What will drive container costs higher is not the component cost for storage, wharfage, container movements, etc. but rather ancillary charges imposed by Customs such as weighing and eventually scanning containers. When combined with operational inefficiencies such as container dwell times and extended storage time, port productivity is reduced and logistics costs are increased. And although terminal handling charges at Nacala Port are high relative to other regions, we found no evidence that terminal handling charges at Nacala Port had an impact on transport logistics in terms of diverting cargo to other ports in the region.

- ***Lack of port equipment and use of ship's gear:*** Lack of port equipment and use of ship's gear is one of leading factors driving low port productivity at Nacala Port. Although CDN recently purchased some equipment to assist with container movements, having only one shore crane, which is not operational for long periods of time during the year is one of the main cause of the port's low productivity. Nacala Port has to rely on the ship's gear to load and off load containers, and while this might be a short-term solution, it is not adequate to address the operational requirements of a modern port.

- ***Low productivity of container operations:*** Container moves per hour are a key performance indicator of the efficiency of a container terminal's operations. The higher the number of moves the better the performance. The average number of container movers per hour of twenty ports in sub-Saharan Africa is about 12 containers mover per hour. The "best-in-class" ports performed as a rate of 20 moves per hour, which are comparable to Western Europe, Asia and North American ports produce at the low end of the range of 20 to 25 moves per hours. By comparison, the Nacala Port averages 6 container movers per hour, which is 50

percent below the average moves per hour of the 20 ports in the World Bank's survey.

- ***Long container dwell times:*** Containers dwell time defined as number of days a container remains in the terminal is an important indicator of a port's performance because it is directly related to throughput and productivity. Long dwell times as experienced Nacala Port users reduce port productivity and throughput. Nacala Port customers indicated that excessive container dwell times were one of the major problems they experienced in using the port. Several users indicated that they experienced dwell times in excess of 30 days for their cargo.

- ***Container terminal capacity utilization:*** The container terminal capacity at the Nacala Port is 100,000 TEU. For the past four years the capacity utilization averaged 40.2 percent, peaking at around 53 percent in 2009. Within the next five years, the surplus container terminal capacity will be exceeded given the growth of container traffic of about 12 percent per year. The practical implications of container terminal demand exceeding terminal capacity are port congestion and higher costs. If the port capacity issue is not recognized and addressed with added capacity, port congestion and higher cost will become even more acute in future years.

Corridor Users

The efficiency of transport logistics in the Nacala Corridor require users also to play a role in helping to address the many challenges the corridor faces to leverage both their influence and skills. Users of the Nacala Corridor, which includes freight forwarders, clearing and shipping agents, major shippers, etc., have not been sufficiently organized as a stakeholder group to leverage their inherent power to address logistics constraints in the corridors. With few exceptions, corridor users have often adopted a *"go it alone approach"*, whereby issues of mutual interests e.g., port inefficiencies, terminal handling charges, scanning and containers fees, unreliable rail services or high road freight rates, etc. have not been generally addressed as a group with common interest.

- ***Trade Facilitation:*** Although, long delays have occurred due to inspections of cargo and processing of Customs documentation, corridor users have not taken advantage of their own strengths to address the many of logistic problems they face. In effect this lack of organization has resulted in users having to deal with: (i) a fragmented transport logistics and supply chain/structure, where each user is on his or her own; and (ii) a fragmented supply chain with no single point of accountability for coordination.

- ***Lack of inland container despots:*** To remove some of the capacity and operational constraints the Nacala Port faces, Inland Container Depots (ICDs) or Container Freight Stations (CFS) linked to the railway network could be developed. Corridors users could benefit from such logistics facilities in terms of transshipment, consolidating freight, loading and unloading cargo, stuffing containers, Customs inspections, repositioning of empty containers, etc., yet little or no effort has made to develop adequate terminal facilities such as ICD or CFS.

- ***Lack of a logistics information management system:*** Users of the Nacala Corridor do not a an effective system to managing the logistics information flow across the entire supply (e.g. such as tracking cargo through the entire supply chain, preparing customs documentation, paying ocean freight rates, completing bills of laden, scheduling shipments, planning containing terminal works in advance or before a train or a truck enters the port's etc. Public and private uses of transport logistics and related cargo information lack an integrated logistic information management system that could assist in better manage their logistics requirement.

Key Recommendations

Notwithstanding the above identified transport logistics constraints and taking into account planned efforts and those already, we note that the Government of Mozambique acting through the Ministry of Transport and Communications along with ANE and CFM are investing in improving the degraded road, rail, and port infrastructure and equipment. Given the above proposed below are several recommendations that address these constraints. The recommendations are more fully elaborated on in the main report, as well as the estimated cost of implementation.

Infrastructure

Recommend the ***Development of 2 to 3 Inland Container Terminals*** as PPPs to improve port throughput and port inefficiency by additional container capacity to address port congestion.

Recommend the ***Development of a Rail Container Service*** as a PPP to address the projected traffic demand on the Lichinga-Nacala rail section and to introduce rail service competition.

Recommend a ***Container Terminal Study*** that is a comprehensive study of the market demand, port access and operational performance, and port costs in order to make recommendations on a port strategy, development and expansion plan, port operational and performance improvements, capital investments for technology and equipment as to how best to address the terminal capacity and operational requirements for container freight demand.

Enabling Environment Recommendations

Recommend that GOM/ MOTC adopt a policy on ***Railway Trackage Rights*** to open up rail access to dedicated industry operated rail services, introduce market competition and address customers' freight demand requirements and service levels.

Recommend that GOM/MOTC establish a ***Surface Transport Regulator,*** especially with respect to economic regulations of the port and railway sectors, whereby concessions as monopoly enterprises exert undue market influence as to port handling charges, rail tariffs, etc.

Recommend an ***Institutional Development Study*** to determine the objective, strategy, institutional structures, functions, span of responsibilities, and resource requirements, including staffing needs and financing to establish a: (i) surface transport regulator for all ports, railways, and road freight services; (ii) Nacala Corridor Logistics Group of stakeholders and (iii) a Corridor Development Authority.

Recommend that Mozambique Customs Administration organize a ***Stakeholder Workshop***, in collaboration with the scanning operator Kudumba, Investments Lda of major shippers, producers, clearing and forwarding agents, etc. to communicate the policy and procedures regarding container inspections, the risk assessment, scanning and weighing containers at the Nacala Port.

Transport Industry

Recommend the creation of a ***Heavy Vehicle Weight Management Program*** to inspect trucks and to address vehicle overloading as demand for road freight service increases for both transit and domestic traffic.

Recommend a ***Train Operations Improvement Study*** to assess and make recommendations on how best CDN's might optimize the railways train operations in lieu of: (1) line capacity

constraints, (2) export commodity mix and volume; (3) rolling stock and equipment requirements; (4) track rehabilitation, and (5) the potential for track access by other rail operators.

Recommend a ***Container Terminal Study*** that includes a comprehensive study of the market demand, port access and operational performance, and port costs in order to make recommendations on a port strategy, port development and expansion plan, port operational and performance improvements, port equipment requirements, amount capital investments for technology and equipment, management and staff training, to meet the future container freight demand.

Corridor Users

Recommend the creation of a ***Nacala Corridor Logistics Group*** as a forum for public and private stakeholders to promote and coordinate issues around users charges, corridor logistics, operational efficiency and policy developments—modeled on the Maputo Corridor Logistics Initiative.

Recommend a ***Corridor Logistics Center Technical and Financial Viability Study*** to analyze the viability of a logistics centers as a PPP for public and private users of the Nacala Corridor aimed at streamlining processing time and procedures and improved operational efficiencies for logistics and transport services providers.

Recommend establishment of an ***Integrated Corridor Logistics Center*** as a PPP for public and private users of the Nacala Corridor aimed at better logistics coordination, streamlining trade facilitation processing time and procedures and improved operational efficiencies for logistics and transport services providers.

1.0 Background and Introduction

Background

Introduction

The Nacala Corridor assessment came about following a request from the Office of the Provincial Government of Nampula Province to the AgriFUTURO project 's management. The intention was to use the assessment results as a planning tool and inputs for developing a Strategic Plan for the Nampula Province, as well as for the broader northern Mozambique region. The AgriFUTURO program mandate is to increase Mozambique's private sector competitiveness by strengthening targeted agriculture value chains. This scope of this assessment contributes to the AgriFUTURO program by assessing the transport demand and the supply and operational characteristics of the corridor's transport logistics and supply chain with a view towards proposing recommendations to improving corridor efficiency.

Purpose and Objective of the Assessment

The main tasks of this assessment were to analyze the constraints to the efficient functioning of the Nacala Corridor, including coordination of infrastructure capacity, policy and regulatory issues, better management of existing road, rail and port infrastructure, logistics services, as well as assess the broader considerations for future investments. The specific objectives of the assessment as set forth by the AgriFUTRO program are to:

1. Implement studies and develop enabling environment action plans based on the finding, and
2. Propose a plan for increasing investment to improve efficiencies.

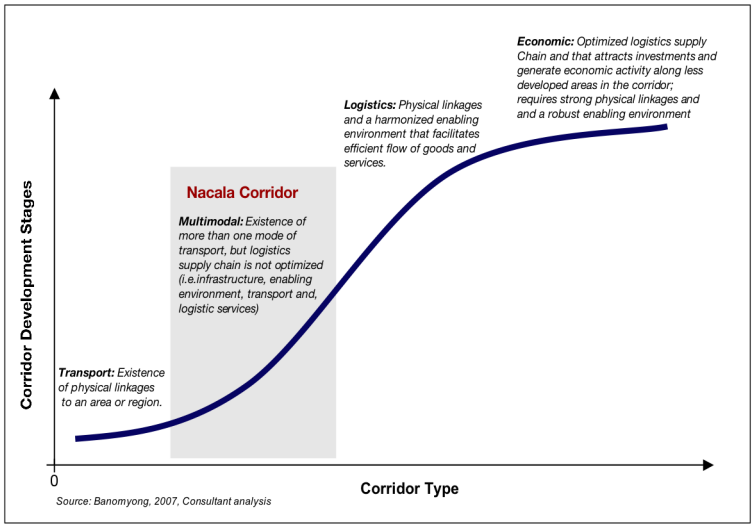
The above two objectives were addressed using a systematic process of collecting and analyzing field data based on interviews with key public and private stakeholders with an interest in the efficiency of the Nacala Corridor. Presented below is the methodology utilize to conduct the assessment.

Methodology and Approach

Assessment Hypothesis

The assessment was conducted on the general hypothesis that the Nacala Corridor can be located along an S-curve shaped expansion path that encompasses the four stages of corridor development, namely a transport corridor, a multimodal corridor, a logistics corridor and an economic corridor. Each corridor development stage has distinguishing operational and efficiency characteristics. Our hypothesis is that the Nacala Corridor is functionally a multimodal corridor due primarily to the prevalence of road freight services, railway services and a port system but the Nacala Corridor lacks the coordination and efficiency to be a logistics corridor as illustrated in Exhibit 1-1. This assessment examines the infrastructure supply characteristics, the freight demand; operational and performance characteristics of the corridor to assess the constraints inhibiting the functioning of the Nacala Corridor as a logistics corridor as illustrated in Exhibit 1-1. To address the hypotheses the focus of this assessment were on four key dimensions of the transport logistic supply chain: (1) infrastructure; (2) the enabling environment; (3) the transport industry and (4) logistics services providers and major shippers such as commercial agricultural producers, consolidators and the extractive industries. Outlined below are our data collection methodology, analytical framework, and the scope of the interviews conducted.

Exhibit 1-1: Stages of Corridor Development



Source: Banomyong, 2007, Consultant analysis

Data Collection Methodology

The data collection methodology involved: (i) a desk review of published data, reports and technical studies and (ii) direct interviews conducted with public and private stakeholders. Field studies involving stakeholders' direct in-person interviews, telephonic interviews and data collection were conducted in Mozambique from February 1st to 28th, 2010. Almost 40 interviews of public sector officials, commercial agricultural estates owners, shipping and clearing agents, freight forwarders, and transport service operators.

Analytical Framework and Key Variables

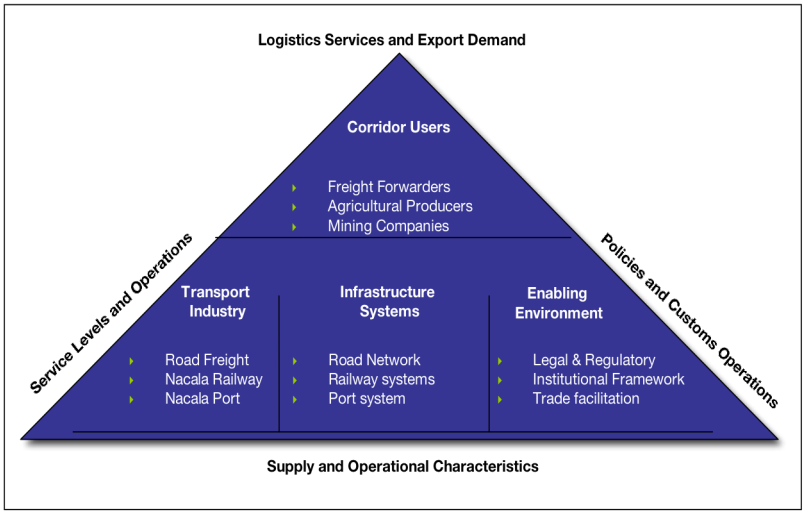
To conduct the analysis eight key variables were assessed across the entire logistics supply chain as the basis to test our hypothesis and assess the efficiency of the Nacala Corridor. These included: (1) collection handling and shipping activities from the farm gate to major collection points/market centers; (2) road freight services (3) railway operations; (4) road conditions; (5) port operations; (6) trade facilitation; (7) container terminal operations, and (8) stevedoring. The analyses conducted included transport demand analysis, comparative transport cost analysis, benchmarking operational performance, service level and capacity analysis.

Structured Survey Instruments

Because of the importance public and private stakeholders play in transport logistics and supply chain and in order to drive policy, institutional reform and attract new investments in the Nacala Corridor a broader strategic approach is required. Such an approach must involve shippers, traders, and consignees; logistics and transport service providers; infrastructure; and national and provincial institutions, policies, and rules (the institutional framework).

The Consultants developed survey instruments around the four dimensions, which align with the eight variables and the general hypothesis discussed above. The four dimensions are (i) infrastructure; (ii) the enabling environment; (iii) the transport industry; and (iv) corridor users such as shipping and clearing agents and major shippers. We hypothesize that the interrelationship of these dimensions determines the performance of the logistics supply chain, as measured in terms of cost efficiency, responsiveness, reliability, and security—in a word, competitiveness. Moreover, their respective performance indicators revealed both the level of integration and coordination, and the services capability within the transport logistics and supply chain. Exhibit 1.2 illustrates these four dimensions, each of which are presented in more detail below.

Exhibit 1-2: Assessment Dimensions



Infrastructure

As indicated above, the Nacala Corridor is a multi-modal corridor with three modes of transport (roads and road haulage, the railway and a port system) available to shippers and producers to transship, export and import their goods. The intent of the infrastructure assessment is to assess the extent to which infrastructure as a logistics supply chain component meets the conditions for efficient functioning of the logistics system. In this assessment we will examine the following issues:

How well developed is the road, railway and port infrastructure in terms of physical supply and operational capacity;
How efficient is the infrastructure with respect supply demand balance;
How well coordinated or integrated with other modes is the infrastructure, in terms the extent of intermodal services and operations;
How much demand is there for a integrated infrastructure system, and
How involved is the private sector in transport aspects of the logistics supply chain with respect to terminal operations, container freight stations, rail container trains, etc?

Depending on the availability of stakeholders we anticipate conducting at least one interview for each infrastructure mode, and whose main scope is to document the supply characteristics of the infrastructure dimension.

Enabling Environment

Critical to understanding the enabling environment and how it impacts the Nacala Corridor is how well the corridor is organized, governed, administered and operated. Our assessment of enabling environment considered: the sector policy and strategic objectives; the legal and regulatory framework; the institutional arrangement; and trade and transport facilitation

We have designed the survey instrument around a series of questions that assess the institutional, governance and operational structure of the Nacala Corridor. And in doing so our assessment will seek to uncover any policy, regulatory or institutional constraints that inhibit the efficient functioning of the Nacala Corridor, and by definition the logistic supply chain. Interviews will be conducted at both the national government ministries (e.g. Transport and Communications, Planning and Development, Agriculture, Mining and Customs), as well as the provincial administrations along the Nacala Corridor.

Transport Providers

Providers of rail freight services, road freight services, and port services are vitally important to the success and sustainability of the Nacala Corridor. However, their service

levels must be competitive yet remain in balance with current and future freight demand in the corridor. This assessment will examine the operational and supply characteristics of the corridor's transport service providers by assessing the extent to which regulatory barriers, inter alia, are inhibiting factors to market entry, operations, market access, tariffs and rate setting, service coverage and service levels. The assessment will examine the extent of modal competition in the corridor, comparative transport costs, service quality and the efficiency of operations of the transport service providers. We anticipate conducting interviews with at least five of the major road freight companies, as well as with senior managers of the Nacala Railway and the Nacala Port.

Logistics Service Providers and Major Shippers

Each of the above three dimensions drive the ability of logistics service providers and shippers to export, import and transship goods in a reliably and efficient manner. Hence, they have a direct bearing on transport costs along the entire logistics supply chain. Freight forwarders as logistics service providers typically offer a range of services including, arranging the surface haulage of goods and the associated formalities on behalf of a shipper, as wells a booking space on the ship or, providing all the necessary documentation and arranging customs clearance. In many countries, major shippers, on the other hand, have increasingly began to manage for their own account many of the functions previously performed by the freight forwarders as a way to better integrate their products into the global supply chain. This assessment examined the roles and functions of logistics service providers and major shippers such a commercial agriculture exporters and extractive industries in the logistics supply chain. Also assess were the extent to which logistics service providers and major shippers were constrained by institutional, regulatory, operational, infrastructure capacity and other constraints that adversely affect their ability export commodities.

Organization of the Report

Presented below is the organization and contents of this Assessment Report. The Report contains the following six Chapters:

Chapter 1.0 above presented the introduction and background to this study. This section also described the objectives of the study and outlined the methodological approach, the expected results and the methods for analyzing the empirical results.

Chapter 2.0 presents a description of the transport infrastructure and supply characteristics, including the road and the railway networks, as well as the port systems that serves the Nacala Corridor. The focus of the chapter is developing a baseline

as to the type, condition and availability of road, railway and port infrastructure and equipment to meet future transport demand.

Chapter 3.0 describes the enabling environment including the transport sector policy, legal and regulatory framework and the institutional structures governing the transport sector at the national and provincial administrative level.

Chapter 4.0 assesses the transport industry and in particular road freight services, the railway freight and port services with respect to service levels and operational performance. The Chapter also examines the transport demand for freight services in the Nacala Corridor, as well as presents the size and structure of the market for rail and road transport and analyzes future transport demand. This section also describes the methodology used in estimated the transport demand and capacity requirements for rail freight services.

Chapter 5 is a presentation of the summary, findings and conclusions of the assessment. The Chapter identifies the main constraints to the efficient functioning of transport logistics and the supply chain efficiency, including enabling environment constraints, infrastructure, transport services, and users, of the Nacala Corridor The Chapter also identifies interventions to address the transport logistics constraints and improve supply chain efficiency.

Chapter 6.0 presents a number of short-term and medium- to long-term recommendations derived from the interventions in Chapter, and which specifically relates to the four component areas of this assessment, namely the enabling environment; road, rail and port infrastructure; road, railway and ports services, and the users of the Nacala Corridor.

Also, the Assessment Report contains a Bibliography of source materials used to develop the research hypothesis and analytical framework and to inform the interview guides during the field studies.

Finally, several Appendices are included as part of the Assessment Report document. The Appendices contain the Consultant's Terms of Reference; the Contact list of persons interviewed, as well the relevant data and source information such as the schedule of terminal handling charges at the Nacala Port.

2.0 Infrastructure

Introduction

Chapter 2 examines the supply characteristics and infrastructure available in the Nacala Corridor to support transport logistics and the supply chain. In particular, this chapter, *inter alia,* assesses mode each mode of transport infrastructure in the corridor, including: (i) the number of kilometers and condition of the road network, as well as the investment requirements and strategy for road development; (ii) the railway network, including the track configuration and rail freight capacity, as well as the railway rolling stock and equipment inventory; and (iii) the port system, including its terminal facilities and equipment, storage and handling capacity.

National Road Network

Mozambique's national road network consists of 30,056 kilometers of roads. Four classes of roads that includes primary, secondary, tertiary and the vicinal roads comprise of Mozambique's classified road network. This road classification system includes both paved and unpaved roads as shown in Table 2-1 below. As shown in Table 2-1 only one-fifth of the total road network consists of paved roads, which has implications for transports costs, as well as access to markets and indeed to production areas - each of which are exacerbated during Mozambique's rainy season.

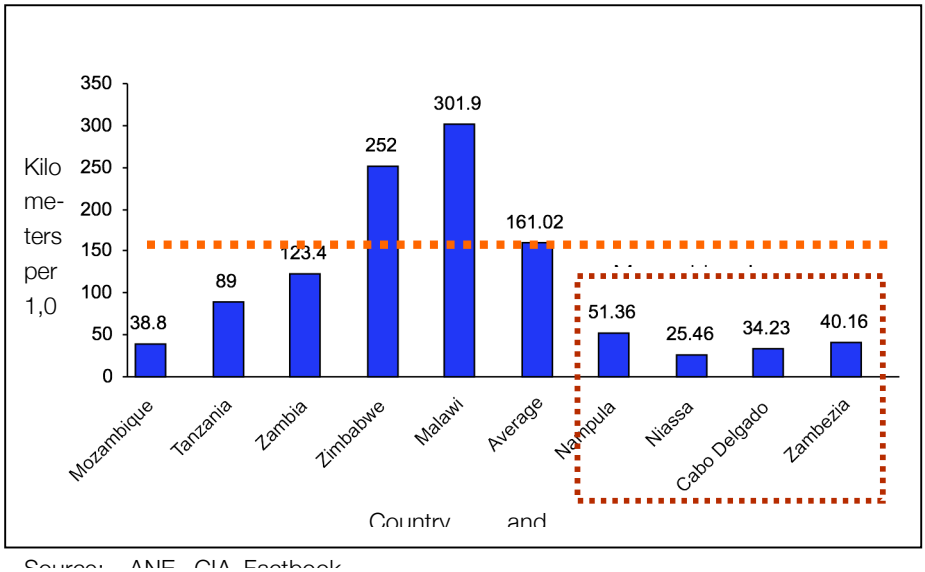
Table 2-1: Mozambique's Classified Road Network

CLASSIFICATION	PAVED	UNPAVED	TOTAL
Primary	4,728	1,243	5,971
Secondary	838	4,078	4,915
Tertiary	667	11,936	12,606
Vicinal	54	6,513	6,567
Grand Total	6,288	23,770	30,056
% of Total	20.9%	79.1%	100%

Source: ANE

As revealed in Exhibit 2-1 below, the road network density for Mozambique at 38.8 kilometers per 1,000 square kilometers, which compared to neighboring countries of Malawi, Tanzania, Zambia and Zimbabwe is well below the benchmark of 160.2 kilometers per 1,000 square kilometers. Comparing Mozambique's northern Provinces of Cabo Delgado, Nampula, Niassa, and Zambezia to the national road network density the situation improves slightly for two of the four provinces. Only Nampula and Zambezia Province with road network densities respectively at 51.4 and 40.2 kilometers per 1,000 square kilometers exceed the national road network density. Mozambique's low road network density is a further indication that market access is constrained by the lack of road infrastructure. Moreover, as will be noted below GOM's road sector strategy is to focus on improving the existing road network through surface upgrades, rehabilitati0on and new construction rather than on expanding the road network.[1] As such, the road network density will not improve in the near term, although the existing road surface conditions of the road network will improve, thereby reducing vehicle operating costs.

Exhibit 2-2: Road Network Density

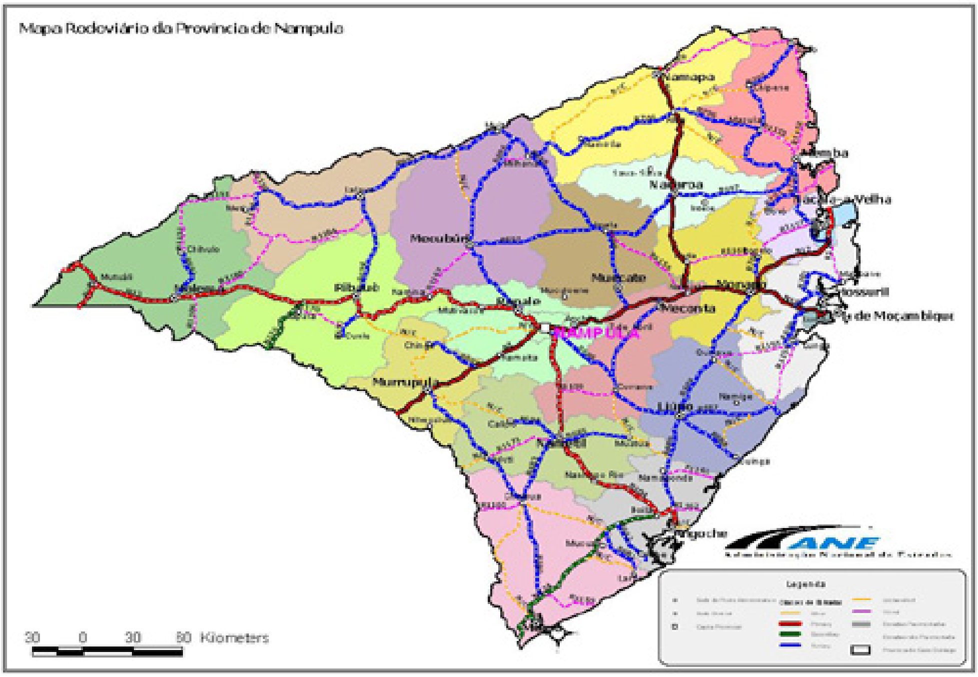


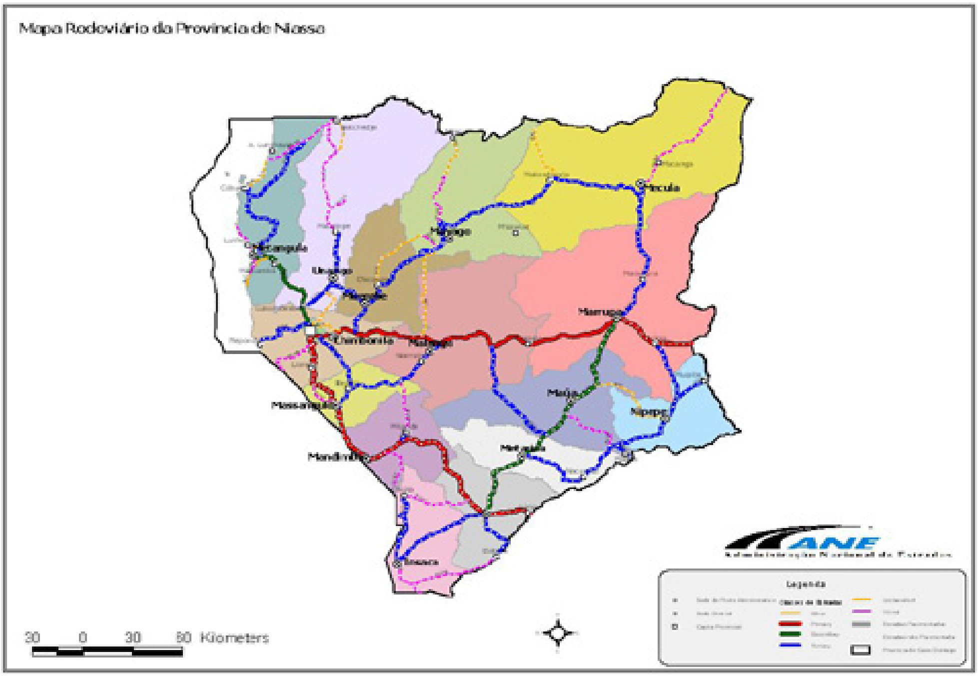
Nacala Corridor Road Network

With the inclusion of Zambia, the entire Nacala Road Corridor comprises a total of 1,033 kilometers of road. In Mozambique, the Nacala Corridor main road crosses two northern provinces of Mozambique, Nampula that borders on the Indian Ocean and Niassa that borders Malawi on the western border of Mozambique

[1] See The World Bank, Project Appraisal Document for Roads and Bridges Management and Maintenance Program - Phase II, 2007.

Exhibit 2-1: Nampula and Niassa Provincial Road Network





The road network also connects to the Nacala Port on the Indian Ocean to the hinterlands and extends the full length of the corridor up to the Malawi border at Entre Lagos, which runs from east to west of approximately 800 kilometers. The north to south lengths extends from Lichinga.

Conditions Analysis of Nampula and Niassa Provinces Road Network

Nampula Provincial Road Network

Of the two northern provinces of Nampula and Niassa, the road network of Nampula Province is more developed than that of Niassa Province. Some 13.4 percent of the roads in Nampula Province are paved compared to none in Niassa Province. Additionally, the N13 is a primary road that extends the western district of Malema to Nampula then connects to Marapo to the east. The road section from Marapo connects to Nacala along the N12 primary road to the Nacala Port is a paved road. As shown on the map in Exhibit 2-1, the N12 and N13 primary roads comprise the main east to west connection of the Nacala Port to the hinterlands. Exhibits 2-1 clearly reveals that a core road network exist in Nampula Province to support the development of the Nacala Corridor. This is further evidenced by Table 2-3, which shows that Nampula Province has a classified road network of some 4,064 kilometers. Of this amount about 25 percent (1,003 kilometers) of the Nampula's road network are primary roads and yet, quite surprisingly, only 13.4 percent of these roads are paved.

Table 2-2: Nampula Provincial Road Network (in kilometers)

Classification	Paved	Unpaved	Total
Primary	508	495	1,003
Secondary	-	166	166
Tertiary	35	1,925	1,960
Vicinal	-	935	935
Total	543	3,521	4,064
% of Total	13.4%	86.6%	100%

Source: ANE

As have been observed in many transport economy studies, poor road surface conditions are directly related to the costs of transport to producers and consumers. Two commonly used measures for this are (1) vehicle operating costs (VOCs) and (2) travel time savings (TTS). Vehicle operating costs varies with the change in road surface conditions from good to poor, and correspondingly travel time changes with the variation in speeds due to road surface caused by the roughness of the road surface.[2]

[2] Considerable research by the World Bank, the U.S. National Academy of Sciences, the British Transport Road Research Laboratory and numerous other prominent research institutions have demonstrated empirically the relationship between vehicle operating costs. The parameters for different road surfaces, road geometric, etc are fully described in the HDM 4 model. Vehicle operating costs are defined as the running costs of putting a vehicle into service or variable costs (i.e. the cost of fuel, oil and lubricants, tires, spare parts, maintenance, etc.). The costs of owning the vehicle or fixed costs include vehicle depreciation, insurance, taxes and fees. These two costs elements vary with road design standards, such as road class, road geometrics, and road surface conditions. As a road degrades from a good road surface to a poor surface vehicle operating costs and travel times increase. Conversely, when a road in poor condition is rehabilitated or paved, vehicle operating cost savings and travel timesavings are realized.

Niassa Provincial Road Network

The road network in Niassa Province that covers the western part of the Nacala Corridor is not as developed as it is Nampula Province. The number of kilometers of paved roads for the classified road network in Niassa Province is shown in Table 2-2 below.

Table 2-2: Niassa Provincial Road Network (in kilometers)

Classification	Paved	Unpaved	Total
Primary	-	423	423
Secondary	-	240	240
Tertiary	-	1,836	1,836
Vicinal	-	966	966
Total	-	3,465	3,465
% of Total	-	100%	100%

Source: ANE

Two key road links in Niassa Province are the Nampula-Cuamba and the Cuamba-Lichinga roads. Presently, both of these roads are unpaved and are in poor condition. Once improved, the African Development Bank (AFDB) expects VOCs and travel time on the improved Namplua-Cuamba road will lead to significant economic gains, as indicated below:

- Average travel time reduced by 41% from 9hrs in 2008 to 5.3hrs in 2014 (Mozambique) and by 60% from 50 minutes in 2008 to 20 minutes in 2013 (Malawi);

- Delays at the Mozambique/Malawi and Malawi/Zambia borders reduced 36 hours to 6 hours by 2015; and composite vehicle operating costs per vehicle km reduced by 36% from US$0.958/km in 2008 to US$0.613/km in 2014 (Mozambique) and 20% from US$0.584/km in 2008 to US$0.470/km in 2013 in Malawi.

Additionally, poor road surface conditions are directly related to the cost of exports and imports as well as to market competitiveness. The AFDB expects the Global Competitiveness Index affecting the Nampula-Cuamba road once paved will improve from 3.1 in 2009 to 4.1 in 2015.[3] Similarly, a reduction of a 1.3 percentage share of transport and transit cost in CIF and FOB prices of imports and exports will be reduced by 25% by 2015.

[3] See: African Development Bank, Multinational-Nacala Corridor Phase I, Project Appraisal Report, Results Based Matrix, May 200, p. vi -vii

Although promising efforts are underway to improve the road network in Nacala Province, significant challenges remain. The situation prevailing in northern Mozambique is one in which roughly only one-third of the entire road network in Nampula Province is in good condition. To put it another way, almost two-thirds of the classified road network is in either fair or very poor condition. The situation does not improve when the unpaved claissified road network is considered, whereby some 68.4 percent of road network is in fair to very poor condition.

Nacala Corridor Railway

CDN Railway System and Service Characteristics

CDN operates both rail freight and passenger services. The rail network consists of 872 track kilometers that extend from Nacala to the border with Malawi, at Entre Lagos. CDN also operates a branch line between Cuamba and Lichinga in Niassa Province.

- ***General freight:*** CDN has the ability to move containerized, bagged and bulk freight, including liquid bulk. Railway service is provided for imports and exports to and from Malawi via the Port of Nacala. CDN can operate unit trains of 1,000 freight tons or 25 wagons of freight from a single customer or shared by more than one customer. The transit times to or from points in Malawi for these trains are on average 34 hours. Freight is also hauled to and from any of the stations on the CDN network. See Exhibit 2-2 below.

- ***Passenger services:*** A regular passenger train service with 1st, 2nd and 3rd class coaches is operated between Nampula and Cuamba. The first class coaches are air-conditioned and the train has a restaurant car that serves light meals and refreshments. Daily train service is operated daily, except Mondays, and departs from Nampula on Tuesday and the next day returns from Cuamba. This cycle carries on till Sunday.

Track Configuration

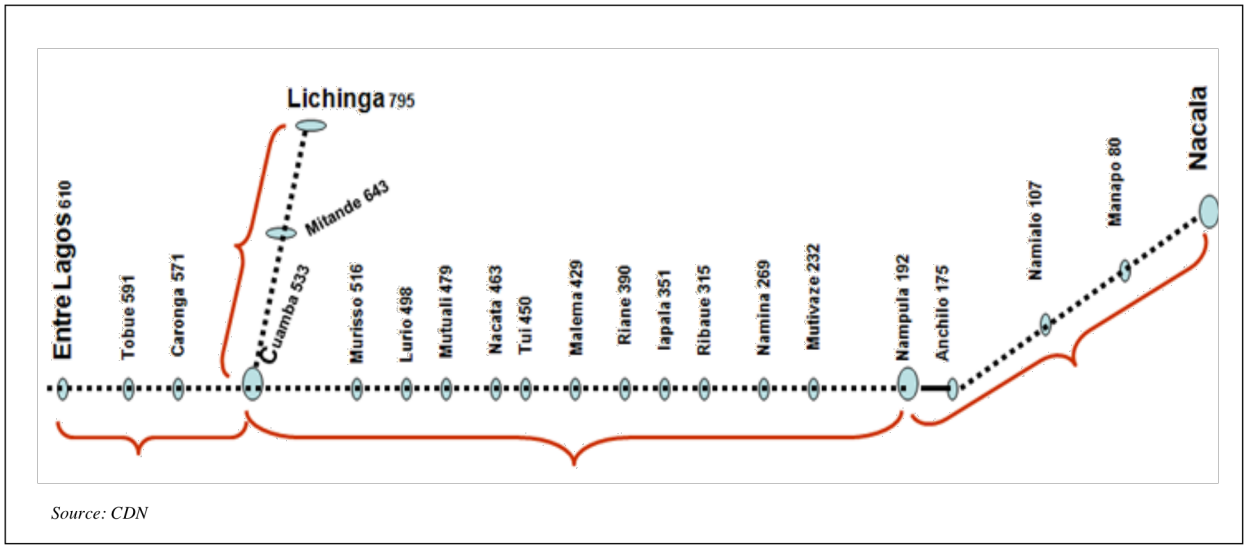
CDN-Norte formerly CFM-Norte extends some 715-route kilometers from the Malawi border to the Nacala Port on the Indian Ocean. The track is 1.67-meter gauge, and uses 30 to 45 kilograms per meter (45 kg/m) jointed welded rail laid on concrete sleepers. The exception is the section between Cuamba and Lichinga, which uses wood sleepers.

Table 2-5: CDN Railway Network		
SECTION	LENGTH	TRACK CONDITION
Nampula to Nacala	180 km	Good
Nacala to Cuamba	533 km	Fair
Cuamba to Entre Lagos	77 km	Poor
Cuamba to Lichinga	262 km	Poor
Total Railway network	872 km	39% of railway network is in poor condition

Source: CDN

Additionally, the 77-kilometer rail section between Cuamba and Entre Lagos near the Malawi border is 30kg rail on wooded sleeper and in need of upgrading. See network map in Exhibit 2-2 below. As Table 2-6 below indicates, the average moving trip speed on the railway line is 25 kilometers per hour. It should be noted that the factors listed in the table are constraints to train operating speeds. Moreover, the modal implications of such low average trains speeds

Exhibit 2.2: Network Map of CDN North Railway



Source: CDN

compared to freight moving by truck at higher speeds is quite significant. For example, a train traveling from Lichinga to Nacala Port, a route distance of less than 800 kilometers will take 32 hours to arrive at the port. This also assumes that the track is in good condition, which the Lichinga to Cuamba section is not. By comparison, a truck with a 40-foot container traveling the same distance at average speed of 75 kilometers per hour requires only 10 hours to reach the Nacala Port and thus, highlights the challenges the railway faces in terms of modal competition.

Table 2-6: Factors Influencing Average Train Speeds Between Stations on CDN Railway

Track Kilometers	Maximum Average Speed (Kph)	Curve Speed (Kph)	Maximum Grade (%)	Maximum Grade (%)	Train Horsepower/ Ton	Meets per Trip	Average Moving Speed (Kph)
715	60	30	2.0	2.0	8-11	2.5 -3.5	25

Source: SATCC

Nonetheless, the railway offers many compelling advantages that road freight services are unable match. Among these are the fact that: (i) railway services which rely on diesel-electric locomotives for traction is cleaner and more environmentally friendly by reducing CO2 emissions than road freight service; (ii) railways have a higher payload capacity than trucks; (iii) a shift from road freight to rail freight service reduces road accidents and save lives; (iv) railway service consumes less fuel than a comparable number of trucks with the same payload, (v) and an increase in the volume of freight transported by road causes rapid road surface deterioration and the need for increased road maintenance, thereby increasing the cost to the economy, etc.

Rolling Stock and Equipment

Table 2-6 presents CDN railway's rolling stock and equipment profile. CDN has five mainline locomotives. Assuming a high level of locomotive availability, for example 90 percent, and efficient train operations such as wagon turnaround times, we can estimate the number of locomotive necessary to operate rail freight service in the Nacala Corridor. This can be done by multiplying the route kilometers by the number of trains and by the number of locomotives per trains divided by the average train speed. Given the practical line capacity for rail freight of about 9.2 million tons per year, CDN should have between 6 and 12 mainline locomotives to meet the demand for rail freight service.

Table 2-6: CDN Railway Rolling Stock and Equipment

ROLLING STOCK & EQUIPMENT	DESCRIPTION
Wagon Types	200 Covered wagons for bagged cargo 190 Container wagons plus Low Sided wagons (LSB) for containers and loose cargo 40 High Sided wagons (HSB) for loose and bagged cargo. 55 Ballast or bulk wagons
Locomotives	5 Main Line Locomotives (with plans to increased to 11 locomotives 2 Shunting Locomotives

Source: CDN

Nacala Line Rail Capacity

Although CDN Railway's practical line capacity is 10 to 11 pairs of freight trains per day, the theoretical capacity (assuming no passenger trains) is between 20 and 22 pairs of trains per day.[4] Based on the railway's passing loops which are 650 meters long and accounting for signal adjustments each train with two locomotives per train on a 2 percent ruling grade can pull up to a maximum of 40 wagons per train. If we assume 35 net tons per wagon x 9 trains pairs per day x 365 days per year the estimated tonnage amounts to 9.2 million tons.

Similarly, in the case of a rail container freight operations involving 20-foot (TEU) and 40-foot containers (FEU) up to 80 containers per train based on two double stacked containers per flat car x 40 flatcars per train. We assume block or unit trains of container freight whereby each 40-foot container holds 22 net tons. Multiplying the net tons times two containers per flat we get 44 tons x 40 flatcars or a trailing load of 1,760 net tons per train pulled by double headed locomotives.

We can derive the annual tonnage for a rail container freight operations on CDN Railway by multiplying the average number of trains per day times the number of flatcars by 44 tons per flat car times 365 days per year. If we assume eight trains pairs per day, we get 16 trains x 40 wagons x 44 tons x 365 for a total of approximately 10.3 million tons per year.

Assuming that there is freight traffic on demand, it should be noted that optimum deployment and utilization of the railway's assets are necessary to achieve such freight volumes. This includes, *inter alia,* labor and management resources, train operations, wagon turnaround times (e.g., from the loading point such as an inland container terminal to the Nacala Port as a destination and loading), repositioning of empty containers or wagons, as well as the availability and high utilization of locomotives. The optimum deployment and utilization of CDN Railway's assets will result in improved service and

[4] Estimates based on a "Regional Study on Railway Telecommunications and Signaling" for the Southern Africa Transport and Communications Commission (SATCC), Final Report, January, 1988

more efficient operations arising from longer trains, higher loads, higher capacity wagons and higher average train speeds.

Rail Freight Traffic and Capacity Utilization

Since 1995 freight volumes hauled by CFM and now CDN Railway has consistently performed well below its practical line capacity of some 9.2 million tons of annual freight. In 1995, CFM- transported some 798 thousand tons, of which 330 thousand tons (41.4%) consisted of transit traffic a 468 thousand tons (58.6%) were domestic imports and exports. And although gains have been made, recent rail traffic data suggest that the situation for CDN Railway has not improved significantly in term of capacity utilization. Recently, the freight volume has declined precipitously since 2008 due to diversion of some of Malawi 's transit traffic to Beira Port.

Nacala Port

The Nacala Port is located at the extreme south of the Bay of Bengo. Due to the depth of its channel, navigational conditions allow vessels of any size to enter and depart 24 hours a day. These characteristics make Nacala the largest natural deep-water port on the East African coast. Opened to traffic in October 1951, the Nacala Port currently has a General Cargo Terminal, able to handle 2.4 million tons of cargo annually. The port also 8 warehouses covering a total surface area of 21,000 cubic meters. The container terminal is 372 meters in length. The Port also has a terminal for liquid bulk cargo, linked by a by and large is a port that not only serves Mozambique's hinterland but also the transit traffic originating and or destined to the neighboring landlocked countries of Malawi and Zambia.

Because of its natural deep water and sheltered position, Nacala has no restrictions on ship movement or size, with the exception of alongside the quay and no night restrictions. Berthing and unberthing is possible 24 hrs a day upon request. Pilotage is however compulsory, ships being boarded 2 n miles 237° from the Nacala lighthouse, unless strong winds are blowing, in which case pilots then board within the bay.

Port Facilities

Presented in Table 2-8 are the three terminal facilities operated by the Nacala Port. The facilities include a general cargo terminal, a container terminal and a liquid bulk terminal. The Nacala Port has four general cargo berths (one of which serves as a POL berth) and two container berths. Bunkering is available by road tanker with a pipeline at the general cargo berths.

Port modernization plans must look beyond the immediate port infrastructure and foster coordinated efforts to improve road and rail systems that provide linkages with hinterland markets. Addressing such bottlenecks will reduce widespread congestion around ports and ensure more effective use of container trade along an integrated transport corridor.

Table 2-8: Nacala Port Facilities

Terminal Type	Capacity	Handling Equipment
General Cargo Terminal	Quay length: 610 meters Maximum Draft: 7-10 meters Annual throughput: 2.4 million tons Nacala has 8 warehouses with a total covered storage area of 21.000 square meters, with a storing capacity of 50,000 tons (an average of 7,000 tons each) and an open storage area of 80,000 m2	20 ton Shore Crane (1) 5 ton Shore Cranes (4) 10 ton Shore Crane (1) 2.5 ton Forklift Truck (3) 4 ton Forklift Truck (1) Bale clamps are available for fitting when necessary Cargo Funnels (5) Vacuvators (2) Bagging plants available upon request
Container Terminal	Quay length: 372 meters Maximum Draft: 14 meters	22 tons ship-to-shore crane 42 tons reach stackers (3) 32 ton forklift (1) 42 tons forklifts (2) 16 tons forklift (for empties) (2) Tractors (2) Trailers (4)
Liquid Bulk Terminal	Dedicated quay (no. 4) of the General Cargo Terminal; Quay Length: 900 meters; Maximum Draft: 9.7 meters; Linked by a 3.5 km pipeline to fuel tanks; Two vegetable oil tanks, with a total capacity of 2,400 tons	

Source: CDN

Port Equipment

Another major concern is the modernization of cargo-handling systems at the container terminal. As Table 2-9 below shows, the Nacala Port lacks the crane equipment to improve its operational efficiency. Moreover the port relies on ship's gear and as such the continued reliance on ships' gear, seriously limits the port capacity to increase productivity. Additionally, the ports one outmoded container gantries is still in use. What is required to improve the port's productivity is a major transformation of how port operations are currently performed. This requires substantial investments in new more efficient port handling equipment, as well as in management and training of port staff, and in a computerized port information management system to manage. In many of the most successful ports in Africa private operators have experienced vastly improved productivity by investing heavily in modern container handling systems.

Table 2-9: Nacala Port Equipment

EQUIPMENT TYPE	RATED CAPACITY	UNITS
Forklifts	42 tons	7
Forklifts	32 tons	1
Forklifts	2.5 to 16 tons	6
Tractors		2
Trailers		2
Gantry		1
Bobcat		2
Front end loader		2
Bagging Plant		2
Vacuvator		2
Pilot Boat		1
Small Work Boat		1
Tugboat		2
Cargo Funnels		5

Source: CDN

Although new equipment is not a panacea—absent such equipment it is unlikely the port will be able to meet the projected container demand. CDN has to be introduced into a port system operations designed to achieve the best performance and supported by proper management and staff training. This has become clear in certain public sector ports that, despite having purchased new equipment, some continue to deliver less-than satisfactory performance. There is a clear need for more training and improved business operations in the port.

Finally, the development of information management systems, information technology, modern trade facilitation customs practices, represent a major goal for Sub-Saharan African ports. Soft infrastructure has traditionally been under funded, thereby contributing to poor port efficiency. It is important to pay more attention to this issue alongside physical port development.

3.0 Enabling Environment

Introduction

Chapter 3 examines the legal and regulatory framework, institutional arrangement, governance structure and administration of the transport sector in Mozambique. The Chapter begins with an analysis of the organizational structure, governance and the roles and functional responsibilities for road administration, development and operations. The primary objective of the Chapter is to assess the extent to which the enabling environment is a constraining factor on transport logistics and supply chain efficiency in the Nacala Corridor. The Chapter also assesses the role of the private sector in the provision of transport infrastructure and services. The focus of Chapter 3 is the enabling environment and how national transport sector policy, the legal and regulatory framework and institutional structure governing the transport sector the Nacala Corridor in terms of transport logistics constraints. Chapter also examines the role of Provincial Administrations of Nampula and Niassa in fostering economic development in the Nacala Corridor and impact the Strategic Economic Plans have on corridor development.

Institutional Arrangement

Administration and operations of the transport sector in Mozambique it is multi-tiered, encompassing national government ministries, provincial governments, implementing agencies and private sector firms. The institutional arrangement and governance structure for the road sector in Mozambique is illustrated in Exhibit 3-1. The main focus of the analysis is on ANE and CFM its institutional capacity, along with the role played by the private sector in supporting each agency's both mission and programmatic objectives.

The Ministry of Transport and Communications (MOTC) and the Ministry of Planning and Development. (MOPD) governs Mozambique's road, rail and port sectors. And at the local level by they Provincial Governments of Nampula and Niassa. The Council of Ministers, is the governing body of all road administrative functions. The Council of Ministers includes the Minister of Public Works and Housing, under which the National Road Administration is aligned, the Ministry of Finance, and the Provincial Governments. Management and administration of the road sector is the responsibility of the Ministry of Public Works and Housing, through its agency the National Road Administration (ANE).

Article 138 of the Republic of Mozambique Constitution defines the role of the central government as the set of the governmental agencies and the institutions that guarantees the prevalence of the national interest and the accomplishment of the government polices. Similarly, article 139, constitute one of the attributions of the central government, is to rule the subjects under the scope of the law and the definition of national politics.

At Provincial level, in the terms of the law, competes to the provincial governments guarantee the execution of governmental politics and exerting the administrative guardianship on the local autarchies.

Policy, Legal and Regulatory Framework

Mozambique's Investment law nº 3/93, of 24 of June (Investment Law) defines the regulatory framework of the process of carrying out both national and foreign private investment in Mozambique and the respective Regulation approved by decree nº 14/93. The decree n.º 43/2009 approved the Investment Law Regulations, where in its Chapter II, Article 4, n.º 1, determines the competency for the coordination of investment process to the Minister who has oversight of planning and development affairs in accordance with the terms of Law 3/93, of 24 June. The Investment Legislation, according to the value, localization and sector of activity provides customs and fiscal benefits to eligible projects. In the case of investments in the Nampula, Niassa and Cabo Delgado, the Fiscal Credit per Investment (CFI) during 5 fiscal exercises is 5,0% 10,0% and 10,0% respectively. Those provinces are part of the Rapid Development Zones.

The Resolution on Transport Policy No. 5/96, which allows private capital to participate in the rehabilitation, operation and management of railway infrastructure and railway operations, enabled an environment for granting concessions to private sector operate specific railway tracks. Mozambican transport policy also envisages the concession and privatization of the port operations on broadly the same terms as the railway and road concessions.

The Provincial Economic and Social Plan (PES) is the instrument that guides the economic and social development in the direction of a sustainable growth of the country and has its financial expression in the Budget of the State. The elaboration and execution of the PES is under the government responsibility. It is based on the five-year government plan and decentralized by province and by sector provincial and sector.

Concessions and Private Provision of Public Infrastructure

Dating as far back as the mid-1990's the Government of Mozambique began considering policy reforms and strategies to improve the financial and operating performance of several of its state-owned transport enterprises, including its railways (CFM-North, CFM-Central and CFM-South) and the ports of Nacala, Beira, and Maputo. Much of the focus of the policy reform and strategy was on restructuring these enterprises, which in large measure has meant accounts separation of assets from operations, staff retrenching and aligning assets and operations to traffic levels, leading to eventual concession of these enterprises.

In reference to the Nacala Corridor, what has emerged in the past decade has been the concessioning of the Port of Nacala and the railway CFM North. The decree (No. 21/2000) grants the concession for the exploitation of the railway network in the Nacala Corridor to the Corridor of the Development of the North, in which this company is detained by Mozambique Railways Company (CFM) with 49,0% and by North Development Corridor Corporation (SDCN) with the remaining 51,0%. This concession is valid for a period of 15 years, renewable for 15 years or additional periods according to the concession contract. The concessions agreement gives CDN the responsibility for operating and managing the Port of Nacala, while CFM manages the railway line and guarantee the investments in rail infrastructures and rolling stocks. Within the concession, CFM has also the role of protect public interests the public in the concessionaire, to carry out investments as well the strategic responsibility to develop new infrastructures lined up to the plans of the Ministry of the transports. CFM, is a public enterprise which goals are to:

- Promote and develop Railway and Port infrastructures and services;
- Promote the development of transport and logistics activities, through the increased involvement of the Private Sector in their operation and management;
- Involve itself, in association with the Private Sector, in the operation of Railway and Port Systems in a sustainable, safe, efficient and profitable manner, transporting passengers and cargo and providing port services; and
- Optimize the use of its assets in a rational and profitable manner.

CFM comprises by four branches where are located accordingly to geographical areas, namely CFM-South; CFM-Center; CFM-North and CFM-Zambezia.

Road Sector Policy

Cognizant of the role infrastructure, especially the roads sector plays in a country's economic development, the Government of Mozambique road sector policy seeks to ensure that social and economic mobility by promoting economic growth, as well as foster

regional development through linkage to all areas of the country. This policy encompasses the following four dimensions:

- National Integration: whereby better roads contribute to the reduction of regional differences and to the building of national unity through integration

- Economic Growth: better roads stimulate economic growth by reducing transportation costs and providing better access to markets, facilitate marketing of agricultural commodities and ensuring reliable delivery of agricultural inputs and while facilitating timely marketing of agricultural production at reasonable costs

- Strategic Asset: better roads bolster Mozambique's strategic position as an essential transit corridor for its landlocked neighbors, facilitating their access to international markets

- Poverty Reduction and Social Development: better roads provide access to district capitals, employment opportunities, schools, health care facilities, and other social services, consistent with Action Plan for the Reduction of Absolute Poverty.

The above roads sector policy notwithstanding there does not appear to be a specific Government of Mozambique policy focused directly on the Nacala Corridor as an integrated development corridor and engine for regional imports and exports.

Road Sector Strategy

The Government of Mozambique with donor support has initiated a comprehensive road sector strategy to address what are clearly poor road network density and poor road surface conditions of the primary and secondary road network in Niassa and Nampula Provinces. Formulated in 2005 for the period 2007-2011, Mozambique's strategy for the road sector takes a medium- to long-term perspective on the development and management of the classified road network, as such implementation activities are contemplated over 10-years.[5] The road sector strategy is intended to:

> "…create an efficient, dynamic, independent, and responsive system of roads management capable of implementing national and provincial policies and effectively delivering road services desired by road users."

[5] According to the World Bank Mozambique's 10-year road's program covers Phases 2 and 3 of the Roads and Bridges Management and Maintenance Project. The strategic plans for investment, maintenance, and finance included in RSS are prepared for a 5-year horizon, 2007-2011.

Underlying the road sector strategy are four basic principles the Government of Mozambique identified to guide the strategy. These principles are: (i) sustainability, (ii) connectivity, (iii) accessibility, (iv) transitability, (v) asset preservation, and (vi) maintainability.[6] Given the above the Government of Mozambique could benefit from:

(a) A Unitary institutional structure such as a Corridor Development Authority to direct and manage the development of the Nacala Corridor; and

(b) An independent regulator for surface transport to regulate railway and port concessions such as CDN and how private entities have or gain access to government owned transport assets such as the railway track and the port.

The Government of Mozambique has formulated a comprehensive strategy to address the medium to long-term challenges facing the roads sector and, in particular, those that Nampula and Niassa Provinces face. However, what remains unclear is how this strategy translates into an effective effort to specifically develop the Nacala Corridor. And while several priority road projects in Nampula and Niassa e.g., the Cuamba- Lichinga road are poised for upgrading, this is unlikely in and of itself to be a sufficient condition to ensure development of the corridor as a logistics corridor.

[6] See: The World Bank's Project Appraisal Document of 2007 for the Roads and Bridges Management and Maintenance Project where the Mozambique four principles for the road sector strategy are defined, Sustainability of the road network is defined as ensuring that resources invested in the sector yield long-term benefits to the economy, through sustainability of maintenance, financial sustainability, and sustainability of capacity. Connectivity is defined as being directly related to the goal of national integration and refers to the role of the primary, and to a lesser extent, the secondary road networks in connecting the nation's provinces, provincial capitals, and main international corridors by contributing to national economic development and connecting national and international markets to zones of production and consumption. Additionally, accessibility refers to the role of secondary roads to provide access to high priority economic poles and to the role of tertiary and vicinal roads to improve and expand rural accessibility, especially in densely populated and economically productive regions. Accessibility is directly related to the concept of transitability. According the Project Appraisal Document, the goal of transitability is to keep roads open almost all year, in almost all weather, especially for roads that are the only source of accessibility for otherwise isolated rural populations and districts. The asset preservation principle is intended to minimize long-term, life-cycle costs of road maintenance and to prevent the high costs of neglected maintenance, especially on roads that represent the largest investment in the sector, paved roads. Maintainability, involves the design and construction of roads, while bearing in mind the Government of Mozambique's limited capacities for maintenance.

4.0 Transport Industry

Introduction

Chapter 4 assesses the transport industry serving the Nacala Corridor, and in particular the road freight industry, CDN railway and the Nacala Port. The focus of this Chapter, inter alia, is on the operational and performance characteristics of the transport industry; the demand for surface transport freight and allied services, such as the Nacala Port services; and the capacity of the industry to meet future demand. What Chapter 4 seeks to achieve is identify the key gaps in the transport industry supply-demand balance, as well as the factors that are inhibiting the efficient functioning of the transport logistics market in the Nacala Corridor.

Road Freight Services

Road freight plays an important role in facilitating logistics services and the provision of transport in the Nacala Corridor. The structure of the road freight market in Niassa and Nampula Provinces is somewhat fragmented with no one dominate market player. In fact, the road transport market largely consists of owner-operators, defined as firms who own 10 trucks or less. However, the preponderance of these firms own one or two trucks.[7] Despite the market fragmentation many of the owner-operators belong to a Truckers' Association, which provides a forum to discuss issues of mutual interests to the industry.

Table 4-1: Registered Heavy Trucks in Niassa Province

	2005	2006	2007	2008	2009
Number of trucks	8	9	34	35	74
Operators	8	8	25	34	64
Average number of trucks per operator	1.0	1.0	1.4	1.0	1.2

Source: Provincial Directorate of Transport and Communications

[7] Lack of detailed data prevented the Consultants from conducting a similar analysis for Nampula Province. However, the data that were able obtained indicate that Nampula Province had 475 registered heavy trucks in 2009.

Although market competition does exist in Mozambique's road freight sector, freight services tend to be rather ad hoc and mainly operates unregulated and without formal contracts.[8] Moreover, trucking firms more often than not offer their services on a one-off basis and for individual loads. This amounts to, for example, picking up an empty container at either the port or from one of the of empty containers terminals such as the terminals operated by Terminais or SDV-Ami, or dropping or picking up a full load container at Nacala Port. Typically, road freight service arrangements do not provide for compensating the owner-operator for the driver's time while queuing to enter the port to drop off a container no matter how many hours the wait takes. Also expenses incurred for over night stays such as driver's lodging and meals are not provided for in the road freight tariffs or negotiated rates. Such expenses are simply absorbed by the road freight company no matter what the costs. Many of the road freight firms we interviewed felt they have no choice in the matter and must accept this practice as a cost of doing business given the competition, if they want to remain in business. This overreaching and abusive practice is clearly an area that Government could play a role and one that may offer scope for some type of regulatory intervention.

Road Freight Tariffs

There are no published road tariff schedules for Nampula or Niassa Provinces, so it was difficult, if not impossible to ascertain different the road freight tariffs. Road freight operators were simply unwilling to say what they charge customers except in as very general way. Road transporters were only willing to say that because of the poor road conditions and transitablity during the rainy season which limits market access, they often charged customers up to three to four times the normal freight rate charged during the dry season. The only information we were able to ascertain on road transport tariff was from major shippers. All complained about the high cost of road transport.

According to the World Bank, Africa is being handicapped by very high road-freight tariffs that range from $0.05 per ton-kilometer in southern Africa to $0.13 per ton-kilometer in Central Africa, while tariffs in other parts of the world are between $0.02–0.04 per ton-kilometer.[9] And although, southern Africa's regulatory environment tends to be more liberalized compared to other regions in Africa, road-freight tariffs still tend to be high compared to the rest of the world.

[8] To the extent road freight service contracts are in use they largely affect large trucking firms operating from Maputo and larger companies. In fact, this was a consistent complaint of road freight firms in Nampula. They reported that trucking companies from Maputo would travel to Nampula empty for a load and transport it back to Maputo or elsewhere south. While the road freight companies agreed that trucking services is a relationship business as are many businesses they nonetheless felt that they were being crowed out of the market. Empty truckloads are normally associated with back-hauls not front-hauls for long–distance transport services.

[9] See World Bank's 2009 Report, "Africa's Infrastructure: A Time for Transformation",

Railway Services

CDN Railway provides railway freight and passenger services in the Nacala Corridor. CDN is a concessionaire who was awarded a concession contract by the Government of Mozambique in 2005. The terms of the concession agreement allow CDN to operate the railway for a 15-year concession term with the option to renew the concession for another 15-year period. CDN operates two types of rail services in the Mozambique along the Nacala Corridor—general freight service and passenger service from Nacala to the border with Malawi, at Entre Lagos, and a branch line from Cuamba to Lichinga.

- **General Freight:** CDN's general freight consists of containerized cargo that includes bagged and break bulk. CDN also transports liquid bulk freight. Rail freight services also covers transit cargo from Malawi and Zambia as well as domestic imports and exports. CDN promotes operating block trains who's train consist is made up of 25 wagons totaling some 1, 000 net tons. Many factors may account for this low service level, including, inter alia, poor conditions of the track, tractive effort, locomotive and wagon availability and utilization, etc. However, it is important to note that this level of train operations is well below the practical line capacity of the railway as it was designed or when the rail assets such as the track, rolling stock and equipment are in good working condition or optimally utilized. Clearly, the train operations will need to be better optimized to compete with road freight services.

- **Rail Passenger Services:** As indicated above CDN also operates regular passenger train service between Nampula and Cuamba. The passenger service includes first, second and third class air-conditioned trains plus a restaurant car. Daily passenger train is operated, except Mondays, and departs from Nampula on Tuesday and the next day returns from Cuamba.

Rail Freight Traffic

An analysis of CFM-N Railway (CDN Railway) freight volume hauled dating back to 1995, indicates that the railway has consistently performed well below its practical line capacity of some 9.2 million tons of annual freight. In 1995, CFM- transported some 798 thousand tons, of which 330 thousand tons (41.4 %) consisted of transit traffic and 468 thousand tons (58.6 %) were domestic imports and exports.

Table 4-2: CDN Railway Freight Traffic (in '000 tons)

2005	217.5	78.4	139.1	123.2
2006	237.8	69.7	168.1	117.4
2007	290.5	64.6	225.6	126.6
2008	244.9	44.9	200.0	115.3

Year	Total Traffic	Domestic Traffic	Transit Traffic	TKMS (in millions)
Average	247.7	64.4	183.3	120.6

Source: CFM and Consultants Analysis, March 2010

Although gains have been made, recent rail traffic data suggest that the situation for CDN Railway has not improved significantly in term of capacity utilization.

Rail Freight Demand

Notwithstanding its current situation, in the next three to five years CDN will face significant challenges in meeting near- to medium-term demand for rail freight services on the rail section between Cuamba-Lichinga and Cuamba-Nacala. These challenges will be fundamentally manifested by CDN's ability to overcome, inter alia, by: (i) poor track conditions; (ii) insufficient rolling stock and equipment and (iii) sub-optimal train operations that result in low train speeds, scheduling delays, poor repositioning of rolling stock, and a general lack of hauling capacity to transport freight on offer with rail freight services. A clear example of this is the rail service currently available on the Cuamba-Lichinga section of the railway, whereby despite the demand CDN has been unable to provide adequate rail service on this line due primarily to the poor condition of the track.[10] Currently, CDN only operates one train per month from Cuamba to Linchinga. This has resulted in some major export producers either having to acquire their own trucks or pay exorbitant transport rates for road freight services. It is imperative that this section of the railway network be rehabilitated and put back into good working condition in order handle the project freight demand for forest and wood products. CFM estimates that rehabilitating the Cuamba-Lichinga section of the railway network will cost some USD 53.4 million derived at by taking the 267 km track times USD 200K per kilometer.

Changes in Rail Freight Traffic Patterns

[10] Based on interviews conducted with CDN management it does not appear that CDN has plans to invest in rehabilitating the Cuamba-Lichinga section of the railway network on its own account. It's also unclear whether CND is required under the terms of the concession agreement to make the necessary investments to for the Cuamba-Lichinga line. In fact, CDN indicates that such capital investments are the responsibility of the Government of Mozambique.

The distribution of rail freight traffic along the Nacala Corridor is expected to change quite dramatic in the next five to ten years. Such changes will have enormous implications for transport logistics and enterprise transport such as CDN railway, the Nacala Port and indeed for the road freight industry as well. The pattern of freight traffic is expected to change along the following lines:

- Replacement of transit goods with domestic exports as the leading share of rail and port traffic;
- Domestic Container traffic will over take Malawi transit traffic;
- Increased domestic containerization due to exports of bananas, forest and wood products originating in Nampula and Niassa Provinces; and
- Increased dry bulk cargo due to the exports of coal originating in Tete Province.

Additionally, in the next five to ten years there will be a significant modal shift away from road transport to rail transport, which will dominate the Nacala Corridor. To accommodate the increase traffic CDN will have to shift its operations away from mixed trains to block or unit trains for container and dry bulk traffic, as well as shift to heavy wagons of 65 net tonnes to accommodate the dry bulk coal traffic. It is also expected that general cargo consisting of Less than Full Container (LFCs) loads will likely be consolidated and shipped by road.

Rail Freight Demand Forecast

The challenges referred to above that CDN faces will become even more acute in ten years and beyond as major exporters of forest products and coal increase their production. Table 4-3 presents a snap shot of the export demand for rail freight services for the mining and forest product industries.

Forest Products Industry

The Forest Association of Niassa (FAN) projects that their members by 2022 will have under cultivation some 322,500 hectares of farm trees in Niassa Province alone. Table 4-3 shows the distributions of planned plantation area by the concessionaire. The five member companies of the FAN are listed in Table 4-3 have invested some USD 42.0 million and have planted in excess of 13,500 hectares of tree farms.

Table 4-3: Existing Forest Concessions in Niassa and Nampula Provinces

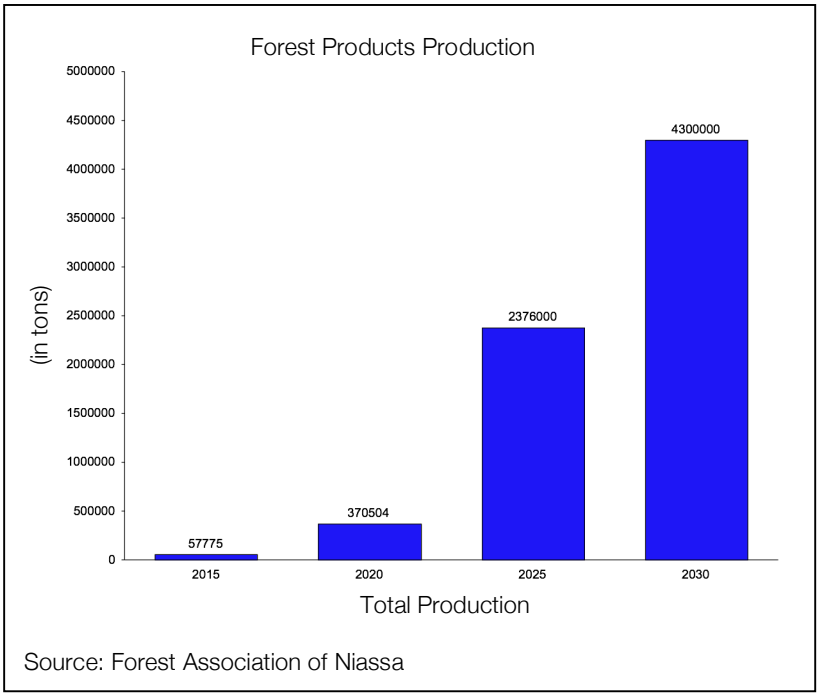
Concession	Main Corporate Investor	Plantation Area (in ha)
Chiketi Forest of Niassa	Global Solidarity Forest Fund (Sweden)	68,500
Forestas de Niassa	Rift Valley Forestry (German & Norway)	12,000
Florestal de Massangulo	Global Solidarity Forest Fund (Sweden)	50,000
New Forest Malonda	New Forest Company (UK) & Fundacao Malonda	27,000
Malonda Tree Farms Mozambique	Green Resources (Norway)	36,000
Total hectares in Niassa Province		322,500
Green Resources	Green Resources AS (Norway)	125,000
Total hectares in Nampula Province		125,000

Source: Forest Association of Niassa and Green Resources

The above forest concessions will produce a range of forest and related wood products for export. These include sawn timber, pulp, wood chips, and engineered wood and treated poles. As illustrated in Exhibit 4-1, at peak production in year 2030, the forest industry in Niassa Province is expected to produce 4.3 million tons of forest products. Exhibit 4-1 also shows the rapid pace at which such production will materialize. For the ten-year period between 2015 and 2025, the compound annual growth rate (CAGR) is estimated at 45.1 percent. Although not as robust as the prior period, the CAGR for the period between 2026 and 2030 will be 12.6 percent.

With the exception of the treated poles all of the forest and wood products can be transported in containers. Listed in Table 4-4 is the container requirement for forest and wood products over the next twenty years. As Table 4-4 indicates, the volume of forest and wood products are manageable by road services until year 2015 when the demand is less than 10 trucks per firm. However, as we forecast beyond year 2016 the challenge is more pronounced and necessarily requires a shift road to rail transport because of the potentially high freight volumes. An average of 46 trucks per day is quite a bit of heavy traffic to add to the Nacala Corridor road and is more suitable rail freight service. And by 2025, almost 300 trucks per day will be needed to move the forest industry volume, or the equivalent of 4 to 12 trains per day depending on the train consist and the rail freight services.

Table 4-4 presents a snapshot of the medium- to long-term demand for road and rail freight services by the forest and wood products industry in order assessed the extent of the transport freight service demand. What must be added to these freight volumes are other types of container freight traffic that CDN now carries such as general cargo, break bulk cargo, and liquid bulk cargo (mainly POL cargo destined for Malawi), etc. For example, the Nacala Port handled only 53,104 containers in 2009 and the port and railway performance was unremarkable. And while much of the containers traffic were transported by truck due to the lack of unavailability of rail freight services.



Source: Forest Association of Niassa

Table 4-4: Estimated Forest Industry Demand for Freight Services

Containers Required (40' TEUs)	2,626	16,842	108,000	195,455
Average Number of Trucks per day	7.2	46	296	536
Average Unit Trains per day (CDN)	0.28	2	12	21
Average Unit Trains per day (Other)	0.10	1	4	8

Source: Forest Association of Niassa, Consultants Analysis, February 2010

Freight Service Demand	2015	2020	2025	2030

Mining Industry

In addition to the challenges cited above CDN railway also faces challenges from the mining industry. The medium- to long- term production of coal by the mining industry in Tete Province will further compounded both the challenges for both CDN's railway and Nacala Port in terms of the ability of railway to meet the demand for coal exports in 2010.

In an effort to provide the necessary rail network capacity some coal exports originating in Tete Province will transported via the Sena Railway line to Beira Port. The Sena Railway is a 320-kilometer line that is currently being rehabilitated by Rites of India and will be completed by 2015. It is expected that coal export volumes via the Sena Railway are will be about 6 million tons per year. Of this amount, about 4 million tons will originate from Vale's mining operations and the remaining 2 million tons from Riverdale operations. And as Vale and Riverdale coal operations increase to full capacity their output is expected to be on the order of 11 million tons for Vale and between 4 to 6 million tons for Riverdale. Due to line capacity of about 8 to 9 million tons on the Sena Railway line and the limited capacity of Beira Port, routing coal shipments along the Sena line is not expected to be a long-term solution for coal exports from Tete Province. This is because Beira Port, which has a capacity of 5 million tons is not a deep-water port. The port is also prone to silting and thus, only smaller vessels can dock at Beira. Beira Port also requires frequent dredging to address the siltation problem. This is further compounded by size of vessels that can dock at Beira Port due to its channel's 8-meter draft.

Alternative Coal Export Routes

Although they appear less promising, other transport solutions are under consideration by the mining industry to route coal exports from Tete Province. Among those being investigated are inland water transport shipments on the Zambezi River. This alternative involves using barges to ship coal down the Zambezia River to the mouth of the Indian Ocean at Chinde. The two main problems with this alternative appear to be the uncertainty of the river water level during several months of the year that would restrict exports; (ii) high dredging costs for the river, otherwise barges would have tie up at a marine dock in the Indian Ocean, (iii) limited coal volume that could be shipped given the infrastructure that would be needed; and (iv) the environmental concerns relating to dredging and establishing an off-shore port/ dock in the Indian Ocean

An alternative route for coal exports is the Nacala Corridor, which involves the use of CDN railway and the Nacala port. The line capacity of the CDN railway from Entre Lagos to the Nacala Port is 9 million tons. It is planned that additional coal exports of some 5 to 7 million tons will be routed to the Nacala Port via CDN railway (Nacala Line). However several key sections will require significant rehabilitation. Coal shipment via CND railway to the Nacala Port also present challenges although not insurmountable. To do so requires construction of section of railway that runs northeastwardly around the Bay. A coal terminal will be built with two mineral berths on the opposite side of the bay from the existing Nacala port at Nacala Vehla.

Routing coal shipments from Tete Province to the Nacala Port will have an enormous impact on the Nacala Corridor, rail freight sector, and indeed on the port itself as both

CDN railway and the port expand their operations to accommodate the projected dry bulk cargo. The mere volume coal and forest product likely produce intense competition between the major shippers for rail freight access. Should such competition does come about it may require a regulatory intervention to allocate line capacity or trackage rights to shippers in order to avoid bidding up tariff rates or to prevent the railway from exerting monopoly pricing.

Nacala Rail Freight Capacity and Demand

By year 2020 forest and wood products (e.g., poles, sawn timber, pulp and paper, wood chips and engineered wood) and coal will command the largest share of international traffic using the Nacala Corridor. Should the projected forest products and coal freight traffic materialize, it is unlikely that the existing line capacity of CND railway (about 9 million tons) will be adequate to transport the projected freight demand.

Table 4-5 Commercial Rail Freight Demand by Major Commodities (in '000 tons)

Cargo Type	2015	2020	2025	2030
Forest and wood products	0.577	4,300	6,000	6,000
Coal		5,000	7,000	11,000

Source: Forest Association of Niassa, Riverdale and Vale

Because of the volume and type of cargo (dry bulk and containers) being projected, additional railway capacity will be needed. Increasing the transport supply is likely to necessitate two things: (i) building a new dedicated coal freight line that can handle higher capacity loads such as longer trains (50 plus wagons) and larger wagons of 65 net tons and (ii) operating primarily block or units trains of high capacity coal hoppers and containers trains.[11] We should also note the rail freight traffic in Table 4-5 above is the incremental demand, and is in addition to some one half million tonnes of additional transit traffic projected to originate in Malawi and Zambia, as well as the normal growth in domestic traffic of some 245,000 tons.

Banana Export Demand

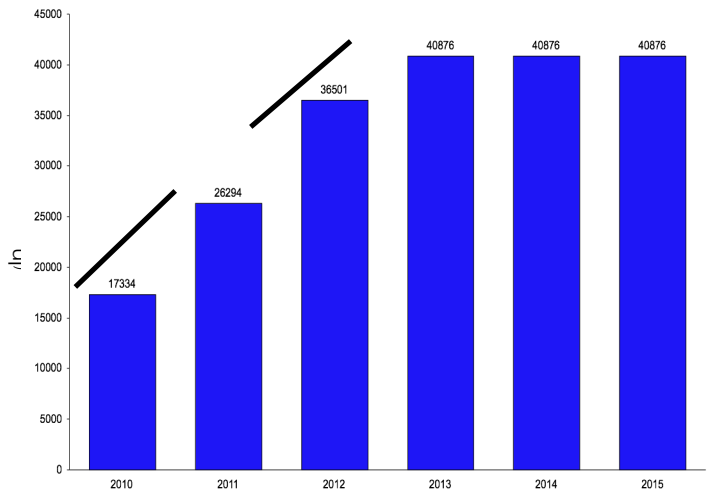
Another major economic development project in the Nacala Corridor is the Matanuska banana plantation in Nampula Province. Matanuska is investing USD 50 million to develop a 3,000 hectare banana plantation that includes several major infrastructure features. The plantation will include: a dam with a 55M m^3 capacity, a pumping stations, packing Stations, warehouse, a workshop; administrative offices, staff houses and social

[11] As noted elsewhere in this Assessment Report, CDN railway at present is constrained by the number and length of passing loops on its railway network, which permits only1,300 wagons per train.

facilities i.e. a schools and medical clinic, a plantation road system; an electrical and water network, etc.

Although demand for existing container cargo will continue to increase at a rather robust pace, the section of the Nacala Corridor between Nampula and Nacala Port will be driven largely by the export of bananas from the Matanuska plantation in the near term. At full production Matanuska plans o ship 100 (40-foot reefers) containers per week or 5,200 TEUs per year. This amounts to 10 percent of the Nacala Port's container throughput at current levels. The CAGR for Matanuska Export volume will grow at an annualized rate of 33.1 percent over the next four years and will level off thereafterwards slightly less than 50,000 tons Also, this will make Matanuska one of the largest agricultural commodity exporters through the Nacala Port in the next three to five years. Although banana exports will be transported to the Nacala Port by road, the main impact on transport logistics and trade facilitation will be at the entrance to the Nacala Port where scanning and weighing of containers will take place, which raises the possibility for congestion at the port's gate. Additionally, the port will need to have the capacity to absorb this additional demand without creating port congestion and longer container dwell times.

Exhibit 4-3: Projected Bananas

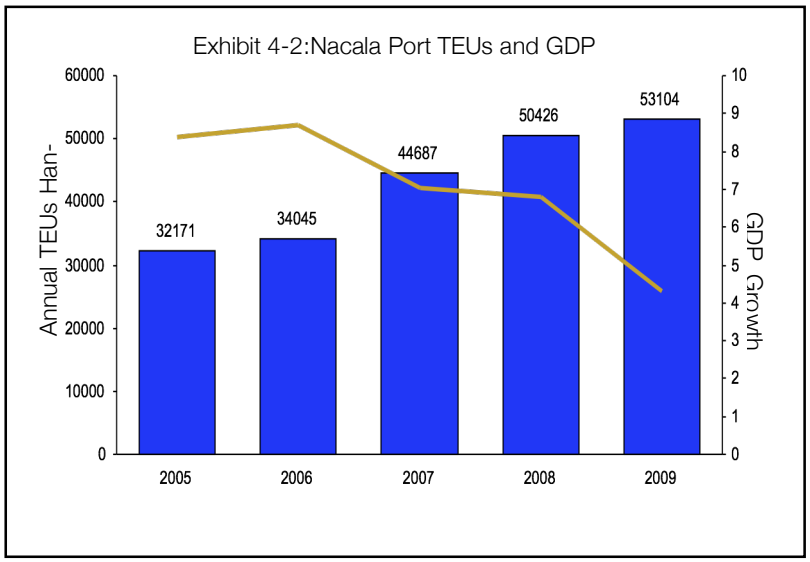


Source: Matanuska and Consultants'

Nacala Port

The Nacala Port is Mozambique's third largest port. The port is situated on the south side of Baia de Bengo, a large sheltered bay with an 800m wide entrance and with a depth of 60m. Longitude and Latitude Latitude: 14° 27'S Longitude: 40° 40'E. The Nacala Port is a natural, deep-water harbor that requires no dredging. Additionally, because the port the port is large enough for vessels to maneuver the port can accommodate any size ships to berth.

The Nacala Port operates under concession agreement between Corredor de Desenvolvimento do Norte, S.A.R.L (CDN) and the Government of Mozambique. The Government of Mozambique awarded the to CDN in January 2005 following an international tender. Under the terms of the concession agreement, CDN has the right to operate the port for a 15-yeam period and an option for a second 15-year period should CDN wishes to exercise its option.



Nacala Port Throughput

As shown in Exhibit 4-2 below, in the past eight years with the exception of year 2005 where there was a slight drop-off the Nacala Port has shown a continued although unremarkable increase in the port's throughput from 743,000 metric tons in 2001 to some 1,046 million metric tons in 2008, representing an compound annual growth of 2.25 percent.[12] A quick analysis of this throughput reveals that between 2001 and 2004 the period when the Nacala Port was still under public sector management annualized traffic grew at pace of about 5.2 percent. In to the period from 2005 to 2008 after the port was concession the pace of the port's annual throughput slackened to about 4.6 percent per year, although total volume continued to increase.

General Cargo

The Nacala Port has a general cargo capacity of 2.4 million tons per year but whose capacity utilization has been well under that mark. Over the five years, capacity utilization for general cargo has ranged from 42 percent up until last 2009 when it peaked to 52 percent.

[12] As noted elsewhere in this report 2005 was a transition year for the Nacala Port in which CFM began to re-linquish control of the port to CDN, a private company who was awarded a 15-year concession contract to manage the Port of Nacala. This may account for some of the fall off.

Container Traffic

Table 4-6: Nacala Port Traffic by Type and Number of Vessels

	2005	2006	2007	2008
Cargo	263	281	297	263
Ships Docked				
General Cargo (in '000 toms)	333.9	416.5	475.7	356.4
Containers (in '000 tons)	415.7	393.1	476.2	519.6
Dry Bulk cargo				
Liquid Bulk	102.2	140.5	148.3	170.0

As illustrated in Exhibit 4-7, the Nacala Port has had a steady rise in its container traffic since 2005, which is consistent with worldwide demand. Between 2005 and 2009, container throughput at the Nacala Port grew at a compound annual growth rate (CAGR) of

Table 4-7: Nacala Port Traffic by Operator and Cargo Type (in '000 metric tons)

Provider	2005	2006	2007	2008
CFM				
General Cargo	11.7	-	-	-
Containers	-	-	-	-
POL	102.2	140.5	148.3	170.0
Sub-total	113.9	140.5	148.3	170.0
CND				
General Cargo	333.9	416.5	475.7	356.4
Containers	414.7	393.1	476.2	519.6
Sub-total	748.6	809.6	951.9	876.0
Grand Total	862.5	950.1	1,100.2	1,046

Source: CFM Operational Performance Reports

10.5 percent. This compares favorable to Mozambique's GDP growth rate, which averaged approximately 6.4 percent over the same period.[13]

[13] See International Monetary Fund, World Economic Outlook Database, October 2009, www.imf.org

Table 4-8: Port Throughput Comparisons

Port	2005	2006	2007	2008	CAGR
DURBAN	1,899,065	2,198,600	2,479,232	2,642,165	8.86
CAPE TOWN	690,895	782,868	764,005	767,501	2.66
MOMBASA	436,671	479,355	585,367	615,733	8.97
PORT ELIZABETH	369,759	392,813	422,846	423,885	3.47
DAR ES SALAAM	287,948	256,391	333,980	373,548	6.72
DJIBOUTI	195,250	224,896	294,902	356,462	16.24
EAST LONDON	49,338	38,308	41,986	57,418	3.86
RICHARDS BAY	5,179	4,191	4,021	9,350	15.92
NACALA	32,177	34,045	44,687	50,246	11.79

Source: Port Management Association of East and Southern Africa

Additionally, despite the continued growth in container traffic, the Nacala Port still has substantial headroom before it achieves full capacity. The port container terminal has a capacity of 100,000 TEUs. Since 2005, the capacity utilization has ranged from about 32.2 percent to 53.1 percent, averaging some 42.9 from 2005 to 2010.

Container Terminal Handling Charges

Discharge	275.00	205.00		
Loading	135.00	175.00	275.00	205.00
Stuffing or Stripping	Palletized goods direct (1 consignee)	Palletized goods indirect (1 consignee)	Palletized goods direct (>1 consignee)	Palletized goods indirect (>1 consignee)
Stevedoring	100.00 Container (40 Ft)	120.00 Reefer	5.50 Empty	6.20 Abnormal
Storage Discharge	Empties 65.00	Reefer 75.00	With goods < 7 days 60.00	With good > 7 days 75.00
Per day Charge Loading	6.00 65.00	45.00 75.00	6.00 60.00	7.00 75.00
Miscellaneous Transshipment	Reception of Empties 120.00	Removal of Containers 85.00	Delivery of Empties 80.00	Lack of Loading Discharge List 120.00
Goods handling	35.00 Container (40 Ft)	60.00 Reefer	35.00 Empty	Abnormal

Table 4-9: Nacala Container Terminal Tariffs (in USD)

Source: SDV-AMI

As noted by some stakeholders who rely on the Nacala Port to export their commodities, port charges for both containers and general cargo are substantially higher at the Nacala Port and indeed, at other Mozambique ports than in other regions of the world. This phenomenon is not entirely surprising when East Africa, Southern Africa, West Africa regions are benchmarked against the rest of world as Table 4-9 indicates.

Based on a study by the World Bank, container handling charges in sub-Saharan Africa are higher than those of those in regions of the world by a factor of two more for the same services. As Table 4-8 indicates, in the Nacala Port, container handling costs are USD 175 compared to USD 181 to USD 269 in Durban, one of the most efficient ports in all of sub-Saharan Africa. This notwithstanding, container handling costs at Nacala Port are still 1.4 times as expensive compared to the rest of the world.

Structure of Terminal Handling Charges

As it is the case with most ports the cost for handling containers or bulk commodities are based published tariff rates. The Nacala Port's published rates for its container operations consist of six categories of charges that include rates for: (1) stevedoring; (2) goods handling discharges; (3) goods handling loading; (4) storage; (5) stuffing and stripping and (6) miscellaneous charges. Presented in Table 4-10 below is a summary of the tariff schedule. For a complete schedule of the Nacala Port's container terminal handling charges see Appendix B.

As Table 4-9 above indicates the Nacala Port charges different rates for different types of containers. For example, the costs of loading a 40-foot temperature controlled container tend to be higher than a standard 40-foot non-refrigerated container. Reefers or refrigerated containers are used for shipping perishable goods such as fruits and vegetables, fish, poultry, etc.

Terminal Handling Chargers Cost Analysis

Terminal handling charges typically consist of the cost of moving and positioning a container for loading, off-loading or storage one the container enters the port gate of have been off-load from a vessel. However, producing an accurate comparison of tariffs among different ports is not always a straightforward forward exercise. This, in large measure, can be attributed to the diverse operating systems and port regulations, nomenclature and tariff structure, ancillary charges, exchange rate differences, pricing of stand-alone agreements with shippers, the confidentiality between the port operator and the shipper, as well as a number of other factors. For purposes of this assessment, our focus is on port terminal handling charges for containers and other charges such as those to be charged by Mozambique Revenue Authority for scanning and weighing containers.

Comparison of Terminal Handling Charges

Typically, shipping lines defined terminal handling charges (THCs) not as surcharges but rather as ancillary charges. THCs, which are non-freight charges (i.e., do not cover the cost of freight by sea, road, inland waterway transport, or rail) represent the additional increase in costs for port's container operations such as, for example, moving containers. Based on the review of the literature on terminal handling charges, wide-variations in THCs are apparent across regions and indeed within regions and also within countries.[14] Moreover, with exception of some Asian countries where national governments tend to exert pricing influence to keep terminal handling rates low, there are no uniform terminals handling charges. THCs rates also diverge between such countries as the United States and Canada, as well as between Europe and the Middle East region. Additionally, THCs in Asian countries are consistent across the carriers, but vary by container size. Also the handling charges at ports in Sub-Saharan Africa tend to be higher than those in other regions. Widespread rate variation also exists within for example the countries of East and Southern Africa. THC rate variations also exist among the four main ports in Mozambique (Maputo, Bearer, Nacelle and Pemba ports).

Table 4-10: Container Terminal Handling and General Cargo Costs Benchmarks

Region	Container Handling Costs Ship-to-Gate (in USD)	General Cargo Over the Quay (in USD per Ton)
East Africa	135-275	6-15
Southern Africa	110-243	11-15
West Africa	100-243	8-15
Nacala Port	85-275	6-7
Durban Port	181-269	N.A.
Rest of the World	80-154	7-9

Source: The World Bank and SDV-AMI

Scanning and Weighing Containers at Nacala Port

Although at the time of this writing the container scanning service at the Nacala Port had not yet been fully deployed and operational despite the considerable outcry that has ensued. The issue relates charges for scanning and weighing containers at Mozambique's ports, especially at the Nacala Port. Some of this outcry has been uninformed and yet other based on speculation. By way of background, the adopted a policy of scanning and

[14] See "Terminal handling charges during and after the liner conference " October 2009

weighing container that pass through the country ports and baggage at the airports. To implement this policy, Government of Mozambique launched a tender in 2005 for a private firm to provide Customs related services.

Kudumba Investments, Lda, a Mozambican private firm, as one of five private firms participated in a Government of Mozambique's open tender to provide scanning services on behalf of Mozambique Customs Authority under a Public Private Partnership (PPP) arrangement in the form of a Build Own Operate Transfer (BOOT). Mozambique Revenue Authority will retain their prerogatives for the core functions of the inspection, selectivity and risk assessment, image analysis and decision making. The scope of the tender was to provide non-intrusive inspections of goods, vehicles, people, luggage and other Customs inspection services. It also provided for Kudumba to assist Customs in improving entry and exit control of people, goods and means of transport, reduce tax evasion, increase Customs revenues by preventing false customs declarations, as well as improve security and prevent terrorism. Kudumba was the successful bidder for the tender and was awarded a concession agreement by the Government of Mozambique in 2006 covering the ports, border posts and airport for a 20-year term on concession fee basis.[15] Under the terms of the concession agreement, Kudumba was contracted to procure, install and operate the scanning program as well as ensure the transfer of skills and technologies to Mozambique Revenue Authority's officials and staff.

As for the stakeholders concerns, the essence of their outcry has been centered on two points. First, it is alleged by some stakeholders that the cost of scanning containers at USD 60 per containers places Mozambique firms in a non-competitive export position for their products on the international market. And while it is true that scanning costs at the Nacala Port once the program is implemented will likely be higher than in other regions of the world the cost is a policy determination by the Government of Mozambique. It is not a port charge set by CDN as the operator of Nacala Port. This is an important distinction to make because it has often gone unmentioned in the concerns expressed by stakeholders.

Secondly, it is has also been the concern of some stakeholder that the scanning operations will involve scanning 100 percent of the containers at the Nacala Port. Follow-up interviews with the operator, Kudumba, confirm this as their intention. Nonetheless, the assessment team investigated this issue during the field visits. We held interviews with both senior officials of Mozambique Customs Authority in Nacala and with the senior manager of Kudumba responsible for installing and operating the scanning program at Nacala Port. We found no evidence to substantiate this concern. In fact, Mozambique's Customs clearly stated the policy is to combine scanning with a risk assessment to determine what number of containers to scan if any. Although recent U.S. laws currently

[15] Scanning services under a concessions agreement are also being provided by Kudumba Investments, Lda at the each of Mozambique's major airports.

mandate scanning 100 percent of containers by 2012, this practice is in conflict with other parts of the world. The convention is that the frequency and number of scans are based on a risk assessment of individual shippers or consignees. The procedure it is not arbitrary. In most countries, including the U.S. as least prior to 2008, less than 20 percent of containers are actually scanned, and in fact, when combined with a proper risk assessment the percentage of scanned containers tends to be less than 10 percent.

Table 4-11: Nacala Port Monthly Performance in 2009

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Container Vessels	8	8	13	8	8	4	9	6	10	6	8	8	8.0	96.0
Vessel occupation measured of the wharf (%)														
Bulk- Grains	63.1	80.3	24.2	34.2	21.9	20.8	96.5	23.8	26.7	80.3	78.4	67.2	124.9	1499.0
General Break Bulk-Cargo	8.0	29.3	4.8	10.1	6.1	4.4	7.9	5.1	2.9	8.9	3.7	1.1		
Bags		42	88		30		53	42	37	34			27.2	326.0
P.O.L	17.8	48.9	22.4	19.5	28.0	14.6	44.2	26.9	33.9	28.8	26.1	24.3		
Other		24	51	23		37		6			14		12.9	155.0
Ship arrivals by vessel type (Number)														
Container Vessels	3	6	7	10	11	10	10	8	8	12	13	12	9.2	110.0
Bulk- Grains	2	1	2	5	1	2	2	1	1	3	3	2	2.1	25.0
Tankers	6	5	4	5	5	3	7	7	9	4	4	5	5.3	64.0
Break Bulk-Bags		5	1		2		2	2	1	2			1.3	15.0
Other	2	1	1	1		2		1			1		0.8	9.0
Average time of permanence of ships in the port (hours)														
Container Vessels	76.6	79.8	71.0	63.7	58.2	60.1	56.8	111.7	113.7	154.2	115.0	99.2	88.3	1060.0
Bulk- Grains	386.3	324.7	99.9	94.4	160.7	154.0	251.6	128.0	44.2	110.6	117.6	93.9	163.8	1965.8
Tankers	45.7	165.9	170.8	53.5	55.2	34.3	132.3	63.6	41.3	54.0	74.0	49.3	78.3	940.0
Break Bulk-Bags		326.1	70.1		134.0		89.5	243.6	173.1	156.7			99.4	1193.1
Other	48.0	9.7	17.3	160.7		52.4		112.3			73.3		39.5	473.6
Average time of mooring of the ships (hours)														
Container Vessels	72.7	72.7	49.9	49.3	30.0	30.0	49.7	100.4	102.1	102.4	86.9	80.7	68.9	826.8
Bulk- Grains	383.9	286.0	93.3	83.9	158.9	120.2	210.0	68.7	38.1	101.2	105.2	79.7	144.1	1729.0
Tankers	21.4	70.4	40.4	28.1	40.3	35.1	45.5	27.1	27.1	51.9	46.9	34.9	39.1	469.1
Break Bulk-Bags		309.4	65.9		132.0		75.3	231.3	170.9	154.5			94.9	1139.3
Other	45.0	7.9	14.1	158.9		38.2		68.7			70.3		33.6	403.0
Average time of operation (hours)														
Container Vessels	64.1	57.7	38.0	28.2	18.7	52.8	40.8	85.6	90.9	90.0	66.3	73.5	58.9	706.8
Bulk- Grains	376.8	283.5	78.0	66.3	149.0	120.2	199.5	65.5	31.0	95.8	99.4	70.8	136.3	1635.7
Break Bulk-Bags		285.9	55.7		117.1		69.6	204.5	162.2	139.0			86.2	1033.9
Other		6.3	3.0	149.0		15.2		65.5			27.7		22.2	266.6
Vessel Productivity/hour (Gross-Berthing)														
Container Vessels	7	8	10	4	5	7	8	5	9	5	6	7	6.8	81.0
Bulk- Grains	61	87	121	110	76	54	91	226	210	102	111	100	112.4	1349.0
Break Bulk-Bags		39	76		26		49	37	35	30			24.3	292.0
Other		19	11	21		15		6			5		6.4	77.0
Vessel Productivity/hour (Liquid-Operation)														

Source: CDN and Consultants Analysis, March 2010

Thirdly, some stakeholders have also expressed concerns about both weighing containers and the cost of weighing. Although weighing containers in some Asian countries is free, charging a fee is not unique to the Nacala Port and can be found in other ports in various regions of the world. This is an administrative procedure to address false declarations on Customs documents.

Finally, a general dismissive attitude towards scanning has emerged in Mozambique, which has also been expressed by some Nacala Corridor stakeholders. To set the record straight we believe this attitude is misguided. Because scanning containers as a Customs procedures plays an important role in security and preventing terrorism, preventing smuggling of goods and contraband, and preventing revenue losses due to false declarations, etc. Additionally, it should be noted that the World Bank along with U.S. Customs, the European Unions and other donors working with importers, exporters, producer and consumers, Chambers of Commerce, etc. have gone to considerable length and at substantial investment to reform Customs administrations around the world. Such efforts have focused on many aspects of trade facilitation, including providing financing and training for countries to integrate scanning and apply advance risk assessments methodologies in trade facilitation regimes to procuring scanning equipment to improving security and strengthening Customs administrations.[16]

Nacala Port's Performance Analysis

A persistent yet addressable problem affecting port efficiency at the Nacala port is the lack of equipment such as container gantry cranes. Nacala Port's productivity is further diminished by the port's reliance on ship's gear for loading and unloading containers.17 Productivity at Nacala Port is 6 moves per hour. This is remarkably low productively but is in line with many other ports in Africa where there is strong reliance on ships' gear, again due to a lack of equipment. As such, productivity tends to be in range of 7 to 10 moves per hour.

[16] The World Bank established a Trade and Transport Facilitation Project for Southeast Europe in the early 2000's for the purpose of Customs Administration Reform; Trade Facilitation Development; Improvement in Customs Information Systems, and Program and Project Implementation, all with the combined objective of improving trade volumes, reducing the cost of trade, increasing Customs revenues, increasing declarations and improved transparency, etc. As a component of this project U.S. Customs provided training in scanning and risk assessments to each of the five country Customs administrations. More recently in 2009, the World Bank launched a Trade Facilitation Facility to improve lending and to help developing countries improve their competitiveness through concrete improvements in their trade facilitation systems and by reducing trade costs. See www.worldbank.org.

[17] According to the World Bank's ACID report this has been a widespread and prevailing problem in many ports in Africa.

It has also been observed that when cranes are available, the number of container moves per crane hour is usually between 10 and 20, compared with between 20 and 30 moves hour in the world leading ports. Durban Port whose container moves per crane hour are between 15 and 20, should be the benchmark for sub-Saharan African ports, and indeed for the Nacala Port and other Mozambique ports.

Region	Truck Cycle Time	Container Dwell Time
East Africa	3.5 Hours to 1 day	5 to 28 days
Southern Africa	2 to 12 hours	4 to 8 days
West Africa	6 hours to 1+ day	11 to 30 days
Nacala	6.5 hours	20 + days
Beira	6.8 hours	20 + days
Maputo	4 hours	22 days

Source: The World Bank

Table 4-12: Average Port Delays

Other measures of performance at the Nacala Port are truck cycle times and dwell time. Truck cycle times measures the efficiency of trucks dropping off and picking up containers at the terminal. Dwell time is the average time spent in a terminal. Both are indications of landside container handling performance. According to the World Bank a typical target for an efficient truck cycle is one hour. Average cycle times at Nacala Port are indicated in Table 4-12 above. The performance of the Nacala Port with respect dwell time needs to be improved quite significantly to be line with its peers in Southern Africa.

Table 4-13: Sub-Saharan Africa Port Performance

Port	Average Moves/Hour	Operator	Equipment
Abidjan	20	PPP	Gantries
Dar es Salaam	20	PPP	Gantries
Douala	20	PPP	Gantries
Toamsina	18	PPP	Gantries
Djibouti	17	PPP	Mobile crane
Durban	15	Public	Gantries
Tema	14	PPP	Gantries
Port Elizabeth	13	Public	Gantries
Apapa	12	PPP	Gantries
Capetown	12	Public	Gantries
Mombassa	10	Public	Gantries
Dakar	10	PPP	Mobile crane
Maputo	10	PPP	Gantries
Beira	9	PPP	Gantries
Port Sudan	8	Public	Gantries
Walvis Bay	8	Public	Ships gear
East London	8	Public	Ships gear
Luanda	8	PPP	Ships gear
Matadi	7	Public	Ships gear
Pointe Noire	7	Public	Ships gear
Nacala	6	PPP	Ships gear
Average	12.3		

Source: World Bank SSTAP, 2008 and CDN Consultants Analysis

According to a port performance study conducted by the World Bank of twenty ports in sub-Saharan Africa, the average container moves per hour is 12.3 with a range to 7 to 20 container movers per hour. By comparison, the Nacala Port's container handling performance is 6 container moves per hour and outside the range in the World Bank's study. See Exhibit for an illustration. Typically, according to the World Bank, container gantry cranes have a theoretical output of 35 to 40 moves per hour or more. However, the commercial output, depending on local conditions, varies usually from 15 to 35 in average, with peak performance nearing theoretical performance. This indicates that the Nacala port is well outside of the range of the operations of a commercial port despite being operating private management.

Although many factors influence container handling, equipment is one of the key components. As shown in Table 4-13 ports that rely on ship's gear, which Nacala Port does, instead of gantry or mobile cranes for container movements tend not to perform as

well as those with gantry and mobile cranes. Nacala Port presently operates with one quayside crane that is often outs of service and seven mobile cranes. See Chapter on Infrastructure.

5.0 Constraints to Transport Logistics and Supply Chain Efficiency

Introduction

Previous chapters of this study assessed the infrastructure assets and the availability of transport logistics services to support the supply chain in the Nacala Corridor. This Chapter identifies the main constraints inhibiting the efficient functioning of transport logistics in the corridor and proposes some possible interventions. The Chapter addresses the focus areas of this assessment namely, infrastructure, the enabling environment, the transport industry and the corridor users. As indicated in Chapter 4, each of the transport systems (the road network, the railway and ports systems) that comprise the Mozambican segment of the Nacala Corridor face medium- and log-term challenges with enormous implications for transport logistics and supply chain efficiency. Highlighted in the sections below are such challenges. These challenges should not be taken as mutually exclusive but rather as a reinforcing set of constraints that if not address will continue to degrade the efficiency of the transport logistics system and the supply chain in the Nacala Corridor. Solving one or two of these constraints will not, in and of itself, be sufficient. Rather, to address these constraints a comprehensive approach is necessary. It requires an approach that takes into account all of the critical aspects of transport logistics. The include, inter alia, the enabling environment; the physical infrastructure; operators and the quality of road and railway and freight services; port operations; users such as freight forwarders and clearing agents, shippers and receivers; rail and port operations, and clearing agent, trade facilitation and how logistics information is managed, etc.

Enabling Environment

The enabling environment also plays an important role in corridor development especially regarding institutional arrangements, governance and facilitation, legal and regulatory framework, and indeed, public policy. The national Government's role, particularly the Ministry of Transport and Communications (MOTC), in developing the Nacala Corridor

derives from its broad public policy mandate, Mozambique laws, and national development priorities. Additionally, MOTC also pursue regional cooperation efforts with neighboring landlocked Country counterparts and coordination as well as with regional institutions such as the New Economic Partnership for Africa (NEPA), the Common Market for East and Southern Africa (COMESA), the Southern Africa Railways Association (SARA), and the Port Management Association of East and Southern Africa (PMAESA). Each of these institutions provide a platform to address issues related to infrastructure development in support of trade and development, regional development, and creating a landscape that promote efficient operations of each member country's railway and port systems and road network.

At the provincial level in Mozambique, the strategic economic plan serves as the guiding document to promote economic and social development in Nampula and Nissaa Provinces.

- ***Corridor Development Strategy:*** As indicated above many opportunities are available at the national level through bilateral cooperation and coordination with regional institutions to discuss broad policy issues affecting Nacala Corridor. Similarly, at the provincial level, regular meetings of the Provincial Governors offer the same promise. However, it appears that no one Mozambique government agency or institution either at the national or provincial level has the primary responsibility for strategy development and strategy execution for the Nacala Corridor, and thus the responsibility to drive public policy. And to the extent such institutions as CPI, and GAZEDA are promote Nampula and Niassa Provinces as attractive investment areas, their marketing and promotion does not appear to be related developing the Nacala Corridor as a logistics corridor or as platform for export trade and development, but rather as an investment destination.

- ***Leading Corridor Development:*** Notwithstanding the lack of a concise strategy for corridor development, which is more of a public policy issue, another compelling issue is the lack of a clear institutional structure with the mandate to lead, manage and promote the Nacala Corridor as logistics corridor. Moreover, for this reason in a broader institutional context, the corridor has not benefited despite its national and regional importance to extent it should have. Nor has the Nacala Corridor develop its infrastructure assets to take advantage of the strategic location of its port, its railway network and road system linkages that extends more than a thousand kilometers.

- ***Lack of a Regulatory Structure:*** Acting as an agent of the Government of Mozambique, the equity partner to CDN in both the Nacala Port and CDN North

Railway concessions, CFM has been place in the inevitable conflict of interest position of trying to regulate CDN while at same time participating in business operations and policy decisions. Potential conflicts of interest situations have emerge in several other concession arrangements in which CFM has the dual role of technical regulator and agent for the equity partner. Notwithstanding, the potential conflict of interest is a more compelling issue of what structures exist to regulate concessions whereby monopolies are most apparent such as the ports and railways. Both the Nacala Port and CDN railway exert monopoly power in rate setting, service levels, etc. In addition, although the concessions agreements are purported to have performance clauses, which we have not been privy to. Typically, it is the role of the regulator to ensure that the terms of the concession agreement are adhered to and exact sanctions if they are not. CFM as the Government agent simply cannot play this role. The absence of an independent regulator also leaves the Corridor users without a forum to lodge a formal complaint or adjudicate disputes that might arise the port or rail operator or terminal handling charges or freight tariffs. The Government's CFM agent is simply not in a position to wear both the hat of a regulator and that of an agent for the equity partner. The potential for CFM's position could be compromised such as in the case of a train derailment where a clear financial loss occurs and cause established in order to avoid future derailment.

- ***Trade Facilitation:*** Another area in which the enabling environment can enhance Nacala Corridor logistics is trade facilitation. Reviewing Customs documentation and inspecting export and import cargo is a major component of the logistics chain. This process can and often does contribute to considerable delays and costs in the movement of containers at the Nacala Port. Corridor users are also beginning to express increasing frustration not only with container dwell times but also with added costs of weighing and scanning containers performed under a concession agreement between Customs and the concessionaire Kudumba. (See Chapter 4.0 for a fuller discussion.) Mozambique Revenue Authority has not initiated any communications between the corridor users and Customs to discuss the procedures of scanning and weighing containers or the justification for stetting the charges at a certain rate.

The above issues taken together highlight the impact that the lack of robust enabling environment underpinned by a lack of a clear strategy and the lack of a supportive institutional structure can have on a corridor.

Road Sector

The primary constraint to transport logistics in the road sector is the poor condition of the classified road network infrastructure, particularly the secondary and tertiary roads, whereby between 30 and 35 percent of the network infrastructure is in poor condition—further compounded by the fact that major sections of the road network are practically impassable during the rainy season. The impact of these logistics constraints is inefficiencies arising from higher vehicle operating costs for road freight operators, especially during the rainy season.

- ***Poor road surface condition:*** The classified road network in Nacala Corridor is generally not in the condition necessary to facilitate export or import trade. In due to poor condition of the network it in effect imposes a tax on trade. The roads are inadequately maintained and are under funded. During a recent condition survey, ANE found that less than a third of the total classified road were found to be in good condition, and the situation gets progressively work when considering the secondary and tertiary road network. This situation in turn results in poor operating conditions for vehicles, resultant regular breakdowns of vehicles, high cost for vehicle repair, and inadequate road safety.

- ***High Transport costs:*** The condition of the road network in the Nacala Corridor continues to be unsatisfactory and is major constraints to transport logistics in the corridor. Poor quality roads result in inefficiencies from slower speeds, and thus, longer travel times, which further increases costs to road freight operators. During the field surveys road freight services companies indicated that because of the poor condition of the road network, which limits their market penetration, they often charge three to four times their normal rate. Such cost increases are passed on the producer and consumers in terms of final demand.

Railway Sector

The railway sector logistics are constrained by a myriad of interrelated problems, among which include: (1) the physical infrastructure; (2) rolling stock and equipment; and (3) train operations. These constraints result in low traffic volume and traffic diversion such as in the case of Malawi's transit traffic due to low service level, lack of service, low speeds, long transit times, low productivity, poor locomotive and wagon availability and utilization, and low operating and financial performance.

- ***Physical infrastructure:*** The poor condition of the Nacala Corridor railway network, whereby key sections of the network such as the Cuamba-Lichinga section which is some 267 kms and the Cuamba-Entre Lagos section 77 kms are constraining rail freight logistics. The poor condition of the track has reduced train speeds to an average of less than 25 kilometers per hour; This track's maximum

average design speed of 60 kilometer per hour when the track is in good condition. These two railway sections alone, amount to some 31 percent of CDN's entire railway network in Mozambique, and require extensive rehabilitation. This has a direct impact on CDN railway network capacity and the ability to provide efficient railway freight logistics services. The logistics impact of CDN's railway poor track conditions can also be illustrated by the length of time it takes a loaded freight train to travel from Lichinga to the Nacala Port, a distance of 795 kilometers. At an average speed of 25 kilometers per hour it will take 32 hours, compared to slightly over 13 hours when the train is moving at the track maximum average speed of 60 kilometers per hour. This is the equivalent of arriving at the Nacala Port in a half day versus taking more than a full day.

Further, compounding the railway logistics problem is the number of passenger stations on CDN's railway network. There are some 22 stations on the railway network that is about one station every 40 kilometers. Because they impact line capacity, passenger stations and along with the number of passing loops restrict running non-stop trains from, for example, Lichinga to Nacala Port due to train meets.

- ***Track configuration:*** Further compounding the railway logistic problem is the network track configuration, which is a single-track system. The track configuration is a logistic constraint, although less so for container traffic because containers can be double stacked on flatcars, and thus have higher railway throughput. The track is a single track configured with a number of passing loops. Passing loops allow an oncoming train to pass while the other train stops. These passing loops, which are some 650 meters in length, limits the number of wagons and locomotives that can make up a train. The track configurations allow double heading of locomotives that is two locomotives plus per train and up 34 wagons per trains to allow an oncoming train to pass. So the mere physical infrastructure i.e., single track and passing loops restrict railway freight throughput. Longer triple headed train such as those in widespread use in Western countries simply could not run on CDN system unless operations were scheduled in such a way to prevent train meets. For example, all eastbound trains could run during the day and all westbound trains during the night, but even this type of operations will require careful and significant planning to avoid train accidents.

- ***Rolling stock and equipment:*** The lack of rolling stock and equipment such as mainline diesel-electric locomotives for traction and wagons for hauling such as flatcars and high sided hoppers also the constrains CDN's railway capacity to meet the freight traffic demand. The lack of equipment to align with current and projected commodity mix results in less freight. The current inventory of rolling

stock and equipment is simply not adequate to sustain a viable railway operation let alone meet the projected demand.

- ***Train operations:*** Both the railway's physical infrastructure and the rolling stock and equipment directly constrained by how CDN make-up and operate trains. As indicated above, the condition of the track, the number of passing loops and stations affect train speeds. They also constrain many trains can pass through a given section of track. CDN's offers a dedicated rail container service that consists of double heading (2) locomotives and a trailing load of 1,000 tons transported on 25 wagons/flatcars. And although this is a far more advanced train consist than running mixed train, this is not the most efficient uses of the transport logistics. A more efficient train operations, assuming the existing physical constraints and the availability of locomotive traction power, would be using double stacked containers on flatcars. This effectively doubles the trailing load from 1,000 tons to between 1,800 and 2,000 tons.

- ***Passenger trains:*** As previously, stated passenger trains consume line capacity that freight trains could be take up. CDN has already limited the amount of passenger service it offers, especially where alternative transport service such as bus service exists. A case in point would be the Nampula to Nacala railway section where CFM been virtually eliminated passenger rail service. Given the freight demand forecasts eliminating passenger rail service once the road network that runs parallel to the railway network is improved, the need to continue offering passenger is problematic.

- ***Line Capacity:*** Another medium to long-term constraints is line capacity. [18] And although line capacity at present is affected by the constraints cited above assuming these constraints can be addressed in the next three to five years even if the line capacity is be improved it will still be a constraint in the medium- to long-term. CDN will easily exceed its theoretical line capacity of an estimated 9 million tons by year 2015, given the forecast demand and export commodity mix of coal, forest products and transit traffic. Such transit traffic consisting of exports of wheat from Malawi and copper from Zambia, as well as imports of fuel and fertilizers. This is especially evident on the section between Cuamba and Nacala where the largest share of the line-haul export traffic of coal, forest products, dry and liquid bulk grain, which will have the highest demand for rail services. This suggests the need for an additional parallel track after 2020 to address the freight volumes.

[18] Line capacity is defined as the theoretical maximum number of train pairs per day over a route accounting for train signals if in use and passenger trains.

Nacala Port

Although the Port of Nacala under the management of CDN has shown positive financial results due to increased throughput over the past five years, the port needs to address a number of near- to medium-term interrelated challenges to sustain this performance. Among these are (i) the high cost of terminal handling chargers; (ii) low productivity of container operations; (iii) lack of port equipment; and (iv) long container dwell times. And although these challenges might appear counterintuitive to positive financial performance, it should be noted that the Nacala Port is: (a) in a strategic location to capture import and export traffic originating from and to its hinterland, (b) an unregulated monopoly as a port concession, and (c) sets its own tariffs irrespective of the price elasticity of demand.

- ***Terminal Handling Charges:*** Nacala Port's terminal handling charges are high relative to other regions such as Asia, Europe and North America but are in line with other ports in sub-Saharan Africa. In fact, Nacala Port container handling charges are in fact lower than the more efficient ports in South Africa such as Capetown, Durban and Port Elizabeth. What appears to be driving container costs at the Nacala Port are not the component or unit costs for such things as storage, wharfage, container movements, etc. but rather ancillary charges such as weighing and eventually scanning containers combined with operational inefficiencies such as container dwell times, extended storage time, etc. Each of these activities reduces port productivity and adds to logistics costs. Although the terminal handling costs at Nacala Port are high relative to other regions but are comparable to high performing ports in east and southern Africa, we found no evidence that port handling charges at Nacala Port had an impact on transport logistics in terms of diverting cargo to other ports.[19] Mozambique export commodity prices are determined by world market prices, and to the extent that terminal handling charges increase the costs of exports, this impact is most likely reflected in the margins commercial producers receive and not in their decision about either production or transport logistics. Additionally, because of the transport logistics and the increased prospects for congestion for both bulk cargo and containerized cargo, some commercial enterprises are considering alternative routes for their commodities. For example, Green Resources is investigating exporting some of their forest and wood products shipments through

- ***Lack of port equipment and use of ship's gear*:** This is one of leading factors driving low port productivity at Nacala Port, and indeed at ports in other regions of sub-

[19] The most notable case is Malawi's transit traffic, which in recent years has been diverted to Beira Port. This diversion has been due to transport logistics such at the poor condition of the CDN railway track on the Entre Lagos - Cuamba section and not the cost of handling cargo at the port.

Saharan Africa. Although CDN recently purchased eight (8) forklifts to assist with container movements, having only one shore crane, that is not operational for long periods during the year lowers Nacala Port's productivity. To counter this, the Nacala Port has taken to relying on ship's gear to load and off load containers. Moreover, while the use of ship's gear might be an immediate solution, it is not adequate to address the operational requirements of a modern port.

- ***Low productivity of container operations:*** One key performance indicator of the efficiency of a container terminal's operations is container moves per hour. The higher the number of moves the more the better the performance. The average number of container movers per hour of twenty ports in sub-Saharan Africa is about 12 containers mover per hour with a standard deviation of 4.6. The "best-in-class" ports in the 20-port study performed as a rate of 20 moves per hour. Such results are comparable to the low end of the range of 20 to 25 moves per hours that Western Europe, Asia and North American ports produce. By comparison, the Nacala Port averages 6 container movers per hour, which is outside of the range of the 20 ports in the World Bank study.

- ***Container dwell times:*** This is an important indicator of a port's performance because it is directly related to throughput and productivity. Dwell time is defined as number of days a container remains in the container terminal. Long dwell time constraint both port is productivity and throughput. During the field interviews in February Nacala Port customers indicated that excessive container dwell times was one of the major problems they experienced in using the port. Several users indicated that they have experienced dwell times in excess of 30 days for their cargo.

- ***Container terminal capacity utilization:*** The Nacala Port container terminal has a capacity of 100,000 TEU. For the past four years, the capacity utilization averaged 40.2 percent, peaking at around 53 percent in 2009. Within the next five years, the surplus terminal capacity of between 47,000 to 60,000 TEUs will be exceeded given the growth of container traffic of about 12 percent per year. This takes the capacity utilization to 89 percent or 89,000 TEUs.[20] The forecast container demand of banana exports alone will add another 40,600 TEUs, which will increase the container terminal demand to about 130,000 TEUs. CDN's port ex planning to expands its container terminal capacity to 175,000 TEUs or by 75 percent from current levels, which would be adequate were the forecast container demand capped at about 130,000 TEUs or at 75 percent of capacity. However, this is an

[20] The international benchmark for port capacity utilization is 80 percent. Typically, when a port's utilization reaches 80 percent of its capacity an expansion of the port physical infrastructure and the addition of new port equipment is required to meet the demand.

unlikely scenario when the forest and wood products industry is considered. By 2015 the forest and wood products industry will generate an additional 58,000 TEUs. Adding, this demand to the estimate of 130,000 TEUs yields 188,000 TEUs. The projected number of TEUs will exceed this means that planned container terminal capacity of 175,000 TEUs in 2015 by 7.4 percent. The practical implications of container terminal demand exceeding terminal capacity are port congestion and higher costs. If the port capacity issue is not recognized and addressed with added capacity, port congestion and higher cost will become even more acute in the out years when the demand is expected to exceed 275,000 TEUs.

Corridor Users

The current transport logistic situation in the Nacala Corridor beckons the need for the corridor users also to play a role in helping to overcome the many current and future challenges the corridor faces. The users of the Nacala Corridor that includes freight forwarders, clearing and shipping agents, major shippers, etc. have not been sufficiently organized as a stakeholder group to leverage their inherent power to address the logistics constraints to the corridors. B and large, with few exceptions, corridor users have often adopted a "go it alone approach" whereby issues of mutual interests such as port inefficiencies and high terminal handling charges, scanning containers fees, unreliable rail services or high road freight rates have generally not been addressed as a group.

- ***Trade Facilitation:*** This situation also extends to issues such as delays due to inspections of cargo and processing of Customs documentation. Corridor users have not taken advantage of their own strengths to address the many logistic problems they face on a daily basis. Therefore, in effect this lack of organization has resulted in users having to deal with: (i) a fragmented transport logistics and supply chain/structure, where each user is on his or her own; and (ii) a fragmented supply chain with no single point accountability for coordination;

- ***Low port productivity:*** CDN has consistently underperformed with respect to port productivity in terms of containers handling, specially when benchmarked against its peer group of ports in Sub-Saharan Africa which average about 12 moves per crane hour compared to CDNs 6 moves per crane hour. This can be attributed, in part, generally poor port operations, including inadequate port infrastructure and port equipment. The result has long berthing delays experienced; poor operating procedures leading to port congestions at the storage terminal and long dwell times.

- ***Lack of Inland Container Despots:*** Both ICDs or Container Freight Stations (CFS) are logistics facilities that corridor users could directly benefit from. The benefits include transshipment facilities, ability to consolidate freight, load and unload

cargo, stuffing containers, Customs inspections, repositioning of empty containers, etc., yet little or no effort has made to think long-term about need for adequate terminal facilities such as ICD or CFS.

- ***Information Management:*** As further globalization takes hold and more efficient supply chains come about, managing the flow of information such as tracking cargo from the factory gate or farm gate will become increasing more in demand. This will require an information management systems capable of tracking cargo through the entire supply, preparing customs documentation, paying ocean freight rates, completing bills of laden, scheduling shipments, planning containing terminal works weeks in advance or before a train or a truck enters the port's etc. due to advance cargo information. Public and private uses of transport logistics and related cargo information lack an integrated logistic information management system that could help better manage their logistics requirement.

Port Competition

With the exception of international transshipment traffic from Malawi no clear evidence exist to indicate that Beira and Nacala Ports were in competition with each other, or that shippers and receivers prefer one port over the other. Because the terminal handling tariffs are the same at each port, what appear to the discriminator are port access, route connection and availability of rail or road service not the port itself. For example, because of repeated problems on the CEAR (Malawi) and CDN (Mozambique) railway line Malawi began routed some of its traffic through the Beira Port. Although each port has unique characteristics such as the Nacala Port as a deep-water port is able to accommodate larger vessels than Beira Port. Beira Port, on the other hand, has or will have better railway connections at least in the near term, so such dry bulk export commodities such as coal will used the Beira Port not for competitive price reasons but for available supply and capacity considerations.

Intermodal Competition

Despite having open and unregulated freight markets one would expect to see fierce competition between railway and road freight services companies. Nevertheless, this does not appear to be the case. Moreover, although inter-modal competition does exist freight demand and indeed competition seems to be somewhat suppressed by the poor conditions of the road and rail infrastructure. Again, one such example of this is the parallel road and rail connection between Cuamba and Lichinga. Rail service between Cuamba and

Lichinga, which includes mixed trains, only operates about once per month. Major shippers regard this limited rail service as too unreliable for their transport needs. Road freight service, on the other hand, which typically is demand responsive, is overly expensive. Neither the railway nor road freight service companies seem to be driven by capturing market share or responding to the market demand or price signals, which would be expected in an open competitive market. This may be in part due to the poor condition of the road and railway infrastructure, which limits the amount, and level of freight services, and thus limiting the scope for inter-modal competition.

Freight Demand Forecast: By year 2020, dry bulk cargo mainly coal shipments and container traffic consisting of forest and wood products, as well as bananas will completely transform the commodity export mix shipped through the Nacala Corridor, and indeed its railway and port systems. To date transit cargo from and to Malawi have been the dominant traffic commanding a while domestic has been only minor component of the cargo mix.

Potential for Growth: Northern Mozambique, and the neighbouring countries of Malawi and Zambia have enormous potential for agriculture, forestry and fisheries, mining and tourism development. However, in order to capture significant cargo from Malawi and Zambia and indeed Mozambique's hinterland, CDN will need to dramatically improve its railway and port operations.

Table 5-1: Transport Logistics and Constraints Analysis Map

Assessment Dimension	Component	Logistics Constraint	Possible Interventions
Infrastructure Assets	Roads sector	Lack Poor road surface conditions of adequate port equipment	Upgrade Cuamba - Lichinga sections of the road network
	CDN Railway	Poor track conditions of sleepers and ballast constrains speeds Lack of rolling and Equipment result in low traction power and an inability reposition flat cars and container	Rehabilitate the track Cuamba - Lichinga and Cuamba - Entre Lagos Acquire rolling stock and equipment
	Nacala Port	Lack of adequate port equipment Lack of information system to manage the flow, distribution and storage of containers	Acquire port equipment, especially mobile cranes Acquire a port information management system
Enabling Environment	Policy and Strategy	Lack of a corridor development strategy	Formulate a Corridor Strategy
	Institutional Framework	Lack of an institutional structure to lead, manage and promote corridor development	Develop a Corridor Development Authority
	Regulatory Structure	Lack of a regulator to regulate rail and port transport concession	Establish a Surface transport regulator
	Trade Facilitation	Lack of a communications protocol to address users issues/concerns regarding scanning and weighing containers	Organize a stakeholders' workshop to communicate the process, procedures, cost and forum for address issues
Transport Industry	Road Freight Services	High transport costs Limited market access Low average speeds Poor train operations with limited use of unit trains Long transit times	Upgrade secondary and tertiary road network
	CDN Railway	Low average speeds Poor train operations with limited use of unit trains Long transit times	Develop an enhanced train operations plan Develop a Commodity based Rail Container Service as a PPP

	Nacala Port	High terminal handling chargers Lack of adequate port equipment Low productivity Long dwell times	Acquisition of mobile cranes Develop inland container depots as PPPs Introduce management and staff raining
Corridor Users	Information Management	Lack of an information management system for transport logistics and e-Logistics such as a - one-stop services (e.g. customs, freight forwarders, exporters, importers, road freighters, others). Lack of a forum for corridor users	Develop a one-stop e-technology logistics systems in an Integrated Logistics Center as a PPP Organize a Nacala Corridor Logistics User Group

Overcoming the many challenges CDN, faces mean delivering port and railway services commensurate with the projected traffic volume and commodity mix to the satisfaction of its customers. Thus, from our analysis it requires essentially a three- part strategy that is capable of transforming the road sector, as well as CDN's rail and port operations and improving rail and port logistics. In doing so, CDN needs to focus in the short- to medium-term on afforts that:

- Execute the road sector strategy;
- Increase the capacity of the Nacala Port and CND Railway; and
- Improve the operational performance of the Nacala Port and CND Railway.

These two important strategies should guide any renewed efforts by CDN to address its underperforming railway and port system. The investment program presented below will enable CDN to take a major step forward to address the many interrelated transport constraints described above.

CDN Railway Infrastructure Investment Program

Infrastructure Investments

Cognizant of the above challenges the railway faces, CDN's has already begun to undertake efforts to increase capacity in its railway by improving its track infrastructure as

indicated in Tables 5-2 and 5 -3.[21] CDN's estimates its capital infrastructure investment program will cost USD 100.00 million to return the Cuamba-Entre and the Cuamba-Lichinga railway section to back to acceptable and safe operating conditions.

Nacala Corridor Road Sector Investments

Cascading from the road sector policy and strategy are a number of programmatic interventions to rehabilitate and upgrade various sections of the road network in Nampula and Niassa Provinces. Listed in Table 5-2 are the planned road investments for the two provinces in the Corridor. With financial support provided by the donor community, the Government of Mozambique is expected to invest some USD 573.7 million over the next three to five years to improve road network in Nampula and Niassa Provinces.

[21] CDN has included in its capital budget USD 5 million for maintenance of the track between Nampula and Cuamba, which consists of replacement of sleepers, welded rail and balast. Typically, maintenance costs would be carried as a capital investment cost unless it involves a major upgrade or rehabilitation.

Table 5-2: Nampula and Niassa Provinces Road Investment Program (in million USD)

Province	Road Section	Length	Civil Works	Estimated Costs
Nampula	Namiti–Angoche			6.1
Nampula	Rio LigonhaNampula			240.0
Niassa	Cuamba-Linchinga		Upgrade and Pave	
Nampula/Niassa	Nampula-Cuamba	384	Upgrade and Pave	219.7
Niassa	Litunde-Marrupa			
Niassa	Lichinga-Litunde & 7 Bridges	203		107.9
Total				573.7

Source: ANE

The two main roads connecting the Nacala Corridor and the most important roads to be upgraded and paved are the Nampula to Cuamba and Cuamba to Lichinga road projects highlighted in Table 5-2 above. Once completed, these two roads should provide a tremendous boost to the economies of the two provinces as new production, particularly as forest, cut wood and wood products go into effect. Thus, within the next five years the road network w ill not be the constraints to transport logistics and supply chain efficiency in the Nacala Corridor as it is currently.

Table 5-2: CDN Railway Infrastructure Improvement Program (in million USD)

Description of Capital Improvements	Estimated Costs
Rehabilitation of the Cuamba – Entre Lagos railway section (77 kms)	15.0
Track Maintenance Cumber - Nacala	5.0
Rehabilitation of the Cuamba – Lichinga railway section (267 kms)	80.0
Total	100.0

Source: CDN

Improving these key sections of CDN Railway is long overdue and has been a major constraint to transport logistics in the corridor. Such improvements will have a significant

impact on the railway's operations and financial performance in terms of traffic and revenues arising from both domestic and international transit traffic. With these improvements we expect to see significantly increased transit traffic from Malawi and Zambia, currently diverted through the Beira Port. Similarly, there will also be increased domestic traffic as coal production ramps up in Tete Province and as forest and wood products come into production in Niassa Province. However, sourcing and financing the above capital investments continues to be a challenge. In addition, it remains unclear whether this is a CDN obligation under their concession agreement, a Government obligation, or a joint obligation of both parties to the concession agreement.[22]

Rolling Stock and Equipment

CDN's capital improvement program for infrastructure, rolling stock and equipment for the railway indicated in Tables 5-3 and 5-4 addresses what has been for many years a persistent constraint to transport logistics in the Nacala Corridor—due largely to underinvestment and a lack of maintenance of the track. Once implemented, this capital program will add significant hauling capacity to the railway and place less of a burden on the road network along the corridor.

Table 5-3: CDN Railway Rolling Stock and Equipment Program (in million USD)

Description of Rolling Stock and Equipment	Estimated Costs
Highsided grain wagons (75 units); flat cars (50 units)	8.75
Mainline locomotives (12 units)	18.82
Shunting locomotives (2 units)	1.20
Trucks (6)	0.42
Wagon rehabilitation (682 units)	10.20
Office equipment	1.20
Total	41.940

Source: CDN

[22] During the field studies in February CDN reported that capital investments for these two projects were the responsibility of the Government and not CDN. And in contrast CFM indicated capital investments were the responsibility of the concessionaire, CDN. However, we were not made privy to the concession agreement between the Government of Mozambique and CDN, and therefore we cannot render an opinion as to the veracity of these comments.

Nacala Port Infrastructure Development and Equipment Plan

As shown in Tables 5-4 and 5-5, CDN has also proposed a capital improvement program totaling some USD 19.2 million to increase capacity at Nacala Port's container and general cargo terminals.

Infrastructure

To increase its capacity to handle additional containers and general cargo CDN has undertaken an extensive capital development program. As indicated in Table 5-4, this program involves improving the Nacala Port's physical infrastructure at an estimated cost of USD 7.55 million.

Table 5-4: Nacala Port Capital Improvement Program (in million USD)

Description of Improvements	Estimated Costs
Container terminal: rehabilitate quay wall, pillars and pavement	3.20
Cargo terminal: reconstruct front quay, readjust mooring	0.50
Quay retention	0.20
Repair crane rails and rehabilitate pavement	2.50
Repair drainage network	0.25
Defense Substitution	0.30
Repair electricity network	0.60
Total	7.55

Source: CDN

Port Equipment

Table 5-5 lists a range of equipment CDN intends to acquire to improve its port operations, especially its productivity at the container terminal. The estimated acquisition cost of the port equipment is USD 11.63 million.

Table 5-5: Nacala Port Equipment Acquisition Program (in million USD

Description of Equipment	Estimated Cost
Security Equipment	0.035
Container Terminal equipment	3.800
Tractors (17 Units)	0.960
Mobile cranes (18 Units)	6.000
Pavement Reconstruction	0.250
Fire equipment and ambulance	0.080
Port Management Information System	0.500
Total	11.625

Source: CDN

Although these are positive developments, taken together it is unclear what precise impact these capital improvements for the general cargo and container terminal and the acquisition of equipment will have on the port's operations and throughput. What is remarkable about CDN's capital program is not only the amount and type of equipment they intend to acquire but the specific number of mobile cranes. As noted in Chapter 4.0, mobile cranes compare favorably with gantry cranes in terms of moves per hour of about 15 to 20. Therefore, this equipment should provide CDN with an enormous opportunity to improve its container handling capacity and increase its throughput. Adding port and railway capacity through capital investments for infrastructure and equipment are exactly the strategy CDN needs to execute. Because these are necessary conditions to improve transport logistics in the port as well as the railway. However, absent the application of modern port and railway operations underpinned with modern information technology and training will not in and of themselves improve port and railway efficiency. Simply put, CDN railway even with a rehabilitated track and additional rolling stock and equipment cannot operate trains in the same manner as in the past. Similarly, the Nacala Port needs to re-engineer its operations and business process by moving away from what's can be characterized as manual port operations to a high-performance port, utilizing modern technology and equipment-laden operations.

In summary, it is notable that ANE with respect to the road sector and CDN as to the port and railway have already initiated concrete efforts through capital investment programs to remove the many transport logistics constraints users of the Nacala Corridor face. Such constraints can be attributed in part to a deteriorated asset base involving the road network, railway and port systems. Deteriorated assets results from, inter alia, underinvestment in the track, the rolling stock and equipment for railways; underinvestment in road maintenance

and lack of new investment to upgrade the road network; and a lack of investment to expand the port and upgrade port facilities and acquire new port equipment. Both CDN and ANE have initiated specific programs to address the above constraints.

Chapter 6 presents recommendations derived from the interventions listed Table 5-1. The recommendations that will be proposed are those deemed most suitable for implementation in the short to medium-term.

6.0 Recommendations

Introduction

The purpose and objective of this assessment were to: (1) implement studies and develop enabling environment action plans based on the findings; and (2) propose a plan for increasing investment to improve efficiencies. Chapter 6 presents the recommendations arising from the assessment findings and conclusions described in Chapter 5 above. The recommendations are derived from our analysis of the constraints to transport logistics in the Nacala Corridor, as well as over 40 field interviews conducted in Mozambique from February 8th to February 28th with the key public and private stakeholders across the entire transport logistics and supply chain. The interviews focused on all aspects of the assessment; including: governance and the institutional arrangement; the policy, legal and regulatory framework; the quality and condition of transport infrastructure; the transport industry and provision of road and rail freight services; port operations; transport costs; trade facilitations and corridor user; commodity production and exports, freight and transport logistics services, and shipping and handling services.

The recommendations presented below addresses: (i) the enabling environment and what reforms are required for public institutions to have a more active and direct role in promoting corridor efficiency; (ii) the infrastructure and operational constraints to the efficient functioning of the transport logistics and supply chain efficiency in the Nacala Corridor; (iii) the need for better public and private stakeholder coordination to address corridor efficiency issues, including logistics costs such as container handling charges at the port and trade facilitation. However, we note that more detailed studies are recommended to accurately and fully determine the viability of the recommendations being proposed and, to more precisely define the development costs, and identify the economic and financial benefits to the public and the commercial benefits to private stakeholders. In developing the recommendations for this assessment we considered the following factors:

- Efficacy and utility of the recommendation to improve logistics efficiency
- Removal of constraints to efficient transport logistics services
- Stakeholder ownership
- Scope for implementation by the private sector
- Potential for public and private sector partnering

- Innovativeness of the approach to achieve successful outcomes Interventions that complement existing transport sector policies, and
- Likely timeframe for implementation once adopted.

It should be noted that several of the capital projects for the roads, railway and port sectors listed in the table below are either underway or already proposed by the Government of Mozambique. The projects are listed here as N.A. or not applicable because they are not intended for funding consideration or implementation under this program, but rather to highlight their importance to transport logistics and supply chain efficiency in the Nacala Corridor and the need to be urgently implemented.