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# NACALA CORRIDOR AND PORT PERFORMANCE ASSESSMENT

## February 2018 Draft Final Report

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# ACRONYMS

| | |
|---|---|
| ABC | Agência Brasileira de Cooperação (Brazilian Cooperation Agency) |
| ACE | Agricultural Commodity Exchange |
| ADL | Airports Development Limited (Ministry of Transport and Public Works of Malawi) |
| AEO | Authorized Economic Operator |
| AfDB | African Development Bank |
| AGOA | Africa Growth and Opportunity Act |
| ANE | National Roads Administration of Mozambique |
| ADM | Airports Company of Mozambique |
| BASA | bilateral air service agreements |
| CBA | cost-benefit analysis |
| COMESA | Common Market for Eastern and Southern Africa |
| CFM | Portos e Caminhos de Ferro de Moçambique (Mozambique Ports and Railways) |
| CFS | container freight station |
| CDN | Corredor Desenvolvimento de Nacala |
| CEAR | Central East African Railways |
| CTA | Confederation of Business Associations of Mozambique |
| CLN | Corredor Logística de Nacala (Nacala Logistics Corridor) |
| DCA | Department of Civil Aviation (Ministry of Transport and Public Works of Malawi) |
| DoR | Department of Roads (in the Ministry of Transport and Public Works of Malawi) |
| EDM | Mozambique Electricity / Electricidade de Moçambique |
| FE | Roads Fund of Mozambique |
| FEU | 40-foot equivalent unit |
| GoMw | Government of Malawi |
| GoM | Government of Mozambique |
| ha | hectare |
| hrs | hours |
| IAM | Cotton Institute of Mozambique |
| ICD | inland container depot |
| INATTER | National Institute of Surface Transport of Mozambique |
| INHAHINA | National Maritime Institute of Mozambique |
| JICA | Japanese International Cooperation Agency |
| km | kilometer |
| LAM | Mozambique Airlines |
| m | meter |
| MASA | Ministry of Agriculture and Food Security of Mozambique |
| MD | Marine Department (Ministry of Transport and Public Works of Malawi) |
| MEP | Ministry of Economy and Finance |
| MIC | Ministry of Industry and Trade of Mozambique |
| MINAG | Ministry of Agriculture of Mozambique |
| MPDC | Maputo Port Development Company |
| MOPH | Ministry of Public Works and Housing of Mozambique |
| MT | metric ton (also denoted by T) |
| MTPA | metric tons per annum |
| MTPW | Ministry of Transport and Public Works of Malawi |
| MTC | Ministry of Transport and Communications of Mozambique |
| MWK | Malawian Kwacha |
| NGO | nongovernmental organization |
| NTMP | National Transport Master Plan of Malawi |
| PDE | Programa de Desenvolvimento Espacial (Spatial Development Program) |
| PEDEC | Project for Nacala Corridor Economic Development Strategies |

| | |
|---|---|
| POL | petroleum, oils, and liquids |
| PQG | Plano Quinquenal do Governo 2015–2019 (Five Year Governnent Plan 2015-2019) |
| PN | Portos do Norte |
| ProSAVANA | Triangular Co-operation Program for Agricultural Development of the Tropical Savannah in Mozambique |
| RA | National Roads Authority of Malawi |
| RFA | Road Fund Administration of Malawi |
| RTD | Road Traffic Department (Ministry of Transport and Public Works of Malawi) |
| SADC | Southern African Development Community |
| SDCN | Sociedade de Desenvolvimento do Corredor de Nacala (Nacala Corridor Development Society) |
| SEZ | special economic zone |
| SOE | state-owned enterprises |
| SPEED+ | Support the Policy Environment for Economic Development |
| TAMA | Tea Association of Malawi |
| TEEN | Nacala Special Exports Terminal |
| TEU | 20-foot equivalent unit |
| TPU | Transport Planning Unit (Ministry of Transport and Public Works in Malawi) |
| USAID | United States Agency for International Development |
| USD | United States Dollar |
| VC | value chain |
| VLL | Vale Logistics Limited |
| WRS | warehouse receipt system(s) |
| WTO | World Trade Organization |
| ZR | Zambia Railways Limited |

# EXECUTIVE SUMMARY

## INTRODUCTION

The objective of the *Nacala Corridor and Port Performance Assessment* is to report on transport, logistics, and production bottlenecks along the Nacala Corridor, and provide recommendations for improvement of the corridor that could lead to development of the region's economy. The study provides analysis of the Port of Nacala, the Nacala Special Exports Terminal (TEEN), railway and road networks, and nodes (inland terminals, weighbridges, etc.) and storage facilities, with an emphasis on transport and logistics services bottlenecks. The report also analyzes economic impacts of implementing selected transport improvements along the corridor. This analysis reports on increased cost savings, and investment leading to employment creation; and provides estimates on additional jobs and income created for the local populations thanks to transport improvements along the corridor. The report was done in close collaboration with the Ministry of Transport and Communications (MTC) and the Nacala Development Corridor (CDN) company.

## KEY FINDINGS

The Nacala Corridor covers the central and southern regions of Malawi and five provinces in northern Mozambique: Cabo Delgado, Nampula, Niassa, Tete, and Zambezia. The corridor is home to about 18 million people, according to various estimates, and agriculture employs 80–85 percent of the corridor's adult population. The corridor's area of influence extends with the rail line east from Nacala port on the Mozambique coast, westward through Nampula Province to Cuamba in Niassa Province, and on to Nkaya in Malawi and Moatize in Tete Province. Moatize in Tete Province is the location of a major coal mine that anchors the west end of the rail line.

***Agriculture can drive growth of corridor trade.*** The agricultural sector dominates economic activity in both Mozambique and Malawi, with 24.8 percent of GDP for Mozambique, and 28.1 percent of GDP for Malawi in 2016.[1] Along the Nacala Corridor, the larger share of the labor force is employed in the agriculture/agribusiness sector. The majority of this population is smallholder farmers engaged in subsistence farming, although production of cash crops is also slowly taking off. Cassava, maize, beans, and horticultural products dominate smallholder production while cotton, cashew, sesame, macadamia, soya, tea, bananas, sugar, pigeon peas, groundnuts, and tobacco and forestry products are produced commercially. The top five exports from northern Mozambique are: sawnwood, cashewnut, sesame seed, pigeon pea and cotton; and from Malawi are: sugar, pigeon peas, groundnuts, tobacco and tea. The top five imports to northern Mozambique are: containerized imports, clinker, fuels, wheat and rice and to Malawi are: wheat, fertilizer, containerized imports, fuel, and clinker. Cotton, tea, plantation forestry (woodchips) and fertilizer have a high potential for production and volume growth.

***But low agriculture productivity limits economies of scale necessary to drive down transportation costs along the corridor.*** Transport costs along the corridor are very high, which make it harder for subsistence farmers to access markets, as they cannot afford to pay these costs in case they do reach higher volumes. Agricultural production and high transport costs are interdependent in that the improvement of current conditions in one would lead to an improvement

[1] World Bank, World Development Indicators

in the other. Large-scale agricultural investments along the corridor, such as forestry investments (which this report examines in detail) and commercial farming investments in soybeans, maize, sunflower; banana, and biofuel plantations, if realized, can help to increase rail transport, which can help create the volumes required to reduce railway fees. If the railway can be further operationalized across the corridor, it has the power to change both production and transport cost dynamics in its catchment area.

***Mega-Projects have driven infrastructure improvements along the corridor.*** The most significant development has been the recently completed mega-project investment by the Vale-Mitsui Consortium comprising the construction of a coal mine at Moatize, a new section of railway and rehabilitation of the existing railroad, and a new coal terminal at Nacala-A-Velha, a distance of 912 kilometers, at a cost of US$7 billion.

***Government and donors also realize the potential of the corridor and are committing resources.*** The governments of Malawi, Mozambique, and Zambia have committed investment, with support from the EU, AfDB, JICA, and Korea EXIM, for the Nacala Corridor Road Project, which will rehabilitate over 1,000 kilometres of road at a cost of approximately US$758 million.

***Mozambique recognizes the importance of reducing policy-related obstacles along the corridor and is proactively tackling the problems.*** Mozambique is removing barriers to trade, including the repeal of the mandatory use of the Nacala Special Export Terminal (TEEN) for exports from Mozambique, effective from the July 31, 2017 and has also carefully structured concession agreements to ensure third-party access for general freight cargo. And through the commissioning of this report, Mozambique has demonstrated interest at identifying, addressing and measuring improvements along the corridor.

***Tackling policy-related obstacles is creating opportunities for greater investment along the corridor.*** These opportunities are concentrated in the downstream gas, coal, forestry, tourism, and agro-processing sectors along the Nacala Corridor. However, most of these projects are realizable only in the medium-to long-term. The focus in the short-term is to identify interventions that can accelerate economic development by lowering transport and logistics costs, which can be achieved by leveraging improvements in transport infrastructure and supporting ongoing efforts to enhance trade and transport facilitation as well as reforms to improve the business environments.

***The Nacala Corridor offers significant potential for the economic development of the regions and countries it serves—Northern Mozambique, Malawi, and Zambia.*** The corridor boasts a strategic location, with proximity to energy resources, fertile lands, tourism spots, and good climate. The Port of Nacala is East Africa's deepest natural port and is the third largest port in Mozambique in terms of volume of cargo handled. In the recent past, there have been massive investments in road, rail and port infrastructure along the corridor. Provided these are coupled with adequate transport and logistics services, this means that one of the crucial requirements for attracting investment and business opportunities to the region, is already in place. Indeed, these efforts have already seen a significant reduction of transport costs along the corridor. A recent study by JICA has shown that the cost of transporting cargo from the port of Nacala to Blantyre in Malawi is 78% less expensive than bringing cargo to/from Beira, 40% less expensive than to/from Dar es Salaam and 39% less expensive than to/from Durban. This clearly illustrates that the Nacala Corridor railway is the most cost-effective option for Malawi based shippers.

***Economic development along the corridor will hinge on increasing railway cargo, growing agriculture, taking advantage of mega projects and growing other economic sectors, such as tourism.*** Currently, there is a large volume of transit cargo going to and from Malawi, which is using road transport and/or the Beira Corridor. Transferring that trade to the railway on the Nacala Corridor would allow railway costs to come further down and reduce costs for traders and producers. Coupling this with increasing agricultural production means a high potential for large volumes of exports out of Nacala, using the railway. In addition, realizing large-scale industrial projects in the downstream gas, coal, forestry, tourism, and agro-processing sectors along the Nacala Corridor can bring the economies of scale to boost transport competitiveness, and thus economic competitiveness of business operating along the corridor. Construction, logistics service companies, and IT suppliers are only a few examples of businesses, particularly SMEs, to find opportunities related to these projects. At the same time, development of the corridor, particularly railway lines and improved road conditions can greatly boost tourism in the provinces of Nampula, Niassa, and Tete, including Mozambique Island, Lake Niassa, and the Niassa National Reserve.

***However, key bottlenecks should be addressed to help realize corridor potential.*** This study examined transport/logistics bottlenecks and production-related/value chain bottlenecks.

1. ***High costs, lengthy time and low reliability*** for facilities and transactions across the corridor hinder competitive advances along the corridor. A considerable portion of infrastructure and transport facilities along the corridor are in poor condition or require further upgrades, including the port, road and rail infrastructure, including weighbridges and loading/offloading equipment, as well investments to securely transport goods.

2. ***Regulatory issues also limit smooth movement of goods across the corridor***. These include transport regulations, such as mandatory use of the export terminal TEEN, which was in effect until July 2017 and checkpoint regulations; customs regulations (ContraMarka system, import/export procedures at border posts); and lack of storage facilities at/near the Nacala port, as well as near production centers across the corridor. Another issue is that sensible regulations are not adequately enforced, such as weight restrictions on roads, which impacts the competitive dynamics between road and rail, as well as transport quality.

3. ***Road-related transport costs in Mozambique can be six times higher than in Malawi and should be addressed.*** Road node costs are significant. For example, when traveling from Beira to Blantyre, road users will pay $132 in road user fees in Malawi and an estimated $370 in road user and weighbridge fees in Mozambique. Traveling the Nacala corridor to Blantyre road user fees are estimated at $64 in Malawi and over $400 in Mozambique. Traveling from Nacala to Lichinga, road users noted informal checkpoint fees and charges including 1,500–2,000 MT at a non-functional weighbridge on the Cuamba-Lichinga road, 2,500 MT at the weighbridge near Nacala, and 2000–3000 MT for bribes at various checkpoints along the corridor.

4. ***While rail is less expensive than road, transit times due to slow wagon speed and delays in loading and unloading make rail uncompetitive.*** Cargo traveling from the Nacala port to and from Blantyre, Lilongwe, Chipata, Cuamba, and Lichinga also has the option of using rail transport, which is typically the cheapest mode of transport. However transit times are longer due to wagon speed on the branch lines and loading/unloading time at the nodes. Loading/unloading a 42-wagon train typically takes between three and four

days, due to the need to shunt typically 10 wagons at a time, which is much longer than the time to unload a truck. There are also multi-modal costs in addition to the rail costs as in most cases cargo has to be trucked from the rail yard to/from the warehouse or factory. These drayage costs are estimated to comprise 18% of the transport cost, which adds to the all-in transport price and reduces the cost competitiveness of rail.

5. ***The main production-related and value chain bottlenecks*** are characterized by low, inefficient production, and lack of seamless supply chain functioning. Inadequate use of inputs and agricultural growing techniques; deficiency of consolidation centers near production points, so as to reduce the number of middle men and post-harvest loss; and lack of adequate storage facilities. Another finding pointed to lack of sufficient coordination between regional governments on transport, infrastructure and trade facilitation policies. Provided that the influence area of the Nacala Corridor covers three countries, harmonization of those policies would be an important factor in increasing regional trade. Value chains in the region would benefit by having easier access to cheaper/higher quality inputs; and by having more markets available to sell their goods to. As a result, increased investment will come to the region, and producers will be able to produce higher volumes, as well as move up the value chains, leading to higher incomes.

***Cost savings to the private sector through increased volume and lower transport costs have been estimated at US$ 28 million by 2020.*** Though cargo traffic along the corridor is expected to rise significantly over the short-term, addressing bottlenecks can help cargo traffic grow faster. The results from the traffic forecast model show that growth in overall cargo will rise from 1.92 million tons in 2015 to 3.45 million tons in 2020. This potential shift is expected to coincide with the new and proposed new improvements in the rail and port system enhance efficiencies on the corridor.

- Road-based traffic is expected to increase marginally from 1.78 million tons in 2015 to 2.17 million tons in 2020.

- Rail-based traffic is expected to increase from 0.14 million tons in 2015 to 1.37 million tons by 2020.

***The potential economic impacts for Mozambique are large: $28 million on costs savings and 30,000 new jobs.*** In 2020, by shifting 535,000 tons of exports onto the Nacala Corridor railway system and removing the direct and indirect costs associated with the compulsory use of TEEN, it is estimated that US$28 million in costs savings can be achieved. If these savings are directed into investment, an additional 116,000 tons of export product will be generated, creating a further 30,000 jobs, either as employment or livelihood opportunities, and an additional US$17 million in income, at an average per worker/smallholder producer of US$580 per year. Malawi may also benefit by 2020, receiving US$4.2 million in cost savings and the creation of 12,390 jobs.[2]

[2] In Mozambique, it is assumed that cost savings will happen as a result of two factors: switching from road to rail and not having to having to use TEEN and pay its fees. The cost savings from those factors are estimated to be nearly US$24 million, which translates into 110,128 tons of additional production in plantation forestry, pigeon pea, cotton, sesame seed, and cashew nut, and a further 17,340 jobs, at an average of US$860 per worker/farmer.

## KEY BOTTLENECKS

The study identified the following transport/logistics, rail, port and value chain bottlenecks along the corridor, which are summarized below, and for which more details are provided in the main report.

### TRANSPORT AND LOGISTICS:

- Costs and delays due to the operation of TEEN for Mozambican exports;
- Costs, delays and time variability issues due to Nampula check points and the broken weighbridge near Cuamba;
- Delays and time variability at road border posts (Beira and Nacala corridors);
- High road node costs;
- Costs, delays and time variability at Cuamba, Lilongwe and Chipata rail intermodal facilities;
- High cost and time of road transport to Niassa;
- Nkaya rail node time variability due to loco availability;
- Port Scanning costs (both Nacala and Beira);
- Nacala Port customs time variability;
- Nacala port high berth container handling times; and,
- Nacala port high time variability.

### RAIL BOTTLENECKS

- Low volume of cargo carried through railway, therefore low demand for railway services;
- Return freights go empty, due to low volume of production and exports in the region, which keep railway costs high;
- Train lengths are short;
- Railway needs better equipment and facilities, particularly for loading/offloading; and,
- Rail sidings are not of sufficient size.

### PORT BOTTLENECKS

- Limited space for expansion, storage and logistics activities;
- Even though there is available space near the port for expansion (near where TEEN is located), this space is currently not rail serviced, and will not be suitable for a rail connection, because of the elevation from the port to this location; and,
- While the use of TEEN is no longer mandatory as of August 2017, there will still be a period of uncertainty in the near term on how customs procedures will function for the exporters and it is likely that some of the additional time and cost burden created by TEEN will continue in the near term.

### VALUE CHAINS/EXPORTS:

- Storage facilities are lacking along the corridor, primarily near farms and at the port;
- Import/ Export procedures at the Port of Nacala are inefficient; the contramarker system is particularly problematic;
- Loading/ offloading operations at the port are inefficient for selected value chains; and,
- Cooperation and coordination between corridor countries are insufficient.

## KEY RECOMMENDATIONS

The study makes the following transport/logistics, systems, infrastructure and value chain recommendations to address the previously-mentioned bottlenecks along the corridor. Recommendations are summarized below. More details are provided in the main report.

## TRANSPORT AND LOGISTICS

- Support to customs in implementing inspections post-TEEN;
- Enforcement of axle load restrictions and weighbridge calibration;
- Improvement of automatic bond release processes;
- Improve process of customs global import lists for large projects; and,
- Modernize port regulations.

## SYSTEMS RECOMMENDATIONS

- Improve contramarker system to allow for pre-clearance;
- Establish trucking appointment system; and,
- Develop freight exchange to match backhaul and reduce transport costs.

## INFRASTRUCTURE RECOMMENDATIONS

- Develop Nacala Port and intermodal operations and infrastructure;
- Invest in railway track rehabilitation and maintenance in Malawi and improve rail operations;
- Invest in inland terminals;
- Mitigate storage constraints at the port and terminals; and,
- Upgrade electricity infrastructure at border posts.

## VALUE CHAIN/EXPORTS

- Improve trade facilitation for imports at the Nacala Port;
- Establish storage facilities for agricultural crops along Nacala Corridor, particularly near farm locations providing access to farmers;
- Increase value addition in agricultural production;
- Improve offloading efficiency at the Nacala Port, given it impacts multiple value chains; and,
- Increase trade and transport policy and facilitation coordination/collaboration between corridor countries in order to reap more corridor benefits.

# 1. INTRODUCTION

## 1.1. BACKGROUND

The Nacala Corridor and Port Performance Assessment evaluates current operations and bottlenecks along the corridor, including at the Nacala Port and Special Export Terminal. CDN-CEAR, the general freight railway and port concessionaire, has supported this assignment, providing first-hand railway and port information, reports, data, and other relevant assistance.

For this assignment, the SPEED+ Project Office in Maputo established a Steering Committee comprising the Ministry of Transport and Communications (MTC), Ministry of Industry and Trade (MIC), the Ministry of Agriculture and Food Security (MASA), Customs, Confederation of Business Associations of Mozambique (CTA), CDN-CEAR, and USAID to ensure that the study is aligned with relevant government policies and regional development strategies.

The SPEED+ office also supported three weeks of stakeholder consultations in Mozambique, Malawi, and Zambia.

## 1.2. PURPOSE OF STUDY

The purpose of this assignment is to provide recommendations on how to better use the high potential and capacity that Nacala Corridor offers, in order to foster more trade and economic development for Northern Mozambique, as well as for Malawi and Zambia.

These recommendations include key trade and transport facilitation measures designed to enhance the competitiveness of the Nacala road, rail, and port system by reducing the time, lowering the cost, and increasing the reliability of transport and logistic services.

These measures will unlock latent economic potential, particularly in smallholder-intensive agricultural value chains, where the developmental impacts of enhanced corridor competitiveness will be the greatest.

## 1.3. STRUCTURE OF REPORT

The remainder of the report is structured as follows.

Chapter 2 presents a historical overview of the corridor, providing the context in which proposed interventions are to be implemented. It includes a review of how the railroad and port concessions have evolved in line with increasing infrastructure investments and discusses corridor competitiveness.

Chapter 3 uses the FastPath2 tool to measure the performance of transit-transport time, cost, and reliability parameters for exporting or importing commodities along a given corridor segment and compares this with comparator corridors before recommending targeted improvements. The chapter also uses the traffic forecasts presented in chapter 5 to model the potential impact of improving turnaround times on the operational efficiency of the corridor rail network, focusing initially on the existing highly traded and potentially highly traded routes.

Chapter 4 is structured into three areas of focus. The first is an analysis of production patterns for a selected list of agricultural value chains. The cost structure of each priority value chain is then developed to inform further detailing of the FastPath2 analysis. The second uses the information

compiled in the value chain analysis to construct traffic forecasts for the Nacala Corridor between 2015 and 2030. The third is an in-depth look at plantation forestry, as it is considered the prospective new export sub-sector (outside of oil, gas, and minerals) to assess what competitiveness parameters have to be achieved for this sub-sector to take off.

Chapter 5 concludes the report by synthesizing the key economic impacts of reduced transport and transit-transport facilitation costs and tables recommendations on the priority policy (or procedural) reforms, systems enhancements, and infrastructure investments that need to be implemented to improve corridor performance.

# 2. CONTEXT

## 2.1. HISTORICAL OVERVIEW

Nacala Port is the third-largest port in Mozambique when measured by volume of cargo handled. The largest natural deep-water port on the eastern coast of Africa, Nacala enables unrestricted entry and exit of vessels, regardless of draught, 24 hours a day, and requires no dredging.

In 1951 the port was opened to vessel traffic. Like much infrastructure built during the colonial period, the Nacala port suffered degradation since independence in 1975. However, owing to its strategic location, the port continued to play an important role in the import and export of goods for hinterland countries, with its main clients being Malawi and the northern province of Niassa in Mozambique.

Nacala port was rehabilitated during 1984–1996 with financing from Finland. The approval of the National Transport Policy in 1996 paved the way for public-private partnerships (PPPs) in transport infrastructure.

The concession to operate the Nacala Port and Railway for a period of 20 years was awarded in 2000 to CDN-CEAR,[3] with shareholding split between SDCN[4] (51%) and CFM North[5] (49%). However, due to the poor performance of the initial investors, the concession did not perform well and began to get traction only in 2007, when Vale decided to anchor coal exports from the Moatize mine in Tete Province to a new proposed coal export terminal at Nacala-a-Velha, located on the opposite side of the Nacala bay to the existing port.

This resulted in the first significant shareholder change. In 2009, Insitec bought out the original two foreign SDCN shareholders, Edlows Resources and the Railroad Development Corporation. Insitec and the other Mozambican investor, NCI/Manica, subsequently sold their shares to Vale in 2010 to give Vale a two-thirds stake in SDCN. This was essential for Vale at the time as it was about to trigger the largest ever anchor project investment in the country.

The decision by Vale to anchor coal exports out of Nacala rather than Beira was the game changer for the Nacala Corridor. Between 2013 and 2017 in excess of US$3 billion was invested in rehabilitating existing and constructing new rail and port infrastructure. This upgrade ensured that the corridor had the capacity to export up to 18 million tons of coal and 4 million tons (coal equivalent) of general cargo on an annual basis.

To enable the operation of both a coal heavy-haul and general-freight rail and port operation that was cross-border in nature, the original concession agreement had to be renegotiated. In 2015 the

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[3] Corredor Desenvolvimento de Nacala (CDN) and Central East African Railways (CEAR) were the names that the original concessionaire, Edlows Resources and Railroad Development Corporation (United States), and CFM (Mozambique) gave to the Mozambique and Malawi freight railway network respectively.

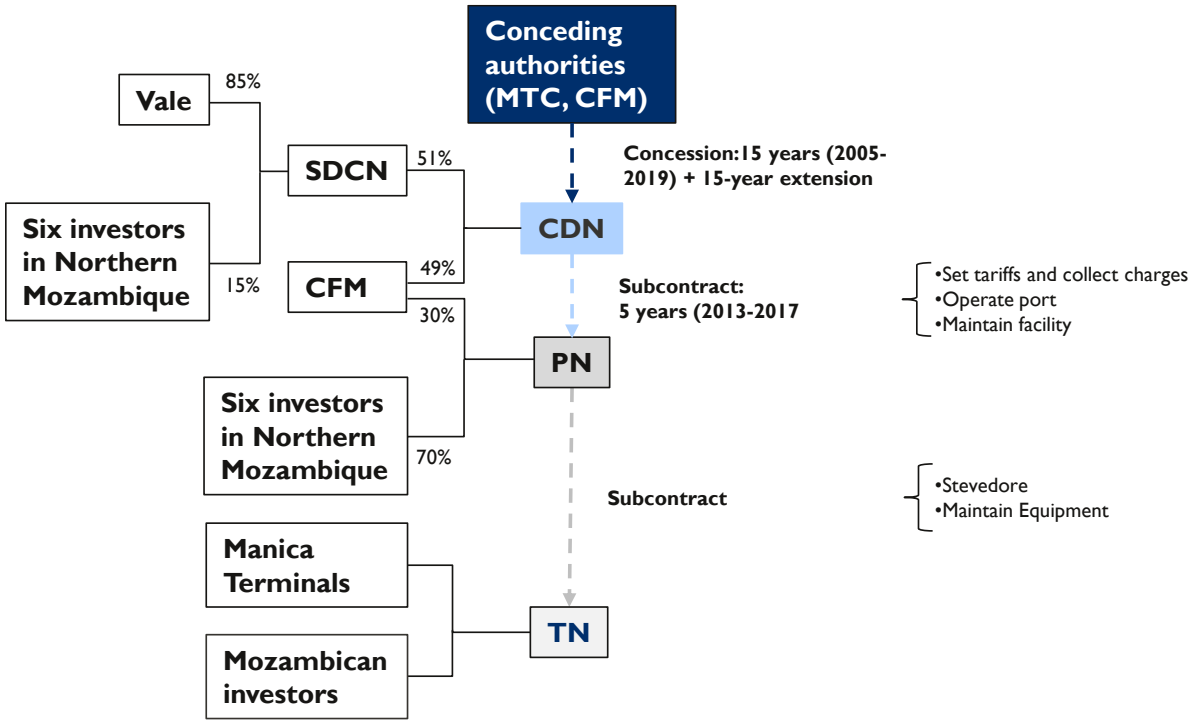
[4] Sociedade de Desenvolvimento do Corredor de Nacala (SDCN) consisting of 42.5% Vale (Brazil), 42.5% Mitsui (Japan), and 15% Local Investors (Mozambique), including the following companies Consórcio Cabo Delgado, Gestra Gestão e Transportes, Gedena Gestão e Desenvolvimento de Nampula Moçambique Gestores (MG), Niassa Desenvolvimento, and Sociedade de Tecnologias Portuárias (STP).

[5] Portos e Caminhos de Ferro de Moçambique (CFM) is a state-owned enterprise comprising four branches: CFM North, CFM Central, CFM South, and CFM Zambezia, which operate railway lines in these geographic zones and is also responsible for port infrastructure and services.

existing 2005 agreement was extended for a further 20 years, following the restructuring of the concession to include additional concessionaires CLN[6] and VLL.[7] This negotiation process resulted in further consolidation of Vale's shareholding in SDCN, rising to 85%, after it bought out shares from local investors in 2013 before selling down half of its shareholding to Mitsui Corporation in 2014.

This restructuring also resulted in the Nacala Port being sub-concessioned to Portos dos Norte (PN)8 in 2012 for five years to end in 2017. The shareholding structure of PN includes local investors (70%) and CFM North (30%). At the end of the concession period in 2018 the GoM will need to decide whether to extend or re-tender the concession. The concession structure and sub-contracting arrangements for the Nacala Port are summarized in figure 7.

FIGURE 1: NACALA PORT CONCESSION AND SUB-CONTRACTING ARRANGEMENTS



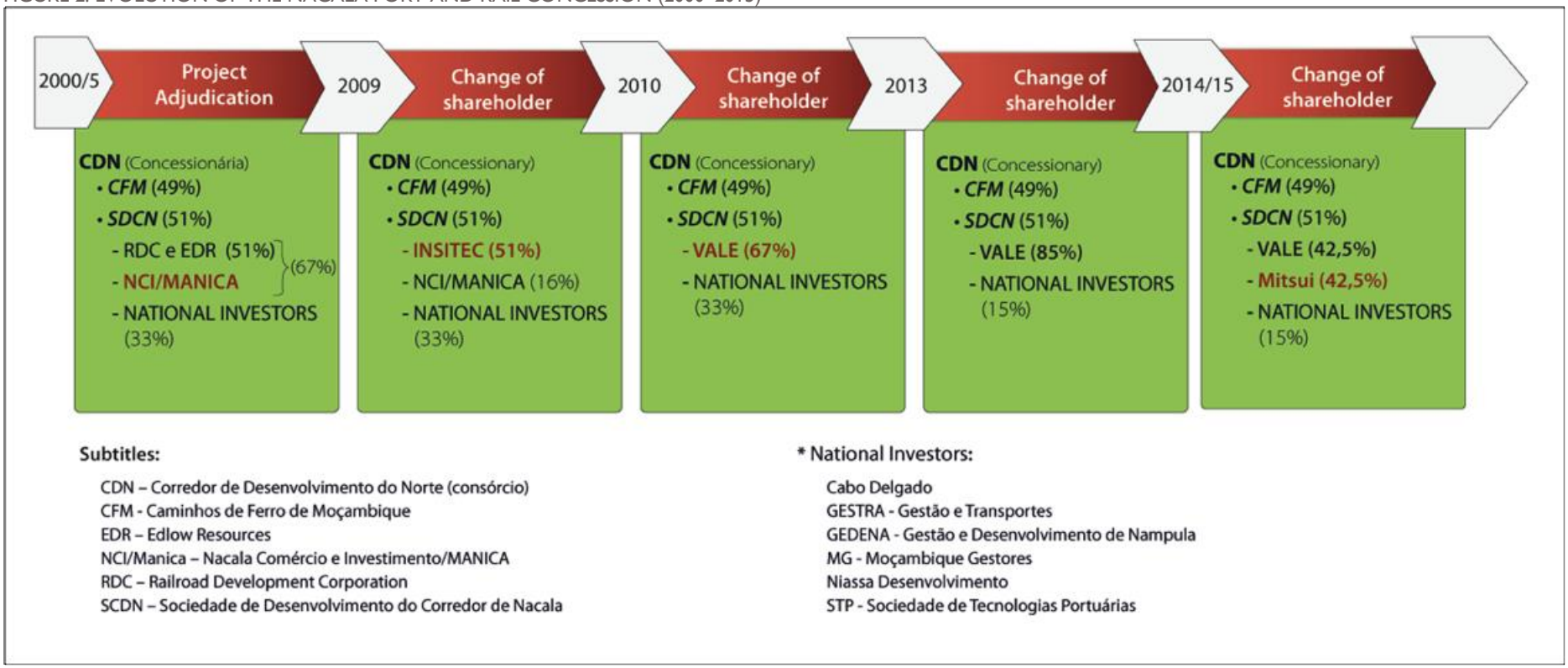

*Source: JICA (2015)*

[6] Corredor Logística de Nacala (CLN) was established as a specialist concessionaire to operate the shipment of tons of coal from the mine in Moatize in Tete Province, Mozambique through Malawi, and down to a new coal terminal at Nacala-a-Velha opposite the existing port of Nacala in Nampula Province, Mozambique, a distance of 912 kilometers.

[7] Vale Logistics Limited (VLL) was incorporated in Malawi to oversee the construction of the new greenfield railway of 138.5 kilometers from the Mozambique-Malawi border at Cambulatsissi to the junction at Nkaya. Now that the railway has been completed VLL has ceded operational responsibility to CLN for operating coal trains along this section of railway.

[8] In return for agreeing to divest their shares in CDN-CEAR to Vale, local investors were offered a 70% shareholding in Portos dos Norte (PN), a new port management company established in 2013, which was sub-contacted by CDN to operate the Nacala Port for 5 years from 2013 to 2017.

FIGURE 2: EVOLUTION OF THE NACALA PORT AND RAIL CONCESSION (2000–2015)




*Source: Centre for Public Integrity (2015)*

*Note from the Centre for Public Integrity: This information was obtained from alternative sources. There may be some margin of error, particularly in the years where there was a change of shareholders, but there is certainty regarding the names of the shareholders.*

In recognition of the substantial investment commitments made by Vale for the Integrated Nacala Port and Railway Project, in 2012 the GoM and Japan signed the Nacala Corridor Port Improvement Project, which included a grant-aid/soft loan package of US$350 million, for the phased redevelopment of the general-freight port infrastructure and operations over the period 2015 to 2020.

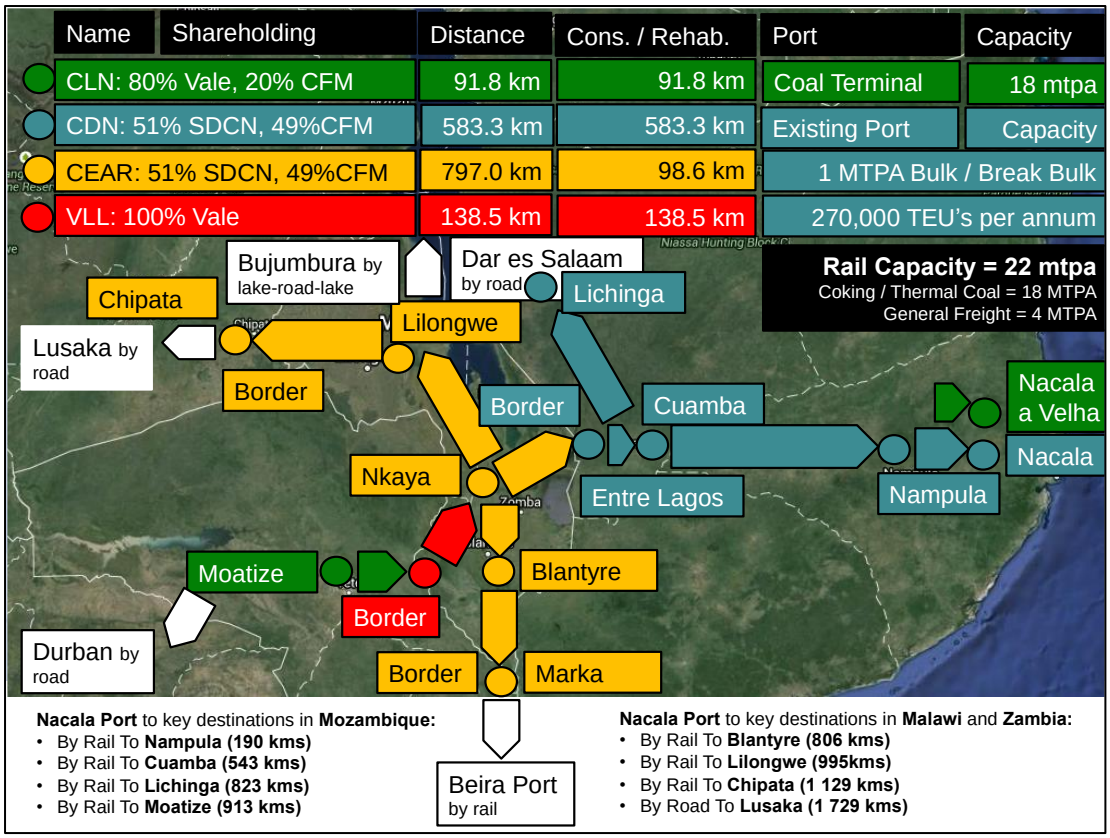
Finally, the governments of Malawi, Mozambique, and Zambia have gradually increased their investment, with support from the EU, AfDB, JICA, and Korea EXIM, to approximately US$758 million for the Nacala Corridor Road Project, which is being implemented in four phases, over a 12-year period from 2010 to 2022.

## 2.2. STRUCTURE OF RAILROAD & PORT CONCESSIONS

One of the significant achievements of the integrated pit-to-port solution has been to structure four interlocking rail concessions, which prioritizes the movement of 18 million tons of coal but also ensures third-party access to other rail operators on the corridor to transport 4 million tons (coal equivalent) of general cargo annually.

Figure 9 shows the interlocking concessions on the Nacala Corridor and which concessionaire is responsible for which cargoes.

FIGURE 3: INTERLOCKING RAIL AND PORT CONCESSIONS ON THE NACALA CORRIDOR




*Source: Nathan (2016)9*

[9] Nathan (2016): Input Report on Market Assessment for Transport Infrastructure in Mozambique, report prepared for PTA Bank.

- Corredor Logístico Norte (CLN) is responsible for handling the 18 million tons annually, of coking coal cargoes from the pit at Moatize to the new Nacala-a-Velha coal terminal.
- Corredor Desenvolvimento Norte (CDN) is responsible for handling the balance of 4 million tons annually of general cargo in Mozambique, from Entre Lagos to the port of Nacala.
- Central East African Railway (CEAR) is responsible for handling the balance of four million tons annually, of general cargo in Malawi, from the junction at Nkaya to Entre Lagos.
- Vale Logistics Limited (VLL) owns the newly built section of railway from the Mozambique border, near Cambulatsissi, to the Nkaya junction in Malawi.

The CDN-CEAR concessions are a main focus assignment. CDN-CEAR is run as an integrated general freight rail company. A recent important development to leverage the developments in the integrated rail and port concession has been the recent signing of an amendment of the Nacala Corridor Agreement of 2000, which was signed between the governments of Mozambique and Malawi on September 15, 2017.

Well-developed transport sector institutional and policy frameworks in both Mozambique and Malawi support this agreement. The main features of these frameworks are summarized in Appendix A.

However, in spite of the sizeable investment in the Nacala rail and port system, supported by a careful structuring of the concession agreements and well-developed institutional and policy frameworks in the transport sector, some bottlenecks continue to undermine the system's full potential.

## 2.3. RECENT STRATEGIC INVESTMENTS

There has been considerable investment activity along the Nacala Corridor over the last few years. Below, the report summarizes the major strategic investments in mining and infrastructure and in agriculture and forestry.

### 2.3.1. MINING AND INFRASTRUCTURE INVESTMENTS

The most significant development has been the recently completed mega-project investment by the Vale-Mitsui Consortium comprising the construction of a coal mine at Moatize, a new section of railway and rehabilitation of the existing railroad, and a new coal terminal at Nacala-A-Velha, a distance of 912 kilometers, at a cost of US$7 billion (table 1).

In addition to this considerable investment in the heavy-haul coal export railway, CDN will invest approximately US$170 million to improve general cargo capacity on those parts of the railway system under its concession that link into the heavy-haul operation but are not directly part of it. These components consist of the following.[10]

- The recovery and upgrade of the Lichinga-Cuamba section (262km) to reconnect remote parts of Niassa province to the main line, at a cost of approximately US$100 million (completed).
- The recovery and upgrade of the Nkaya-Limbe section (98km) to improve Railway Capacity and Reliability in and out of Malawi, at a cost of approximately US$50 million (ongoing).

[10] CDN-CEAR (2017): Understanding Nacala Logistics Corridor, Confidential Internal Presentation prepared by CDN-CEAR to support their ongoing marketing efforts with partners and customers.

- The recovery and upgrade of the Namarral-Nacala section (25km) to improve Railway Capacity and Reliability in and out of the Nacala port, at a cost of approximately US$10 million (completed).
- The recovery and upgrade, focusing on emergency repairs, of the Nkaya-Mchinji section (406km) to improve Railway Capacity and Reliability in and out of the railhead at Chipata in Zambia and the capital city of Lilongwe in Malawi, at a cost of approximately US$10 million (ongoing).

TABLE 1: VALE-MITSUI CONSORTIUM INTEGRATED MINE-RAIL-PORT PROJECT INVESTMENT

| Type Of Investment | Sections (Kms) | Investment (US$ Million) | Unit Cost (US$/Km) | % Investment (Component) |
|---|---|---|---|---|
| New Build (Greenfield) | 230.3 | 1,455 | 6,317,846 | 48 |
| Moatize to Cambulatsissi | 62.5 | 222 | 3,552,000 | 7 |
| Cambulatsissi to Nkaya junction | 138.5 | 1,078 | 7,783,394 | 35 |
| Mossuril to Nacala-A-Velha Coal Terminal | 29.3 | 155 | 5,290,102 | 5 |
| Rehabilitation/Upgrading (Brownfield) | 1,043.4 | 1,608 | 1,541,116 | 52 |
| Nkaya Junction to Entre Lagos | 101.0 | 196 | 1,940,594 | 6 |
| Limbe to Nkaya Junction | 96.0 | 14 | 145,833 | 0 |
| Entre Lagos to Mossuril | 584.4 | 1,286 | 2,200,548 | 42 |
| Cuamba to Lichinga Branch Line | 262.0 | 112 | 427,481 | 4 |
| Railway Investment (Total) | 1,274.0 | 3,063 | 2,404,805 | 100 |
| Within National Territory of Malawi | 335.5 | 1,288 | 3,839,046 | 42 |
| Within National Territory of Mozambique | 938.2 | 1,775 | 1,891,921 | 58 |
| Nacala-A-Vehla Coal Terminal | | 1,000 | | 100 |
| Coal Mine and Washing Plant | | 3,000 | | 100 |
| Coal Mine | | 1,000 | | 33 |
| Washing Plant | | 2,000 | | 66 |
| Total Investment | | 7,063 | | |

*Source: Nathan (2016)*

The governments of Malawi, Mozambique, and Zambia have committed investment, with support from the EU, AfDB, JICA, and Korea EXIM, for the Nacala Corridor Road Project, which is being implemented in four phases, at a cost of approximately US$758 million.[11]

- Phase 1 involved the rehabilitation of 348 km of road from Nampula to Cuamba in Mozambique (US$270 million) and construction of 13 km bypass road west of Lilongwe city in Malawi (US$24 million).
- Phase 2 involved the rehabilitation of 360 km of road from Luangwa Bridge to Mwami in Zambia US$237.5 million).
- Phase 3 involves the rehabilitation of 175 km from Cuamba to Lichinga, including a spur to Mandimba, in Mozambique (US$150 million).
- Phase 4 involves rehabilitation of 75 km between Liwonde and Mangochi in Malawi and construction and establishment of One-Stop-Border-Posts (OSBP) between Malawi and Mozambique at Chiponde/Mandimba border post and between Malawi and Zambia at Mchinji/Mwami border post (US$76.5 million).

The GoM has also committed investment, with support from the EU, for the rehabilitation of the remaining sections of an alternative route to Malawi, namely the Nacala-Nampula-Mocuba-Milange road. The key investment is the 110 km road between Milanje and Mocuba (US$117 million).[12]

[11] African Development Bank (2017).

[12] European Union: Upgrading of the Milanje – Alto Benfica Road Corridor Feasibility Study (2013).

The GoM had to take out a soft loan, estimated at approximately US$350 million, from the JICA to rehabilitate the Nacala Port. Given the state of degradation of the Nacala Port, the first tranche of financing was for emergency rehabilitation, followed by a credit line for what is called the Nacala Port Development Project,[13] which will be implemented over three phases.

- Phase 1, financed by a US$30 million grant, consisted of north quay pavement repair, a new container area, purchase of two Reach stackers, two RTG, and the repair of the liquid bulk quay and the installation of firefighting equipment (March 2014 to September 2015).
- Phase II, financed by a US$70 million, included the construction of a new access road to the port, pavement of the container yard, construction of a new rail transport container terminal, dredging, purchase of three RTG, and the construction of a new entrance (no dates specified).
- Phase III, at a cost of US$250 million, will involve the reconstruction of the quay, pavement of the container terminal, dredging, pavement of the access road, purchase of three RTG and tug-masters (no dates specified).

### 2.3.2. AGRICULTURE AND FORESTRY INVESTMENTS

Though the number is limited compared to the central zone including Sofala, Manica, and Tete provinces, where several large-scale biofuel projects have been approved, foreign investors have submitted proposals for large-scale agriculture investments to be carried out within the catchment region of the Nacala Development Corridor.

Most investments consist of forest plantations and the development of commercial farms for the production of cereals and legumes, especially maize, soybeans and oilseeds. Their projects are mostly planned in Niassa Province where an investor could relatively easily find a large vacant area suitable for plantation or commercial farming, since most districts in Niassa Province have a low population density due to their remoteness.

Table 2 summarizes the proposed large-scale agriculture and forestry investment projects in the Nacala Corridor since 2008.[14] These significant investments in infrastructure and agricultural/forestry development have been supported by ongoing efforts to improve trade facilitation measures. The more notable of these include the ratification by the World Trade Organization (WTOO Trade Facilitation Agreement[15] by Malawi (in July 2017), Mozambique (in January 2017) and Zambia (in December 2015).

[13] JICA: Final Report on the Project for Improvement of Nacala Port in Republic of Mozambique (2015).

[14] The most up to date report on the status of these investment projects in the Nacala Corridor Agricultural Development Master Plan, prepared by the Ministry of Agriculture, Mozambique, with support from the ProSavana programme.

[15] The objectives of the Trade Facilitation Agreement (TFA) are (i) the simplification and standardization of processes and procedures; (ii) removal of obstacles to trade; (iii) reduce trade costs; (iv) expedite movement, release, and clearance of goods; (v) improve cooperation between customs, immigration, police, agriculture (phytosanitary), and health on trade facilitation and customs compliance; and (vi) enhance technical assistance to build capacity to implement the TFA.

TABLE 2: NACALA CORRIDOR LARGE-SCALE AGRICULTURE AND FORESTRY INVESTMENTS

| Investor | Activity | Project Site | Area (Ha) | Status |
|---|---|---|---|---|
| Matanuska (Zimbabwe) | Banana Plantation | Monapo district, Nampula | 3,800 | Have only developed 1,450 ha due to impact of Fusarium Wilt (or Panama) Disease, which was originally detected in 2013. |
| Luambala Jatropha (Finland) | Jatropha plantation (Biofuel) | Majune District, Niassa | 8,700 | November 2012 changed production to soya, maize, and beans for the domestic market |
| Niassa Green Resources (Norway) | Forestry plantations (Eucalyptus/Pine) | Sanga and Lichinga district, Niassa | 60,000 | Have only developed 13,500 ha of forest, 6,000 ha under pine and 7,500 ha under eucalyptus. Have stopped planting due to market concerns |
| Lurio Green Resources (Norway) | Forestry plantations (Eucalyptus) | Ribauè, Namina, Morrapula, Mecuburi, Erati and Rapale districts, Nampula | 126,000 | Have only developed 4,000 ha of eucalyptus forest. Have stopped planting due to market concerns |
| Florestal de Massangulo (Zimbabwe) | Forestry plantations (Eucalyptus/Pine) | Lichinga district, Niassa | 80,000 | Have only developed 4,380 ha of forest. No additional information could be sourced |
| Quifel (Portugal) | Commercial farming (Soybeans, Sunflower) | Gurue district, Zambezia | 10,000 | No update available |
| Brasperson (Brazil) | Commercial farming (Soybeans, Maize | Mandimba district, Niassa | 16,000 | No update available |

*Source: ProSavana–Nacala Corridor Agriculture Development Master Plan (2013)*

Of more significance for the Nacala Corridor has been the repeal of the mandatory use of the Terminal de Exportação Especial de Nacala (TEEN) for exports from Mozambique, effective from the July 31, 2017. This regulation was widely viewed by private sector stakeholders as an impediment to trade, notably exports from Mozambique as it did not apply to transit cargoes, because of the high costs imposed to make use of the terminal to process exports. However, the details of how export procedures will work in a post-TEEN environment still have to be worked out, and there is a concern by private sector stakeholders that unforeseen costs may continue to be imposed on local exports.

Ongoing efforts to remove barriers to trade coupled with the massive investment in road, rail, and port infrastructure have presented an extraordinary opportunity to pursue a cluster of hitherto unrealizable large-scale industrial projects, which hold the potential to transform the country and region's economic trajectory. These opportunities are concentrated in the downstream gas, coal, forestry, tourism, and agro-processing sectors along the Nacala Corridor. However, most of these projects are realizable only in the medium- to long-term.[16] The focus in the short-term is to identify interventions that can accelerate economic development by lowering transport and logistics costs, which can be achieved by leveraging improvements in transport infrastructure and supporting ongoing efforts to enhance trade and transport facilitation as well as reforms to improve the business environments.

[16] Mott MacDonald (2015): Strategic Perspective on the Nacala Development Corridor, a report prepared by the Programa Densolvimento Espacial (PDE) housed in Ministry of Transport and Communications, Mozambique.

In spite of the sizeable investment in regional transportation networks, supported by a careful structuring of the concession agreements to ensure third-party access for general freight cargo and the repeal of the requirement for the mandatory use of the TEEN, some bottlenecks remain that undermine the realization of the system's capacity.

A concise problem statement would state that while there has been appreciable volume growth in cargo handled through the port of Nacala over the last decade, corridor flows have been dominated by growth in imports transported by road to the provincial capital of Nampula, the largest city along the corridor. By contrast, over the same period volume growth in transit cargoes, best suited for transport by rail and destined for landlocked Malawi, has been sluggish, despite the cost competitiveness of rail when compared to road transport. Unlocking this capacity will be critical to lowering transport costs in the hinterland regions of Mozambique (Zambezia and Niassa) and deep hinterland landlocked countries (Malawi and Zambia).

## 2.4. CORRIDOR COMPETITIVENESS

Table 3 shows total volume growth through the Nacala port has been an impressive, growing at an average annual rate of 6.2% from 2007 to 2016. However, there has been a significant decline in recent years from a peak of 2.17 million tons in 2014 to 1.64 million tons in 2016.

TABLE 3: NACALA PORT–TOTAL VOLUMES, 2007–2016 (000'S TONS)

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Transit | 952 | 876 | 1,050 | 1,155 | 1,354 | 1,351 | 1,912 | 2,171 | 1,716 | 1,635 |
| Average Annual Growth: 6.2% | | | | | | | | | | |

*Source: Portos do Norte – Official Port Statistics (2012-2016)*

Table 4 shows that total volume growth of transit cargoes through the Nacala port has been less than impressive, growing at an average annual growth rate of just 1.7% from 2007 to 2016. Moreover, transit cargoes to Malawi dropped from 22.5% of total volumes to 15.2% over this period. In contrast to overall traffic volumes, transit traffic remained more or less the same from 2014 to 2016.

TABLE 4: NACALA PORT–MALAWI TRANSIT CARGO, 2007–2016 (000'S TONS)

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Transit | 214 | 227 | 261 | 221 | 203 | 206 | 291 | 251 | 231 | 249 |
| % Traffic | 22.5 | 25.9 | 24.8 | 19.1 | 15.0 | 15.2 | 15.2 | 11.6 | 13.5 | 15.2 |
| Average Annual Growth: 1.7% | | | | | | | | | | |

*Source: Portos do Norte- Official Port Statistics (2012-2016)*

Table 5 shows that the Beira port continues to handle more transit imports and exports for Malawi than the Nacala port. The fact that the market share of Nacala has remained constant suggests that users are relatively stable and that new customers need to be attracted to the corridor.

TABLE 5: NACALA VS. BEIRA PORT - MALAWI TRANSIT CARGO, 2013–2015 (000'S TONS)

| Beira Corridor | | | Nacala Corridor | | |
|---|---|---|---|---|---|
| 2013 | 2014 | 2015 | 2013 | 2014 | 2015 |
| 538 | 397 | 581 | 291 | 251 | 231 |
| Market Share of Total Malawi Trade by Volume (%) | | | | | |
| 15.5 | 14.4 | 22 | 8.4 | 9.1 | 8.8 |

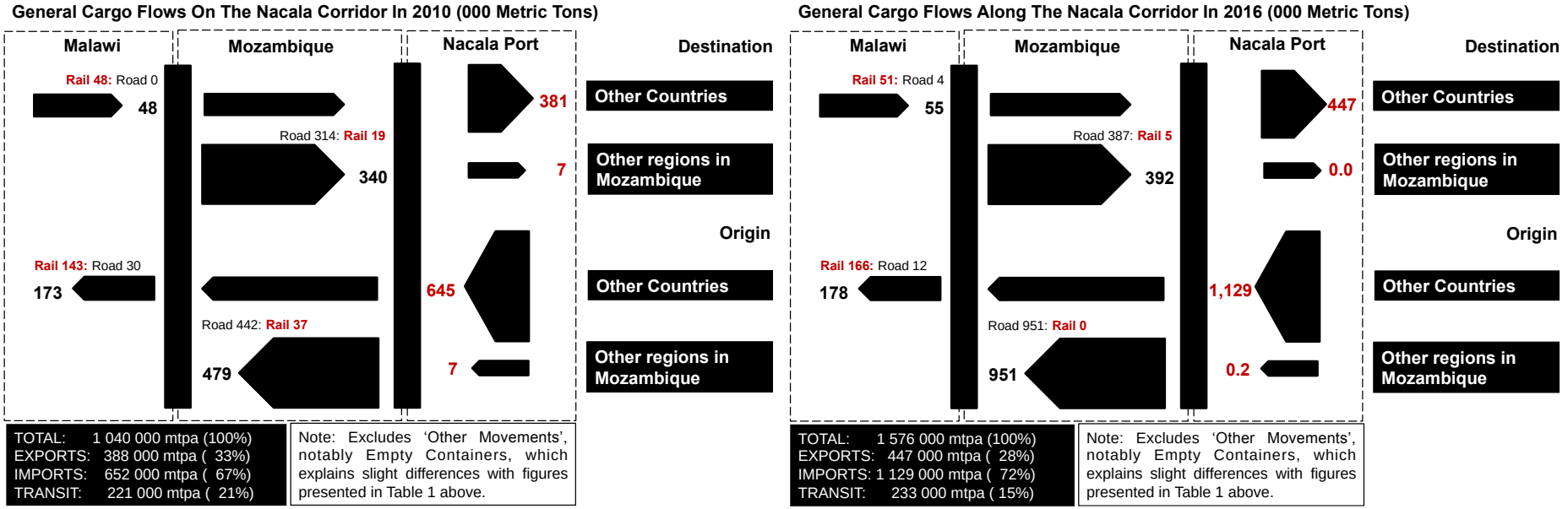
*Source: Cornelder Mozambique – Official Port Statistics and Portos do Norte – Official Port Statistics (2013-15)*

Figure 10 provides a more detailed look into the modal split, in terms of cabotage (sea), road, and rail transport for both national (Mozambique) and transit (Malawi) cargoes for the years 2010 and 2016. The key conclusions to be drawn from the figure are as follows.

- Imports have expanded much more rapidly than exports. From 2010 to 2016 there was an increase of 477,000 tons in imports, compared with only 59,000 in exports. When broken down further national (Mozambique) imports grew by 472,000 tons and transit (Malawi) imports by only 5,000 tons and national (Mozambique) exports grew by 52,000 tons and transit (Malawi) exports by 7,000 tons. This suggests that national (Mozambique) imports, which have contributed 88% of all additional port volumes, have been the driving force behind growth over this period.
- National (Mozambique) cargoes have expanded much more rapidly than transit (Malawi) cargoes. From 2010 to 2016 there was an increase of 510,000 tons in national cargoes compared to just 12,000 tons for transit cargoes. This suggests that transit cargoes through the Nacala port have stagnated over this period.
- Road transport is by far the most dominant mode of transport on the corridor, accounting for 76% of cargo in 2012 and 86% in 2016. However, for national cargo road transport accounted for 92% of cargo in 2010 and 99% in 2016. These flows are dominated by movement between the port of Nacala and the provincial capital of Nampula. By contrast, transit cargo on rail transport accounted for 86% of cargo in 2010 and 93% in 2016. This suggests that rail cargoes are best suited for long-haul inland national and transit cargoes but flows beyond Nampula are still low. Moreover, road transporters to/from Malawi prefer the Beira Corridor because it is closer and cheaper.

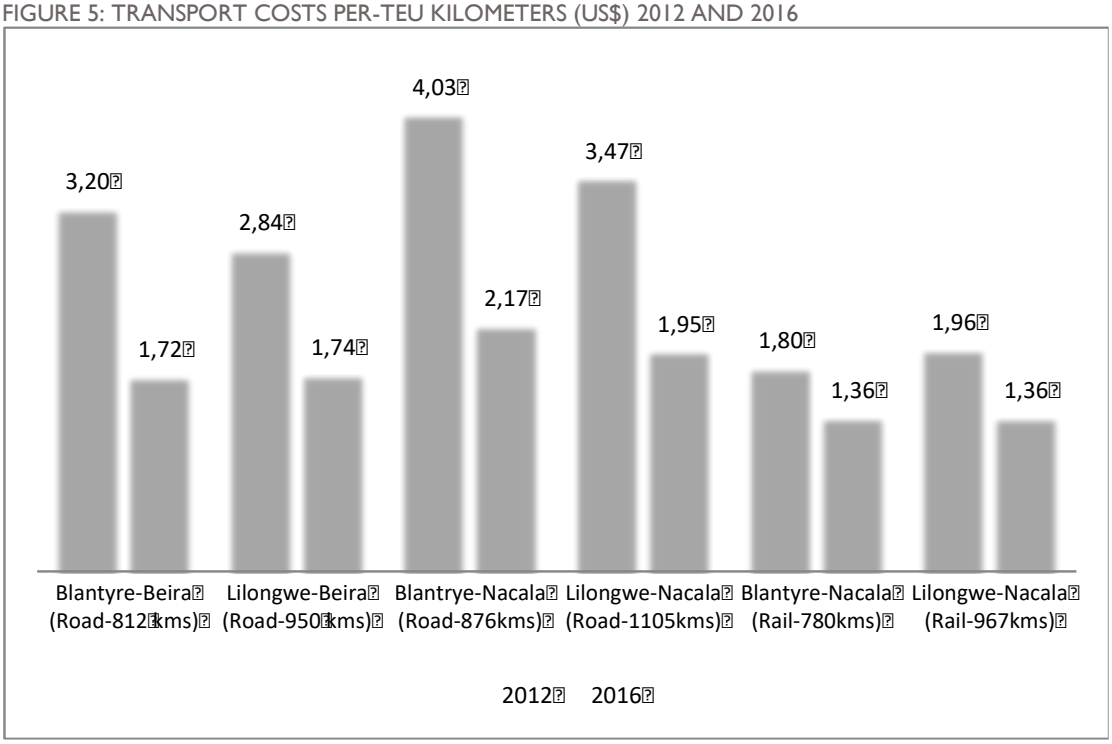
Figure 11 highlights that road transport costs are appreciably higher on the Nacala compared with the Beira Corridor, even though the difference in distance is marginal. By contrast, rail transport costs and distances are appreciably lower, but this has not resulted in the anticipated surge in the use of rail-based transport since the rehabilitation of the line. The high road transport prices are in spite of the cost of road transport coming down, due to a combination of lower fuel costs and a tighter market, which rail transport has matched stride for stride. While accepting that road and rail pricing is dynamic due to changes in market conditions, infrastructure performance, and the quality of logistics services, it is clear that bottlenecks continue to frustrate the realization of the full potential of the Nacala Corridor's port and railway system.

FIGURE 4: MODAL SPLIT OF NATIONAL AND TRANSIT CARGOS ON NACALA CORRIDOR




*Source: Portos dos Norte – Official Port Statistics (2010 and 2016)*

FIGURE 5: TRANSPORT COSTS PER-TEU KILOMETERS (US$) 2012 AND 2016




*Source: USAID (2012)[17], Transcom Sharif-Malawi Interview (07.08.2017) and CDN-CEAR Business Plan (2016)*

The following section presents a *FastPath2* software tool diagnostic analysis of corridor performance in terms of time, cost, and reliability of the transit-transport system.

17 USAID (2012): Logistics Review of the Beira and Nacala Corridors, a report prepared for the AGRIFUTURO program.

# 3. CORRIDOR TRANSPORT LOGISTICS PERFORMANCE

## 3.1. CORRIDOR TRANSPORT INFRASTRUCTURE OVERVIEW

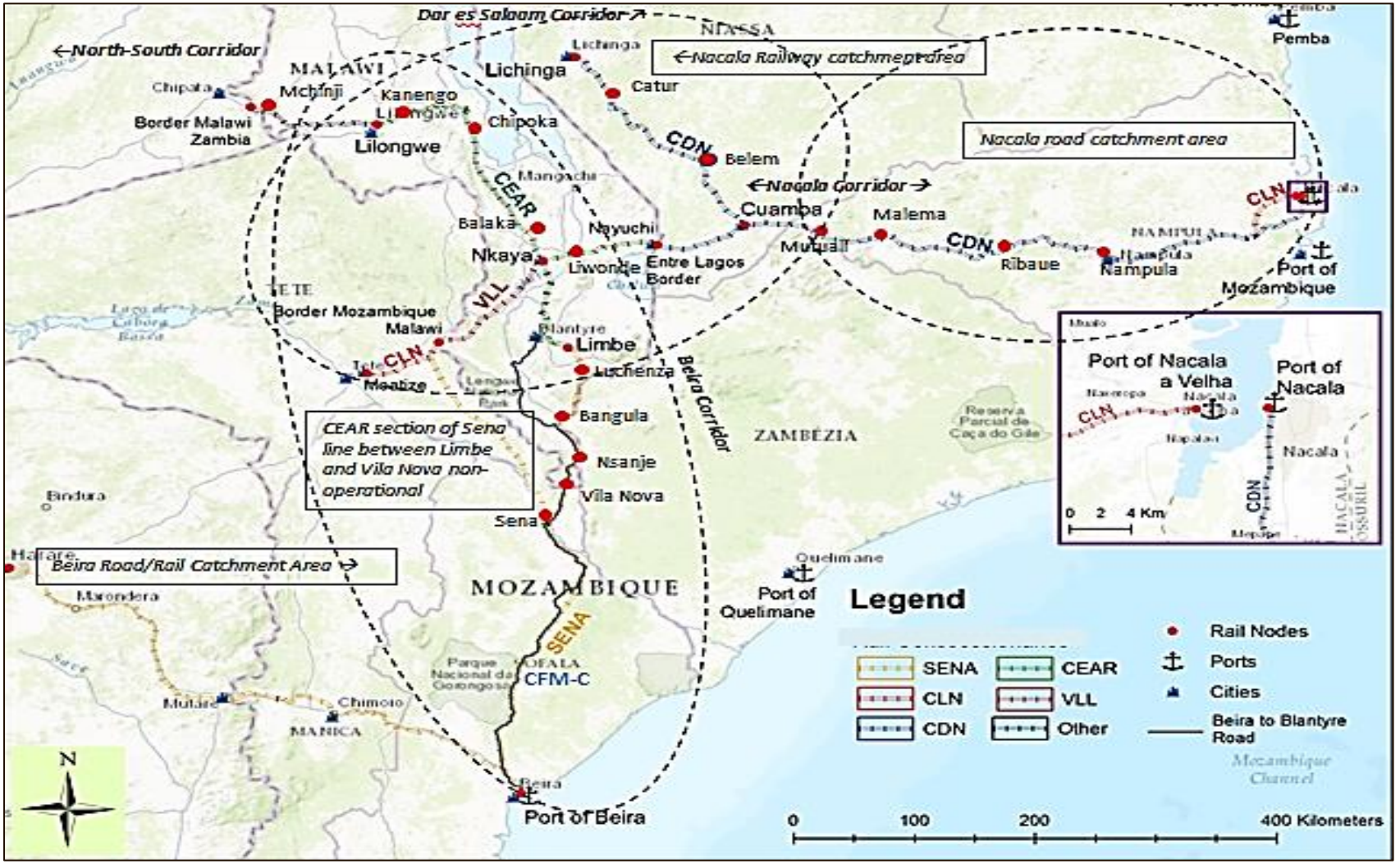
### 3.1.1. REGIONAL CORRIDOR OVERVIEW

Northern Mozambique, Central/Southern Malawi, and Eastern Zambia are served by four main trade and transport corridors for regional and international trade: the Nacala corridor, the Beira corridor, the North-South corridor, and the Dar es Salaam corridor. Nacala and Beira both have captive traffic zones and compete for traffic where their catchment areas overlap (figure 12). The Niassa, Nampula, and (Upper Zambezia) provinces in Mozambique effectively serve as captive markets for the Nacala Corridor for both imports and exports. Malawi's regional and international trade is served by several transport corridors, with Beira being the most important competitor for international trade. The North-South road corridor is the most important route for regional trade, dominated by imports from South Africa. This promotes the diversion of Malawi's international exports through the South African port of Durban, despite the longer land transport distance, and most often higher costs. It is not always the shortest and lowest cost route which is chosen by customers.

This study focuses on the geographic region in Mozambique and Malawi served by the port of Nacala. Beira port and corridor are also discussed, but discussion is limited to the corridor's role as a competitor to the Nacala Corridor. The Nacala Corridor covers the central and southern regions of Malawi and five provinces in northern Mozambique: Cabo Delgado, Nampula, Niassa, Tete, and Zambezia. The corridor is home to about 18 million people, according to various estimates, and agriculture employs 80–85% of the corridor's adult population.[18] The corridor's area of influence extends with the rail line east from Nacala port on the Mozambique coast, westward through Nampula Province to Cuamba in Niassa Province, and on to Nkaya in Malawi and Moatize in Tete Province (the location of a major coal mine that anchors the west end of the rail line).

[18] Estimated from Chirwa, E.W., Kumwenda I., Jumbe C., Chilonda P., and Minde I. 2008. Agricultural Growth and Poverty Reduction in Malawi: Past Performance and Recent Trends. ReSAKSS Working Paper. And FAO. 2016. Mozambique Country Fact Sheet On Food And Agriculture Policy Trends, 2013 data. http://www.fao.org/3/a-i5931e.pdf

FIGURE 6: MAP OF NACALA AND BEIRA CORRIDOR CATCHMENT AREAS




*Source: SOCIO-ECONOMIC IMPACT ASSESSMENT REPORT: POTENTIAL ECONOMIC IMPACTS OF THE NACALA RAIL AND PORT PROJECT, Nathan Associates (2016)*

In southern Malawi, the corridor extends to the main commercial center surrounding Blantyre. The corridor also extends north to Lilongwe via Salima by rail and Dedza by road, and then to Chipata, Zambia. In Mozambique, the Nacala Corridor extends north from Cuamba to Lichinga via both a railway spur line and a road axis, which connects high-potential agricultural regions in hinterland Mozambique to the main urban centers of northern Mozambique and southern and central Malawi.

### 3.1.2. NACALA CORRIDOR

***Nacala Port***

Nacala port serves as the prime port for northern Mozambique and was the preferred location for the 18 mtpa Vale coal export terminal, including the construction of a new high capacity 912 km long railway from Moatize through Malawi. Nacala was chosen because of the unrestricted depth of the bay, allowing large bulk vessels to be used for coal exports, with reduced sea freight rates. This was despite the fact that Beira is about 340 km closer by rail to Moatize and that Vale had already developed a coal terminal at Beira.

The Nacala general cargo port now has access to a high capacity and reliable railway, which has opened up new opportunities for expansion and reduction of transport and logistics costs. The general freight rail service has open and free access to the main coal export line, with up to two operating slots per day in each direction. Figure 13 shows the expansion of the general cargo port to be supported and funded through JICA, which is currently being implemented. Some aspects, such as the provision of rail sidings and equipment for the container terminal, have not yet been finalized according to CDN.

FIGURE 7: PLANNED DEVELOPMENTS AT NACALA PORT BEING FINANCED BY JICA

*Source: Port of Nacala Handbook and Directory 2017/2018*

The port is privately managed through a concession with CDN and is currently operated by Portos de Norte SA. The latter contract is coming up for renewal in 2018, and at the time of the team's field mission, there was uncertainty over the future operator.

The total area within the existing port secure zone is approximately 25 ha and an adjacent area of about 15 ha to the south, presently occupied by poorly utilized older smaller warehouses and open land. The JICA master plan, as shown in Figure 13 above, is planning to incorporate this area into the port secure zone. Further limited expansion is possible to the north along the coast, likely requiring some land reclamation. The port is surrounded by built up areas and expansion is therefore constrained.

The existing port has two container berths along the south quay and three general cargo berths along the north quay, the most northern berth serving as an oil terminal. The JICA master plan, as shown in Fig 7 above, is planning to switch the container and general cargo berths during the next planned phase of port development. Some general cargo ships currently call on the container quay due to draft restrictions. More detail on the port is presented in table 6.

TABLE 6: NACALA PORT DESCRIPTION

| Component | Description |
|---|---|
| Berth depths | Existing container berths are 14m below CD, and the general cargo berths 10m. The new container berths will be 12m requiring some reconstruction and deepening of the berth. Vessels of up to 50,000 dwt or 4,000 TEUs can thus be accommodated. |
| Marine access | Very good with no depth restrictions, more than 25m deep. No maintenance dredging required for marine access. |
| Road access | Direct from the N8, single lane in both directions, narrow, but in good condition, and with few congestion issues. Some local congestion outside of Kudumba and gate during peak times. Second access point is being constructed through JICA project. |
| Rail access | Direct access from the railway mainline into the port marshalling yard, which is capable of handling up to 30 wagons (450 m). It is thus not able to handle full 42 wagon train sets in the port and this requires splitting and shunting – this is not ideal. The rail sidings to serve the container terminal are currently limited to 20 wagons, and the future layout has not yet been finalized – but could be an operational and capacity constraint affecting the train turnaround time in the port |
| Storage and handling | At the present time, all ship loading and unloading is carried out by ships cranes (geared vessels), and yard handling by reach stackers and tractor trailers – as far as possible, direct transfer onto trucks is carried out on the quayside. A large temporary bulk storage inflatable warehouse has been provided, but the main storage is provided by the private sector, along the N8, about 5 to 8 km from the port. |

*Source: Nathan Associates, with information from Portos do Norte*

At present, the port is not congested, but the main constraint for future expansion is the limited space available for terminal activities and storage. Rail access is also constrained due to the limited siding length: ideally full train lengths should be accommodated at the port in order to reduce terminal handling time, increase port capacity and hence lower costs. The main operational objective for most ports is to keep the quayside clear at all times, allowing vessels to discharge and load as quickly as possible. For Nacala and for the other east coast ports, the objective of keeping the quayside clear at all times applies primarily to imports.

Bulk should ideally be handled to and from remote storage facilities by conveyor systems and import containers should be moved away from the quayside immediately, normally by tractor trailers either to temporary stack or transferred directly to road or rail haulage out of the port area. This will be particularly important for Nacala when the new STS cranes are installed. In the ports of Dar es Salaam and Mombasa, which have also suffered from lack of storage space for containers, which

severely affected port efficiency, capacity, and hence costs., The solution for national import containers was to develop many privately operated ICDs and CFSs (container freight stations) close to the port where the imports could be customs cleared and possibly destuffed and stored for collection by the importer. This solved the problem of port congestion but added significant cost of double handling (typically $100/TEU) and severe road congestion in and around the port. Transit import containers are most often removed from the port quickly, within one day for road or rail haulage, to an inland container deport or dry port for customs clearance. Rail transport has the advantage over road in that it can transport more than 80 TEUs in one movement directly to a Customs-bonded inland dry port. (In the US, dry ports and ICDs are able to handle trains of more than 150 wagons.)

At present, rail terminal facilities on the Nacala Corridor, both in the port and inland, require a full 42-wagon general freight train to be taken to a marshalling yard or station siding, to be split into three or four sections and then shunted to and from the ICD or customers siding. This adds to time and cost and is also a security issue.

Planned developments include the commencement of the second phase of the JICA financed port expansion, which is delayed and has not yet started. The second phase will entail the completion of the new container terminal and the provision of two ship-to-shore gantries. These will more than double the existing vessel TEU handling rate, from about the existing 10-12 TEUs/hr for geared vessels and will reduce shipping costs and also increase port capacity (figure 13).

***Nacala Railway***

The Nacala main line railway between Moatize and the Nacala terminal has been rebuilt to a high standard to handle up to 18 mtpa of coal exports, 20.5 t axle loads, using special wagons able to carry 63 t of coal, with current train lengths of 120 wagons. The Nacala railway is a single track, with passing loops to allow trains to pass each other safely. It is controlled by a central train control system. At full capacity, the Nacala railway will handle up to 10 trains per day in each direction.

Capacity can be increased by either lengthening the passing loops and trains or by providing additional passing loops. A dual track may be economically viable when freight volumes increase beyond about 40 mtpa. The passing loops for the coal trains are 1800 m long. Up to seven coal trains per day will operate in each direction at full capacity, but currently there are four or five trains per day. The Concession Agreements require the provision of at least two general freight trains per day, initially 35 to 42 wagons long, using the older passing loops which are about 600 m long. The current general freight capacity has been given by CDN-CEAR as 2.4 mtpa in both directions, slightly less than two trains per day in each direction.

The general freight branch lines in Mozambique extend from Cuamba to Lichinga (346 km) and from Nacala port to the junction with the coal main line (26 km). These lines have been repaired and upgraded to 18 t axle loads, which should permit up to 53 t of freight to be carried in each wagon, but the branch lines are presently limited to 40 t or 15 t axle loads because of bridge load limitations. The initial axle loads in the region, when the railways were built more than 100 years ago, was 15 t (four axles per wagon, six per locomotive). The axle loads in Zambia, Mozambique, and Zimbabwe have gradually been increased to 18 t. The axle load on the main Nacala coal export line is 20.5 t, and on the TAZARA line in Tanzania the axle load is 20 t. The permissible axle load is often reduced below the design axle load due to deteriorating track conditions (including speed restrictions). The Lichinga line does not have any formal passing loops, but two stations en route

serve as passing loops, allowing train lengths of 30 wagons. There are no formal Inland Container Depots (ICDs) at Cuamba and Lichinga.

In Malawi the key branch line is between Nkaya and Limbe (96 km). It has been upgraded to 18 t axle loads, but currently is limited to 15 t because of bridge load restrictions. The upgrading of this branch line, particularly in respect of the bridge loads, is being addressed by CDN-CEAR and the intention is to increase the rail axle loads on the Malawi branch lines to 18 t. The railway line to the South beyond Limbe is non-operational, and CEAR has no plans to reopen this section for now.

The branch line from Nkaya to Lilongwe (283 km) is in poor condition, but operational with speed restrictions, using 25 wagon train lengths. CDN-CEAR is currently implementing a US$10 million repair program, focusing first on bridge and culvert repairs and then on formation and sleeper replacement. The line is prone to flood damage. The rail link to Mchinji and Chipata is of a higher standard, but also is in poor condition (erosion of the ballast and the formation). It is operational. There are privately operated ICDs in Blantyre, with restricted rail access, but not at Lilongwe/Kanengo.

Besides the current upgrade of the Nkaya- Lilongwe rail section, which is clearly essential for this rail service to be viable, it is understood from CEAR that a freight terminal and interchange will be developed at Nkaya to in order to adjust the length of the trains from the branch lines to the main line. The branch lines can presently handle train lengths of up to 30 wagons, whereas the mainline operates up to 42 wagons for the general freight services. The Nkaya location seems logical because it is where the branch lines link to the higher specification main line, although there is presently no customer base at Nkaya.

There is also a private sector proposal to build a freight terminal/ICD at Liwonde. Discussions held with one of the financial backers, Pembani-Remgro, indicate that a freight terminal/ICD is being considered, but there is as yet no agreement with CDN-CEAR on this proposal nor has a final decision been taken to fund Moto-Engil, the developers of the project.

The construction of an ICD has commenced at Chipata to serve the eastern Zambia market, but is halted due to the lack of demand. The start-up of recent maize exports may provide the required incentive. CDN-CEAR is investigating the possibility of establishing warehouses at Chipata to capture maize and cotton exports that are currently transported by road to Beira through Katete and Tete.

The Zambian government, with support from a Chinese construction company, has proposed to construct a 390 km new rail link between Chipata and Serenje on the TAZARA line, in order to access the Copperbelt. The rail link has some political support but is unlikely to be economically feasible for the foreseeable future due to insufficient volumes and high capital costs (likely more than US$2.5 billion, excluding rolling stock). The question of additional capacity on the Malawian and Mozambique rail section would then also arise.

***Nacala Road Corridors***

In general, the main roads within Malawi are in good condition, and within Niassa and Nampula in Mozambique extensive road upgrading programs are currently being implemented. The two main corridors from Nacala to Malawi include the following.

- Milange Corridor. This is the preferred route between Malawi and Mozambique and is in good condition except or about 30 km which requires surfacing. The distance between Milange and Nacala of 750 km, can be covered in one day by some truckers.
- Mandimba Corridor. The Northern route is less used and has longer section of unsurfaced roads. The road between Cuamba and Lichinga remains unsurfaced.
- Cuamba–Lichinga Corridor. This road (approximately 300 km) is unsurfaced, but in good-to-fair condition.
- Nampula–Cuamba Sub-Corridor. Recently upgraded to a surfaced road and almost completed in excellent condition.
- Nacala–Nampula Sub-Corridor. Surfaced and in good condition.

### 3.1.3. BEIRA CORRIDOR

***Beira Port***

As noted above, the Beira road corridor is the Nacala corridor's main competitor for traffic to and from Malawi. The prime catchment area for Beira is central Mozambique, Zimbabwe, Zambia, the copper belt, and southern Malawi. Beira port has traditionally served as the prime port for Malawi's international trade, up to 1985 via the Sena railway to Limbe, and after 1985 by road through Tete. The railway has not been operational since 1985, and it is unlikely that the railway will be reinstated in the foreseeable future due to the projected high rehabilitation costs.

Beira port is several times larger than Nacala with respect to area, number of berths, shipping calls, and freight volume (table 7). However, the port suffers from limited depth and a long 40 km access channel that requires constant maintenance dredging. As a result, operating costs and risks are high. The port is privately managed through a concession with Cornelder. The table below has more information on Beira port. The general cargo berths in Beira are currently suffering from berthing delays of up to 30 days for fertilizer imports (peak season). There are no delays on the container berths.

As noted above, Vale chose to move its coal via the Nacala corridor, despite the existing coal terminal in Beira. During the Nacala corridor construction period, coal was transported from Moatize to Beira, but the draft limitations at Beira, particularly in the 40 km long access channel, required Vale to use smaller vessels for loading and to then transship to larger vessels offshore, resulting in additional costs and risks. Vale ceased using the Beira coal terminal and the Sena railway for their coal exports in September 2017.

FIGURE 8: BEIRA PORT LAYOUT 2017


*Source: Nathan team 2017*

TABLE 7: BEIRA PORT DESCRIPTION

| Component | Description |
|---|---|
| Area | The total area of the existing Beira port and the land available for future development of more than 500ha. Beira serves Zimbabwe, Zambia, Malawi and the DRC, and has a throughput of 3 to 4 times more than Nacala – including the coal export berth |
| Berths | 4 container berths and 4 general cargo berths, including a grain terminal. in addition, a coal terminal and an oil terminal |
| Depths | Vary from 10 m for the general cargo berths to 12 m for the containers and oil berths |
| Marine access | Difficult, via a 40 km long channel, 8m below CD, entry for large vessels only on the tide. Requires continuous maintenance dredging |
| Road access | Generally good from Malawi through Mwanza to Blantyre and through Dedza to Lilongwe. Between Beira and Dondo, approximately 30km, often poor and prone to flooding |
| Rail access | No rail access to Malawi, except via Moatize – not viable for general freight. The Sena line connection to Malawi has been closed since 1985, and seems unlikely to reopen |
| Storage | The port area is not constrained |
| Constraints | The marine access and depth of the general cargo berths |
| Planned developments | Proposal to extend the general cargo quay by 600m to provide additional 2 large berths. Planned new major coal terminal is on hold |

*Source: Nathan (2017) with information from Cornelder*

### *Beira Rail*

There is presently no direct operational rail link between Beira and Malawi, except via Moatize. A trial shipment of clinker imports for Malawi was sent by rail to Moatize, for transhipment to road to Blantyre, but this was considered to be not viable due to the storage difficulties and high costs. The existing link between Mutarare and Limbe has been non-operational since 1985, and the section linking to Bangula (sugar exports) was flood damaged in the late 1990s.

### *Beira Road*

The road link between Beira and Malawi carries more than one mtpa of freight, mostly in the import direction for Malawi. Sections of the roads have been very poor in the past but have recently been upgraded. The roads (below) in Malawi are generally in good condition.

- Malawi via Mwanza, through Tete, and also carrying the freight to and from South Africa and Zimbabwe. It is congested in sections and is now in good condition, except for 30 km from Beira, which is undergoing repair.
- Malawi via Dedza, also routed through Tete, but the traffic to and from Lilongwe is routed through the border post at Dedza. It is generally good in good condition.
- Zambia via Katete, used for freight to and from eastern Zambia including Chipata is generally in fair to good condition.

## 3.2. CORRIDOR TRANSPORT AND LOGISTICS PERFORMANCE ASSESSMENT

### 3.2.1. ANALYSIS OF NACALA CORRIDOR CURRENT PERFORMANCE

Below, the report details transport time and cost for containerized goods moving through the Nacala corridor. Table 8 summarizes transport time and costs for the Nacala corridor from the port to destination.[19]

TABLE 8: *FASTPATH2* NACALA CORRIDOR TIME AND COST SUMMARY

| Corridor | Type | Imports | | | Exports [c] | | |
|---|---|---|---|---|---|---|---|
| | | Price US$ | Price US$/t [b] | Time hours | Price US$ | Price US$/t [b] | Time hours |
| Nacala-Blantyre Road | Road Link [a] | 1,741 | 75.67 | 17 | 1,449 | 62.98 | 17 |
| | Border Post Node | 77 | 3.33 | 1 | 93 | 4.02 | 1 |
| | Road Node-Mozambique [d] | 419 | 18.22 | 14 | 419 | 18.22 | 14 |
| | Road Node-Malawi | 64 | 2.78 | 0 | 64 | 2.78 | 0 |
| | Seaport Node [e] | 430 | 18.69 | 71 | 655 | 28.47 | 81 |
| | Total | 2,730 | 118.69 | 103 | 2,679 | 116.47 | 113 |
| Nacala-Blantyre Rail [f] | Rail Link | 2,225 | 58.56 | 32 | 1,780 | 30.69 | 32 |
| | Border Post Node | 0 | 0.00 | 2 | 0 | 0.00 | 2 |
| | Intermodal Container Terminal Node | 130 | 3.42 | 50 | 130 | 2.24 | 62 |
| | Rail Node | 27 | 0.71 | 7 | 27 | 0.47 | 5 |
| | Seaport Node | 430 | 11.31 | 71 | 655 | 11.29 | 81 |
| | Total | 2,812 | 74.00 | 162 | 2,592 | 44.69 | 182 |
| Nacala-Lichinga Road | Road Link | 2,500 | 108.70 | 18 | 2,300 | 100.00 | 18 |
| | Road Node | 46 | 2.00 | 14 | 46 | 2.00 | 14 |
| Nacala-Lichinga Road | Intermodal Container Terminal Node [g] | 0 | 0.00 | 0 | 380 | 16.52 | 9 |
| | Seaport Node | 430 | 18.69 | 71 | 655 | 28.47 | 81 |
| | Total | 2,976 | 129.39 | 103 | 3,381 | 147.00 | 122 |
| Nacala-Lichinga Rail [h] | Rail Link | 1,745 | 45.93 | 44 | 1,396 | 36.72 | 44 |
| | Intermodal Container Terminal Node | 130 | 3.42 | 100 | 130 | 3.42 | 100 |
| | Rail Node | 27 | 0.71 | 5 | 27 | 0.71 | 5 |
| | Seaport Node | 430 | 11.31 | 71 | 655 | 17.23 | 81 |
| | Road Link (Drayage) | 500 | 13.16 | 2 | 500 | 13.16 | 2 |
| | Total | 2,832 | 74.54 | 222 | 2,707 | 71.25 | 232 |
| Nacala-Lilongwe Rail [f] | Rail Link | 2,740 | 72.11 | 64 | 2,192 | 57.68 | 64 |
| | Border Post Node | 0 | 0.00 | 3 | 0 | 0.00 | 14 |
| | Intermodal Container Terminal Node | 130 | 3.42 | 48 | 130 | 3.42 | 48 |

[19] For road cargo this is the final destination. Rail cargo is unloaded at the rail terminal of its final destination. Drayage is not included as it greatly varies among products based on the warehouse or factory location.

| Corridor | Type | Imports | | | Exports [c] | | |
|---|---|---|---|---|---|---|---|
| | | Price US$ | Price US$/t [b] | Time hours | Price US$ | Price US$/t [b] | Time hours |
| | Rail Node | 27 | 0.71 | 7 | 27 | 0.71 | 5 |
| | Seaport Node | 430 | 11.31 | 71 | 655 | 17.23 | 81 |
| | Total | 3,327 | 87.55 | 192 | 3,004 | 79.05 | 211 |
| Nacala-Chipata Rail [f] | Rail Link | 3,146 | 82.79 | 76 | 2,517 | 66.24 | 76 |
| | Border Post Node | 0 | 0.00 | 3 | 0 | 0.00 | 14 |
| | Intermodal Container Terminal Node | 130 | 3.42 | 48 | 130 | 3.42 | 48 |
| | Rail Node | 27 | 0.71 | 7 | 27 | 0.71 | 5 |
| | Seaport Node | 430 | 11.31 | 71 | 655 | 17.23 | 81 |
| | Total | 3,733 | 98.23 | 204 | 3,329 | 87.60 | 223 |

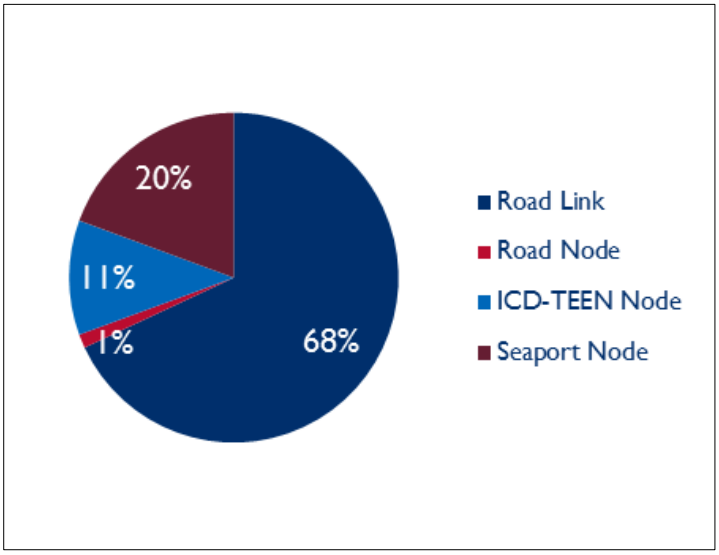
*Source: Nathan Associates*

*[a] Road link fees were calculated based on the assumption that trucking prices quoted in interviews were inclusive of border post fees and road node fees; therefore these fees have been backed out of our calculations to arrive at the link price.*
*[b] Assuming 23 t/cargo per truckload and 38t/rail wagonload.(excluding the weight of the container)*
*[c] Cheaper as backhaul.*
*[d] Includes overnight stop and checkpoints.*
*[e] Assumes stuffing time is at the port for exports.*
*[f] Price is per wagon which is 2-20' or 1 -40'. Price and time do not include drayage.*
*[g] TEEN price for 1-20' container including formal fees, informal fees and drayage to/from TEEN.*
*[f] Price is per wagon which is 2-20' or 1 -40' and includes drayage.*

Cargo traveling by road encounters costs and times at the port, on road links (trucking), at road nodes (weighbridges, checkpoints, tolls/road user fees), border posts, and, for Mozambican exports, the TEEN dry port. Rail cargo passes through the port, rail links (including passing loops), rail nodes (junctions, locomotive changes), ICDs or inland loading/offloading points, and, in some cases, intermodal road transport to the warehouse or factory.

As shown above in Table 8, most corridor costs in Nacala consist of road or rail link costs. However, the majority of time is often captured at the port. For rail cargo, a significant amount of time and cost is also spent at inland offloading/loading points.

FIGURE 9: MOZAMBICAN EXPORT COST BY TRANSPORT COST COMPONENT–ROAD




*Source: Nathan Fastpath2 calculations from interviews (2017).*

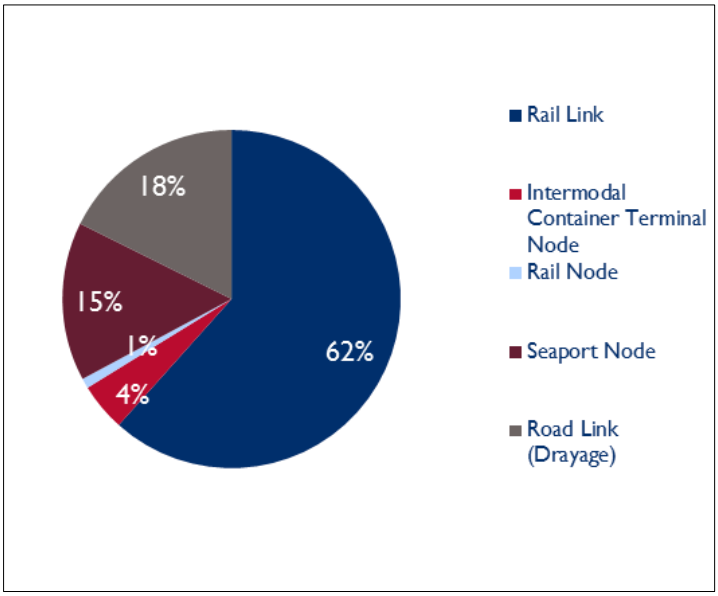
Source road transport costs are typically quoted by trucking companies as "all in" prices from the origin to destination. For purposes of the FastPath2 analysis, we split these road costs into cost per link (i.e. trucking costs) and node (road user fees, checkpoint fees, and weighbridge fees) when possible to see where costs were high. As shown in figure 15 above, the road costs constitute the majority of the transport costs. However, road node costs are also significant. For example, when traveling from Beira to Blantyre, road users will pay $132 in road user fees in Malawi and an estimated $370 in road user and weighbridge fees in Mozambique. Traveling the Nacala corridor to Blantyre road user fees are estimated at $64 in Malawi and over $400 in Mozambique. Traveling from Nacala to Lichinga, road users noted informal checkpoint fees and charges including 1,500–2,000 MT at a non-functional weighbridge on the Cuamba-Lichinga road, 2,500 MT at the weighbridge near Nacala, and 2000–3000 MT for bribes at various checkpoints along the corridor (US$1 = MZN 59– 23 Jan 2018).

Road transport time was quoted at two days from Nacala-Blantyre with an overnight stop near the border. Transport time to Cuamba can be done in one day but travel to Lichinga requires an overnight stop near Cuamba.

Mozambican exporters consistently mentioned that the Nacala corridor was more expensive than competing corridors due to the Terminal de Exportação Especial de Nacala/Nacala Port and Special Export Terminal (TEEN). Costs were estimated at approximately $380 for a 20' and $500 for a 40' container (See text box below under recommendations for more detail.). As shown in figure 15 above, this represents 11% of transport costs (assuming TEEN costs for a 20' container). However, the MEF recently passed a decree that no longer mandated use of TEEN effective July 25, 2017. TEEN costs were still included in the FastPath2 base case as implications of the new decree were uncertain at the time of the team's fieldwork. As elaborated in chapter 5, the law is not very clear, and the exporters were still uncertain as to whether they would be able to actually avoid TEEN in practice. This is due to the lack of other bonded warehouses and uncertainty over the availability and willingness of customs officers to do inspections at the port and warehouses, and the possibility of government calling for mandatory use of TEEN for specific cargo or situations. Provided that the spirit of the decree is implemented, national exports through Nacala port should increase. An estimate of the direct impact of cost savings that could be realized by removing TEEN costs is included in the recommendations section of this report.

Cargo traveling from the Nacala port to and from Blantyre, Lilongwe, Chipata, Cuamba, and Lichinga also has the option of using rail transport, which is typically the cheapest mode of transport. However, transit times are longer due to wagon speed on the branch lines and loading/unloading time at the nodes. Loading/unloading a 42-wagon train typically takes between three and four days, due to the need to shunt typically 10 wagons at a time, which is much longer than the time to unload a truck. Further, as shown in figure 16, there are usually multi-modal costs in addition to the rail costs as in most cases cargo has to be trucked from the rail yard to/from the warehouse or factory. These drayage costs are estimated to comprise 18% of the transport cost, which adds to the all-in transport price and reduces the cost competitiveness of rail. The cost is high despite short distances due to fixed costs which are spread over a short distance, and that many of these trips are in remote areas with poor road conditions and little competition. Also, the costs increase when products must be trucked at both the origin and destination. Products that are directly discharged at one or both nodes face more competitive all-in costs of using the rail. For example, Farmer's World has private rail sidings to warehouses in Liwonde, and Bakhresa has silos at Nacala port and rail sidings and bulk handling at Blantyre.

FIGURE 10: NACALA-LICHINGA RAIL TRANSPORT COST BY TYPE–IMPORTS




*Source: Nathan Fastpath2 calculations from interviews and CDN-CEAR (2017).*

The Cuamba-Lichinga spur line opened in 2016. Traders participating in a pilot train indicated that rail prices initially look competitive, but when transport costs from the factory to warehouse at both the origin and destination were added, costs were less competitive. These costs were quoted at $250/wagon at each end, totaling $13/t. The total price is then similar to the cost of using an informal trucker, where you have door-to-door delivery. It also took between three and four days to offload cargo from the train during the pilot run because there are no mechanized loading/offloading facilities. Cargo had to be unloaded manually, using one truck and 10 laborers to offload from the wagons and load onto the truck by hand.

The doors were welded shut and had to be opened, which also took time, and then the doors were too narrow for forklifts to be used to offload palettes. Total transport time was eight days with three days of loading, one day of travel, three days of offloading and one day of wagon return. Finally, storage capacity for such a large single consignment (approximately 520 tons) is difficult to accommodate, as the available warehouse capacity is 3,000 t, which has to be split to accommodate different types of commodities that could be stored under the same roof (e.g. cement and food). Users of the pilot found that operations were too inefficient to justify the price difference, but as operations improve, and volumes increase, the railway could bring cost savings to the region.

Table 9 details the time and costs at the Nacala port.

TABLE 9: FASTPATH2 NACALA PORT TIME, COST, AND RELIABILITY SUMMARY

| Component | Imports | | | | | Exports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Price US$ | Time hours | Time Variability | Reliability % | Logistics Score | Price US$ | Time hours | Time Variability | Reliability % | Logistics Score |
| Berth | 74.00 | 21 | 28.57 | 76.00 | 67.78 | 74.00 | 21 | 28.57 | 76.00 | 67.78 |
| Channel | 0.42 | 1 | 75.00 | 48.00 | 88.89 | 0.42 | 1 | 75.00 | 48.00 | 88.89 |
| Consolidation [a] | 0.00 | 8 | 31.00 | 118.75 | 88.89 | 225.00 | 24 | 68.00 | 39.58 | 73.89 |
| Customs | 124.00 | 8 | 100.00 | 38.00 | 68.33 | 124.00 | 2 | 62.50 | 55.00 | 78.33 |
| Gate | 83.00 | 1 | 125.00 | 30.00 | 58.89 | 83.00 | 1 | 125.00 | 30.00 | 58.89 |
| Intermodal Transfer | 35.00 | 8 | 118.75 | 31.00 | 57.78 | 35.00 | 8 | 118.75 | 31.00 | 57.78 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Yard | 113.50 | 24 | 75.00 | 48.00 | 62.78 | 113.50 | 24 | 75.00 | 48.00 | 62.78 |
| Total | 429.92 | 71 | | | | 654.92 | 81 | | | |

*Source: Nathan FastPath2 estimates based on information from Portos de Norte and interviews (2017)*

*[a] Assumed stuffing is done at the port for exports but not imports.*

Ports are generally profitable, because they primarily serve a captive market, for example Nacala serving Nampula and Niassa provinces in Mozambique. Port tariffs are therefore often based on cost plus a margin. (However, rail competes directly with road, so rail tariffs are most often based on what the market can bear, even if it is loss making). For the Malawi and eastern Zambia traffic, Nacala competes with Beira, and to some extent Durban in South Africa. Thus, the performance and costs of Nacala is assessed in relation to Beira and Durban, but including the whole corridor performance and costs, and other factors such as customer preference. Tariffs are similar but differ in detail and will likely change with increased competition. Beira is a much larger port than Nacala in terms of number of berths, shipping calls, storage space, and container handling capacity, but suffers from marine access constraints, and also vessel congestion for bulk imports such as fertilizers

During a visit to Beira in November 2017, it was noted that Beira port has berthing delays of up to 30 days for fertilizer imports for Zimbabwe and Zambia. Nacala has no berthing delays, and bulk unloading is faster than Beira, but Nacala would not be able to handle the same volumes as Beira. Shipping agents such as LBH and shipping companies such as MSC and CMA-CGM report that there are very few delays at Nacala except for the slow container handling rates because of the absence of STS cranes, which will be rectified in the planned JICA upgrade. The delays caused by the need for a contra marker prior to ship handling can perhaps be overcome by the port accepting an electronic submission one day before the vessel berths.

The Nacala port is not congested at present, but the port area is very limited in terms of total area (about 25 ha) and also the landside width of the port (250 m). There is very limited storage space within the port. For this reason, according to the Nacala Port tariff book, there is no free storage time provided for containers. Beira offers between five and 15 days of free storage for import containers, as it does not have the same space constraint.

The capacity of the present container terminal is set at 180, 000 TEUs per year, and the fully equipped new two-berth terminal on the north quay is planned at 250,000 TEUs per year. A modern container berth, fully equipped with gantry cranes and a width of 500 m, should have a capacity of about 250,000 TEUs per year (per berth), such as the new container terminal at Mombasa and the new modern terminal at Coega/Ngqura. For all the African east coast ports, the efficiency, costs, and capacity of the port is largely determined and influenced by how quickly the imports, both containers and bulk, can be moved away from the quayside and out of the port. At present, this works quite well at Nacala because both bulk and containers are moved away from the quayside fairly quickly. As volumes increase, rail will play an important role in reducing port congestion because it is able to move large quantities in a much shorter time than road.

The container terminals at both the existing port of Dar es Salaam and the old terminal at Mombasa, suffer from the same problem of limited space and width. Congestion was solved by the creation of many private sector operated ICDs (Dar es Salaam) and Container Freight Stations (CFSs) (Mombasa). Goods were moved from the port to the ICDs/CFSs by trucks, leading to additional costs and causing further port access delays and congestion. The new modern container terminal at Mombasa, together with the new high capacity railway service, is expected to put virtually all the CFSs out of business. Thus, the key objective for Nacala, with the expected increase in freight volumes, is to use the CDN/CEAR rail service as much as possible to remove imports from the

port, free up space, and minimize truck congestion within the port. The planning of an efficient rail-port interface is therefore very important, even if it is not implemented in the short term.

Finally, during the field mission, stakeholders mentioned concerns about future of Nacala port operations with the end of PN's concession in 2018. It is an open question as to whether CDN will take over operations or put out procurement notice to bid. In addition, stakeholders note that the port regulations were very out of date and should be updated to ensure efficient, safe, and competitive operations at the port.

### 3.2.2. ANALYSIS OF BEIRA CORRIDOR CURRENT PERFORMANCE

While the team's focus was on collecting information related to Nacala corridor transport infrastructure and processes, when possible, data was also collected for Beira, as it is an important alternative transport route for cargo to/from some catchment areas of the Nacala corridor.

As noted above, the rail link to Beira is currently not operational, and all traffic is by road. The roads are generally in good condition, but the route is heavily travelled. Based on the data collected, road costs to Beira were similar to or more competitive than those to Nacala, but more expensive than transport by rail. Transporters indicated that the road route to Beira had more issues at the border posts than Nacala, in particular at Mwanza-Zobue where delays ranged between one and three days. The border post has issues with electricity, as did the Milange border post on the Nacala corridor. Further, the area also has had recent security concerns and theft issues. The Beira Corridor costs are captured in table 10.

TABLE 10: FASTPATH2 BEIRA CORRIDOR TIME AND COST SUMMARY

| Corridor | Type | Imports | | | Exports [c] | | |
|---|---|---|---|---|---|---|---|
| | | Price US$ | Price US$/t [b] | Time hours | Price US$ | Price US$/t [b] | Time hours |
| Beira-Blantyre Road | Road Link [a] | 1,519 | 66.04 | 17 | 1,503 | 65.35 | 17 |
| | Border Post Node | 79 | 3.43 | 24 | 95 | 4.13 | 24 |
| | Road Node-Malawi | 132 | 5.74 | 0 | 132 | 5.74 | 0 |
| | Road Node-Mozambique [d] | 370 | 16.09 | 12 | 370 | 16.09 | 12 |
| | Seaport Node | 530 | 23.03 | 133 | 530 | 23.03 | 133 |
| | Total | 2,630 | 114.33 | 186 | 2,630 | 114.33 | 186 |
| Beira-Lilongwe Road | Road Link | 1,738 | 75.57 | 21 | 1,697 | 73.78 | 21 |
| | Border Post Node | 54 | 2.35 | 24 | 95 | 4.13 | 24 |
| | Road Node-Malawi | 238 | 10.35 | 0 | 238 | 10.35 | 0 |
| | Road Node-Mozambique [d] | 370 | 16.09 | 12 | 370 | 16.09 | 12 |
| | Seaport Node | 530 | 23.03 | 133 | 530 | 23.03 | 133 |
| | Total | 2,930 | 127.38 | 190 | 2,930 | 127.38 | 190 |
| Beira-Chipata Road | Road Link | 2,210 | 96.07 | 20 | 2,194 | 95.37 | 20 |
| | Border Post Node | 62 | 2.71 | 24 | 79 | 3.41 | 24 |
| | Road Node [d] | 258 | 11.22 | 12 | 258 | 11.22 | 12 |
| | Seaport Node | 530 | 23.03 | 133 | 530 | 23.03 | 133 |
| | Total | 3,060 | 133.03 | 189 | 3,060 | 133.03 | 189 |
| Beira-Lichinga Road | Road Link | 3,000 | 130.43 | 25 | 3,000 | 130.43 | 25 |
| | Border Post Node | 0 | 0.00 | 0 | 0 | 0.00 | 0 |
| | Road Node [d] | 46 | 2.00 | 12 | 46 | 2.00 | 12 |
| | Seaport Node | 530 | 23.03 | 133 | 530 | 23.03 | 133 |
| | Total | 3,576 | 155.47 | 170 | 3,576 | 155.47 | 170 |

*Source: Nathan FastPath2 estimates based on information from Portos de Norte, CDN-CEAR and interviews (2017)*

*[a] Road link fees were calculated based on the assumption that trucking prices quoted in interviews were inclusive of border post fees and road node fees; therefore these fees have been backed out of our calculations to arrive at the link price.*

*[b] Assuming 23 t/cargo per truckload.*

*[c] Cheaper as backhaul.*

*[d] Time is overnight stop. Cost is road user fee and weighbridges.*

Beira port is estimated to be approximately $100 more expensive than Nacala for imports due to higher customs and yard fees, but less expensive than Nacala by over $100 when considering consolidation costs for exports at Nacala. When considering TEEN costs, Nacala becomes nearly double the cost of Beira for national exports. Beira port is currently suffering from severe berthing delays for fertilizer imports (general cargo berths) of up to 30 days due to capacity constraints (vessel unloading of only 1500 t per day for some vessels). The Beira Port Time and Cost Summary is presented in table 11.

Vale decided to use its Nacala coal terminal for all of its coal exports during September 2017. This has resulted in switch of freight from Beira to Nacala of up to 4 mtpa. Beira port is operated by Cornelder, a private sector company (all berths except the oil terminal). The company is clearly concerned about the increased competition from Nacala which could well lead to a short-term reduction in tariffs for both ports, as well as the road and rail costs. The operators on both corridors will try to protect and even increase their market share of Malawi trade. During a visit to Beira by the consultants and CDN, Cornelder were not willing to engage with us.

TABLE 11: FASTPATH2 BEIRA PORT TIME AND COST SUMMARY

| Component | Price US$ | Time | Time Variability | Reliability % | Logistics Score |
|---|---|---|---|---|---|
| Berth | 78.0 | 18 | 66.67 | 52 | 56.67 |
| Channel | 0.7 | 12 | 75.00 | 48 | 88.89 |
| Consolidation | 0.0 | 0 | 0.00 | 0 | 0.00 |
| Customs | 225.0 | 30 | 80.00 | 46 | 73.89 |
| Gate | 21.0 | 1 | 125.00 | 30 | 67.78 |
| Intermodal Transfer | N/A | N/A | N/A | N/A | N/A |
| Yard | 205.0 | 72 | 50.00 | 62 | 38.33 |
| Total | 529.7 | 133 | | | |

*Source: Nathan Associates FastPath2 calculations (2017)*

### 3.2.3. COMPARISON OF FASTPATH2 CORRIDOR PERFORMANCE ASSESSMENT BY MODE AND ROUTE

This section provides a summary of costs and times by route and mode. Table 12 on the following page summarizes performance by corridor, including time and price from port to offloading point (or vice-versa). Main takeaways of port-destination performance by corridor are discussed below.

***Nacala-Cuamba-Lichinga***

Historically the Cuamba-Lichinga area has had poor transport infrastructure, which has suppressed export opportunities and resulted in expensive imports. Transport costs and times for this area are higher on a per ton kilometer basis than to Blantyre and even Lilongwe and Chipata. Due to high transport costs, little was exported from the region, further adding to transport costs due to the trade imbalance and lack of backhaul.

However, opportunities for growth have been opened by recent and ongoing road works, and CDN invested a significant sum into rehabilitating the railway. Destinations from the Cuamba catchment

area on to the North, South, and West are far enough distance to be cost-effectively served by rail transport.

The FastPath2 analysis shows that from Nacala-Lichinga, rail import prices are less expensive than road prices on a per unit basis. However, in most cases, the product has to be trucked to its final destination at an additional cost and time. Lichinga area traders quoted these costs at $250 per 40 t wagon at point the origin and destination, amounting to $13/t. When including drayage costs at both endpoints, the difference between Nacala road and rail prices is smaller but still significant ($75/t rail vs $129/t Nacala road and $155/t Beira). Without drayage costs the cost margin is even more significant.

There is an even larger difference for exports as rail exports receive a price discount due to the trade flow imbalance as they are return cargo ($71/t on rail vs $130/t Nacala road without TEEN-$155/t Beira road). Further, rail exports did not face the same TEEN mandates that road transport faced (but this additional margin may disappear now that TEEN is not mandated). However, transit times are longer for rail (for imports, 222 hours vs. 103 hours via Nacala road and 170 hours via Beira).

While rail is cheaper than road transport, it is not a door-to-door service, and transit times are therefore longer. Rail wagons travel on average at half the speed of trucks. Loading/unloading time is longer. On the Cuamba–Lichinga branch, there is only a single track, and passenger trains have priority. The most efficient rail operations have direct discharge to a warehouse or factory via dedicated rail sidings, such as at Farmer's World in Liwonde.

Rail also requires economies of scale to be efficient. Efficient railways operate with block trains based on a set schedule, in order to optimize equipment utilization. However, seasonal agricultural traders may have issues reliability meeting these schedules and quantities. Therefore, despite its lower cost, not all traders are able to utilize rail service. However, those that can utilize the railway and limit drayage costs by locating their warehouses near the rail depots can realize large savings. The development of such rail freight hubs has been very successful in Europe and the US (Ref DIRFT in the UK, and the BNSF Elwood Logistics Park in the US).

TABLE 12: FASTPATH2 NACALA AND BEIRA: TOTAL TIME, COST, AND RELIABILITY SUMMARY

| Corridor | Length km | Containerized Imports | | | | | | | Containerized Exports | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Price US$ | US$/ km | US$/ tkm | US$/ t | Time hours | Reliability % | Logistics Score | Price US$ | US$/ km | US$/ tkm | US$/ t | Time hours | Reliability % | Logistics Score |
| Lichinga | | | | | | | | | | | | | | | |
| Beira-Lichinga Road | 1,250 | 3,576 | 2.9 | 0.12 | 155 | 170 | N/A | N/A | 3,576 | 2.9 | 0.12 | 155 | 170 | N/A | N/A |
| Nacala-Lichinga Road w/ TEEN [a] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 3,381 | 4.1 | 0.18 | 147 | 122 | 53/62 | 69/31 |
| Nacala-Lichinga Road w/o TEEN [a] | 821 | 2,976 | 3.6 | 0.16 | 129 | 103 | 51/67 | 62/31 | 3,001 | 3.8 | 0.17 | 130 | 113 | N/A | N/A |
| Nacala-Lichinga Rail [a] | 787 | 2,832 | 3.6 | 0.16 | 75 | 222 | 54/61 | 47/55 | 2,707 | 3.4 | 0.09 | 71 | 232 | 54/61 | 61/47 |
| Blantyre | | | | | | | | | | | | | | | |
| Beira-Blantyre Road | 800 | 2,630 | 3.3 | 0.14 | 114 | 186 | 54 | 55 | 2,630 | 3.3 | 0.14 | 114 | 186 | 48 | 53 |
| Nacala-Blantyre Road | 853 | 2,730 | 3.2 | 0.14 | 119 | 103 | 43 | 62 | 2,679 | 3.1 | 0.14 | 116 | 113 | 45 | 63 |
| Durban-Blantyre Road [b] | 2,289 | 5,300 | 2.3 | 0.10 | 230 | N/A | N/A | N/A | 5,300 | 2.3 | 0.10 | 230 | N/A | N/A | N/A |
| Nacala-Blantyre Rail | 795 | 2,812 | 3.5 | 0.09 | 74 | 162 | 52 | 58 | 2,592 | 3.3 | 0.09 | 68 | 182 | 53 | 63 |
| Lilongwe | | | | | | | | | | | | | | | |
| Beira-Lilongwe Road | 1,012 | 2,930 | 2.9 | 0.13 | 127 | 190 | 54 | 55 | 2,930 | 2.9 | 0.13 | 127 | 190 | 48 | 54 |
| Nacala-Lilongwe Rail | 963 | 3,327 | 3.5 | 0.09 | 88 | 192 | 50 | 56 | 3,004 | 3.1 | 0.08 | 79 | 211 | 51 | 58 |
| Chipata | | | | | | | | | | | | | | | |
| Beira-Chipata Road | 968 | 3,060 | 3.2 | 0.14 | 133 | 189 | 48 | 55 | 3,060 | 3.2 | 0.14 | 133 | 189 | 48 | 53 |
| Nacala-Chipata Rail | 1,102 | 3,733 | 3.4 | 0.09 | 98 | 204 | 51 | 57 | 3,329 | 3.0 | 0.08 | 88 | 223 | 51 | 59 |

*Source: Nathan estimates based on interviews with CDN-CEAR, trucking companies, freight forwarders and traders (2017)*

*Notes: Prices assume no backhaul. Time includes time at both links and nodes. Road prices are per truckload (23 t), rail prices are per wagon (38 t).*

*[a] Reliability and Logistics scores for Nacala-Cuamba/Cuamba-Lichinga.*

*[b] Port price is estimated, and time is excluded as the field work did not include a trip to Durba*

***Nacala/Beira-Blantyre***

Again, the unit price for rail is lower than road.[20] Road prices in the region are inflated by the fact that many transport services are one way. This is especially the case for traffic to/from Nacala, but less so for Beira, where truckers are more able to get backhaul. Lack of backhaul is an issue as it means that the one-way trip bears the whole cost. To avoid this, truckers importing from Beira to Lilongwe, for example, will stop in Chipata to bring exporters to Beira as return haul. Rail cargo faces the same constraints when wagons return empty. In Chipata, stakeholders noted that matching imports with exports to achieve lower round trip prices was essential for making rail transport cost effective.

Travel from Blantyre to Nacala by rail is the least expensive option, but door-door, road transport is still quicker. While Nacala and Beira road prices are similar, the Nacala route is currently quicker and receives a better logistics score than Beira due to congestion at Beira border posts, port, and on the road links. The road distance to Durban is much longer and therefore overall more expensive than transporting via Beira or Nacala, but still chosen as an option by some shippers due to supply chain considerations and/or Durban's superior availability of ship calls.

Historically, Beira roads had been better than Nacala roads, but with recent investments into Nacala corridor roads, traffic should increase, provided there are no bottlenecks at the port. Shippers expressed concerns about the uncertainty of the port's operations after PN's concession ends in 2018, as well as concerns over delays in the construction. Shipping lines noted that operational efficiency is much better at Beira, where there is automated equipment (gantry cranes) and they do not have to use ship's gears for offloading. This means that offloading is much faster: 45 to 60 moves/hour compared to between 12 and 18 depending on the number of ships' gears in Nacala.

***Nacala/Beira-Lilongwe and Nacala/Beira-Chipata***

The Nacala railway also is less expensive than road transport to Lilongwe and Chipata. However, time and reliability are factors due to the quality of the rail in Malawi after leaving the mainline. After CDN-CEAR's rehabilitation of the Malawi spur line, rail should be the obvious choice for some commodities. Rail cost savings typically increase with distance, as can be seen by the lowest unit prices overall being for rail to Chipata.

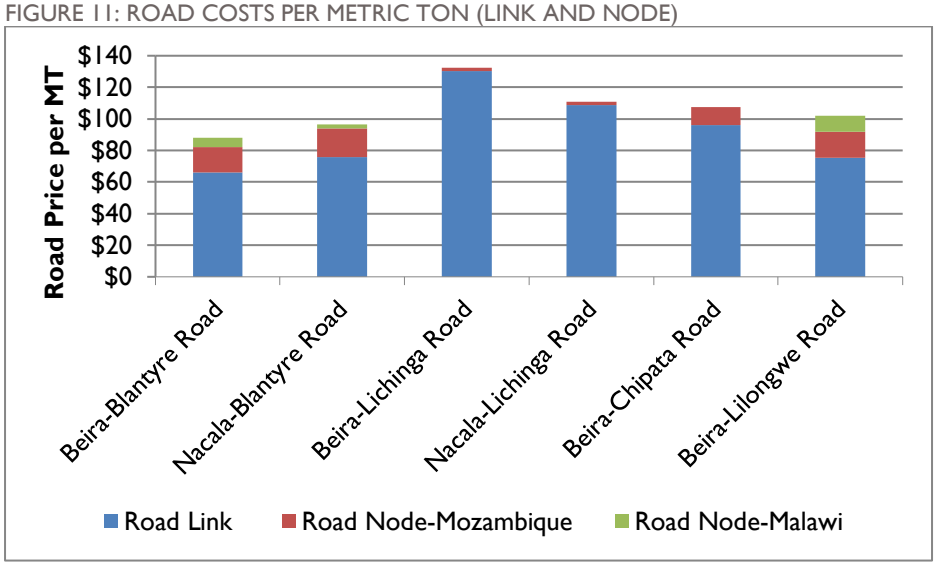
### 3.2.4. PERFORMANCE BOTTLENECK ANALYSIS

***Cost/Tariff***

As shown above, transport costs on the railway are less expensive than on the road. Road costs to/from Nacala are similar to those to Beira, after the repeal of mandatory use of TEEN. Road transport costs on the main routes are typically considered to be acceptable, although road user fees/tolls in both Mozambique and Malawi are high and add significantly to trucking costs. However, costs to more remote inland and locations are high, especially to the Lichinga region of Mozambique where road conditions are poor and competition low (figure 17). It is these areas farthest from the port where rail has the greatest potential to bring transport cost savings and spur growth.

[20] Note that rail prices do not include rail depot to warehouse (drayage) costs.

FIGURE 11: ROAD COSTS PER METRIC TON (LINK AND NODE)




*Source: Nathan estimates from FastPath2 (2017)*

On both corridors, road user fees were found to be high. For example, traveling from Beira to Blantyre, road user fees/tolls were estimated to be US$132 in Malawi and US$350 in Mozambique, plus a US$20 fee at Tete weighbridge. From Blantyre to Nacala, these fees were estimated to be US$64 in Malawi and US$403 in Mozambique.

***Transit Time***

Figure 18 shows transit time bottlenecks related to the Nacala and Beira transport corridors. Orange and red depict areas of high time.

Road rehabilitation projects have already improved road transport from Nacala to Malawi (with the exception of one remaining section) and have led to reduced time and cost on these mainline road sections. Lichinga currently faces issues of poor road conditions, but the same should be the case for Niassa over the next few years. Other areas around cities face congestion issues, which slow transit times.

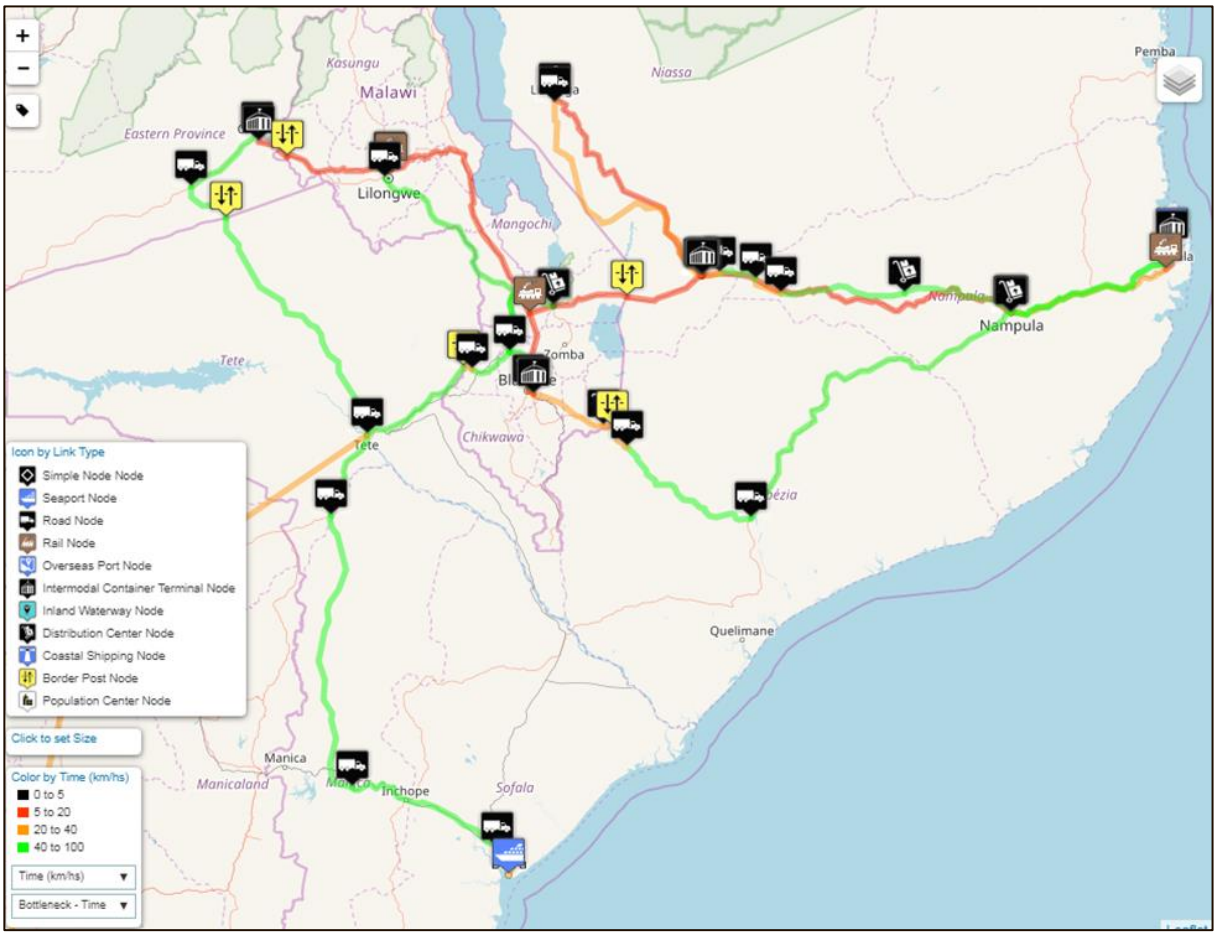
All border posts were cited as having delays due to electricity outages. This was particularly a problem for the Mwanza/Zobue border post, which sees more traffic than Milange. Road user fees for Mozambique trucks are charged according to the specified route by the purchase of vouchers, which are often unavailable due to lack of electricity. If the return route is changed, then the truck driver needs to buy additional vouchers before he can drive, which often causes delays.

While rail transport costs may perform well, transit times do not. Transit times from Cuamba-Lichinga are long, as priority is given to passenger trains that make frequent stops. As volumes on this spur line increase, performance will have to increase as well. Rail transit times in Malawi and Zambia are poor due to poor track condition off of the mainline. Investments are currently being made that should mitigate this constraint. Rail transit times in general are poor due to offloading/loading times, as further discussed in section 6.6later in this report.

Bottlenecks at Nacala port mainly refer to poor offloading/loading times due to reliance on ship's gears. This should be mitigated by the JICA project, which will purchase two gantry cranes. Additionally, there are occasional waits for a berth as space is currently limited during the

construction phase, until the dredging is done, as only one berth is capable of receiving ships with a large draft, therefore container ships and bulk ships sometimes compete for berths.

FIGURE 12: TIME BOTTLENECK MAP




*Source: Nathan Associates FastPath2 (2017)*

### *Issues Identified from FastPath2 Bottleneck Analysis*

The *FastPath2* bottleneck analysis of both corridors shows many links where infrastructure improvement is needed in the form of physical infrastructure investments that will reduce high road and rail transport costs. However, there are also several cases where policy-related issues were identified.

Table 13 summarizes key bottlenecks and recommendations on improving performance on the Nacala Corridor. A more detailed set of recommendations is developed in chapter 5.

TABLE 13: SUMMARY OF BOTTLENECKS AND RECOMMENDATIONS

| Bottleneck | Recommendation |
|---|---|
| Costs and delays due to the operation of TEEN for Mozambican exports. | MEF recently issued a decree that no longer mandates that exports use TEEN. This must be properly implemented by customs and could be supported by technical assistance to customs and support to the private sector in developing bonded warehouses. |
| Costs, delays and time variability issues due to Nampula check points and the broken weighbridge near Cuamba. | Work must be done to combat corruption. Additionally, the weighbridge should be made operational in order to properly enforce axle load restrictions. |

| Bottleneck | Recommendation |
|---|---|
| Delays and time variability at road border posts (Beira and Nacala corridors). | There are delays hence time variability at the border posts due to loss of electricity, which could be fixed with generators. |
| High road node costs. | Road user fees/tolls are high in Mozambique and Malawi. Further, Mozambican road user costs are on a voucher system, and there are delays in processing the vouchers during power outages. |
| Costs, delays and time variability at Cuamba, Lilongwe and Chipata rail intermodal facilities. | Investment in longer rail sidings and loading/offloading equipment is required to reduce time and costs at inland nodes. |
| High cost and time of road transport to Niassa. | The planned road investments should improve road conditions and increase competition on this route. |
| Nkaya rail node time variability due to loco availability | Investment in infrastructure and better planning. |
| Port Scanning costs (both Nacala and Beira). | As this service is an obligatory service currently performed by one provider, the government should regulate the price to ensure that it is fair and competitive. Alternatively, the service should be open to competition. |
| Nacala Port customs time variability. | Reform the contramarker system. |
| Nacala port high berth container handling times. | Gantry cranes will be introduced under the JICA project |
| Nacala port high time variability. | Gantry cranes and other equipment will be introduced under the JICA project. |

## 3.3. NACALA GENERAL FREIGHT RAILWAY CAPACITY ASSESSMENT

### 3.3.1. THE RAIL OPERATIONAL MODEL

A rail operational model has been developed to calculate an indicative cost of operating a defined freight service from one rail terminal to another and back again. The main purpose of the model is to allow cost sensitivity tests to be carried out for changes in a wide range of operational inputs. Thus, the model will calculate the decrease in unit costs for increasing freight volumes, and for improved equipment utilization (decrease in train turn-around time). The cost of rail transport is mainly governed by fixed costs, mainly due to the inflexibility of the services, having to operate fixed freight terminals, and because of high infrastructure costs. Road transport is more flexible, with door-to-door services, and therefore mostly governed by variable costs.

The general freight service on the Nacala Corridor has the unique advantage of access to the high standard and reliable coal export line, without having pay for the capital costs and the track maintenance costs. This is specified in the rail concession agreements. However, the maintenance costs of the Cuamba-Lichinga, the Nkaya-Limbe, and also the Nkaya-Mchinji sections are included in the operating budgets of CDN/CEAR. It is also understood that the capital costs (US$10 million) of the current upgrade of the Nkaya-Kanengo (Lilongwe) line is for the account of CDN-CEAR.

### 3.3.2. NACALA CORRIDOR BASE CASE RAIL PERFORMANCE

The base case rail model assumes that the present general fright operating principles and specifications are retained with no major new investments in infrastructure and equipment. The main current freight movements are on the Nacala–Blantyre service, while the Nacala–Cuamba and Cuamba–Lichinga volumes are very low but set to grow substantially with increasing exports form the agriculture and forestry sectors, which in turn will generate increased imports. The largest general rail freight volume will be on the Cuamba–Nacala section that carries all the freight from all origins and destinations (before cargo splits off to go to Cuamba or onwards to Liwonde, Limbe, Lilongwe, Chipata, etc).

The mainline is designed to carry 18 mtpa of coal exports, using trains lengths of 120 wagons, four locomotives (1,680 m long with 1,800 m passing loops). This equates to seven operating slots per day in each direction, plus an allowance of two operating slots for general freight and one for passengers, a maximum number of 10 slots per day in each direction. The general service is currently limited to 42 wagons, often less, carrying 40 t per wagon, yielding a capacity of 1.12 mtpa in each direction.

If this volume is to be exceeded, train length will have to be increased and/or the freight carried in each wagon increased to 53 t, which would be compatible with the 18t axle load design on the Nkaya – Blantyre branch line, but presently limited to 15t axle loads due to bridge load constraints. CDN/CEAR planned to increase general freight trains up to 75 wagons, which will require the general freight passing loops to be lengthened. Thus, the maximum capacity of the general freight service could be 2.8 mtpa in each direction (75 wagons x 53 tons x 2 trips x 350 days). The longer trains will, however, require additional infrastructure investment in the port and inland terminals.

While any rail capacity estimate must necessarily include the total traffic on the rail section, the time and cost of transporting specific selected freight categories need to be assessed separately. For example, the wagons used for wheat or petroleum, oil, and liquids (POL) imports are not suitable for the export of any other products, and the wagons are returned empty, which limits the percentage utilization of the wagon.

Containers can be used for return freight and so can open wagons, but only if it is cost effective to reposition the wagon, which is often not the case because of the high daily fixed cost of the wagon. For example, if an open wagon is being returned empty to Nacala from Blantyre, does it pay to divert the wagon to Lichinga to pick up, for example, timber logs for export to Nacala?

Detailed analysis has been carried out on selected freight categories.[21]

- Tea exports from Blantyre, containerized in Blantyre
- Timber exports from Lichinga and Namina/Ribaué, primarily for logs for a possible woodchip plant, ideally located at the Nacala port
- Cotton exports from Cuamba, either in bulk box wagons or containers
- Fertilizer imports to Liwonde, either in containers or bagged bulk

***Nacala – Blantyre – Nacala***

At the present time, CEAR reports that it is able to load their wagons on average four times per month. This implies an average wagon or train turnaround time of between seven and eight days. Assuming an average transit speed of 25km/hr, this gives the time spent in the terminals of four days, most of which is taken up by shunting the wagons into the customer's sidings, rather than unloading and loading operations. The sidings at the ICD (in Blantyre), the cement plant (in Blantyre) and the fertilizer plant (in Liwonde) are all limited to handling 10 wagons. The branch line from Nkaya to Limbe has been refurbished and upgraded to 18 t axle loads, but the current permissible load has been limited to 40 t per wagon (15 t axle loads). This is because of siding restrictions and limitations on some bridges. Projected volumes by rail for 2020 are 530,000 t imports and 125,000 t exports.

[21] For the FastPath2 analysis, it has been assumed that the cotton is being containerized at the port and that fertilizer is being transported in bulk.

### 3.3.3. NACALA – CUAMBA – NACALA

Currently there is very little rail traffic between Cuamba and Nacala, mainly fuel imports and cotton exports, up to 6,000 tpa each, implying partial, not full, train loads (wagons picked up or dropped off by through trains). The rail sidings at Cuamba are about 450 m long, allowing train lengths of 30 wagons. There is no specialized freight or container handling equipment at Cuamba. It was seen that baled cotton is exported in box wagons, which are then transferred to containers in the port at Nacala. Exports for 2020 are projected at 124,000 t and imports at 127,000 t. Most of these exports, approximately 80,000 t are plantation forestry exports from Namina, where a dedicated facility will have to be constructed. Capacity problems will only arise after year 2025, when the total import volume to all destinations is projected to exceed 1.18 mtpa.

### 3.3.4. CUAMBA – LICHINGA – CUAMBA

There is very little freight on this line at present, but up to 240,000 t of plantation forestry exports are projected for 2020, so, as at Namina, a dedicated facility will have to be constructed at Lichinga. There are no passing loops on this line but there are two stations with sidings of 450 m, which allow trains to pass. Allowing for one passenger train per day in each direction, it should be possible to operate two freight trains of 30 wagons per day in each direction giving a capacity of 840,000 tpa in each direction, with a 40t wagonload. There are no freight handling facilities at Lichinga, but 450 m long sidings at the station.

### 3.3.5. IMPROVED CASE RAIL PERFORMANCE ON THE NACALA CORRIDOR

The team has created an improved case scenario, assumes that investments are made by the railway operator (CDN/CEAR), logistics companies, or directly by importers/exporters, which produces more efficient ICDs and terminal operations and reduces the time spent by the train in the end terminals from 4-5 days to 1-2 days. It is the time spent in the terminals that normally dictates the train turn-around time. (For example, the new rail container terminal developed by DPW in Maputo has been designed to handle two 50 wagons, 100teu, trains simultaneously, offloading and loading in less than 10 hours per train.

***Nacala – Blantyre – Nacala***

Assuming that the container terminal at Nacala port is design with improved efficiency in mind (longer multiple sidings and rail gantry cranes) the main improvement at Blantyre must be focused on lengthening the sidings at the CCTL and GMS ICD's and also at the customers' sidings: particularly at Lafarge in Blantyre and Farmers World in Liwonde. By lengthening the sidings to handle between 20 and 25 wagons, a saving of two days can be achieved on the train turnaround time, with fewer shunting moves, resulting in savings of about $150 per wagon (40 t or 2 TEUs) equivalent to about 7%. Increasing the wagon carrying capacity to 53 t (18 t axles) could reduce freight rates by up to 20% and allow two heavy containers to be carried in each wagon, rather than only one at present.

***Nacala – Cuamba – Nacala***

The total projected imports on this section to all destinations will exceed 1.18 mtpa by 2025. This will require the general freight trains to be lengthened and/or the wagon carrying capacity to be increased. The axle loads on the main line are 20.5 t, so there should be no issue on increasing the wagonload capacity on this section. A container handling and storage facility should be provided at Cuamba, allowing cotton and possibly hardwood exports to be containerized in Cuamba rather than

in the space-constrained port where cotton is currently containerized. Empty containers (and container wagons) being returned from Malawi could be used for the cotton and hardwood exports from Cuamba. Furthermore, a specialized handling facility for forestry exports will have to be established at Namina if a woodchip export capability is established on the Nacala Corridor.

***Cuamba – Lichinga – Cuamba***

The main project freight volumes on this line are forestry exports, project up to 615,000 t by 2021. Poles will require special wagons but logs for chipping in Nacala could be transported in conventional open wagons, which could then also be used for import freight, projected at 193,000 t by 2021. Forestry exports will require a specialized terminal and storage area at Lichinga, where a container handling and storage facility should also be developed. Train length will be limited to 30 wagons, requiring train assembly at Cuamba into longer trains for the Cuamba–Nacala section.

### 3.3.6. RESULTS SUMMARY (IMPROVED OPERATIONAL PERFORMANCE)

The improved operational performance is mainly brought about by improved terminal operations (port and inland): lengthening the rail sidings, ideally to handle a full train length, initially between 35 and 45 and later up to 75 wagons which will require new ICDs or CFS's to be developed after 2025. Increasing the wagonload to 53 t to conform to the axle load of 18 t on all branch lines should also be carried out before 2025. For CDN to target freight to and from eastern Zambia and possibly the Copper Belt, then upgrading the Nkaya – Chipata section will likely be essential.

***Nacala – Blantyre – Nacala***

The key actions are to lengthen the sidings at the ICDs and bulk customers, initially to handle between 20 and 25 wagons, and later to full train lengths at an expanded integrated ICD to serve Blantyre and Liwonde. A modern rail serviced logistics hub would provide an incentive for existing and potential rail customers to relocate their operations to within the logistics hub, thus reducing transport costs and providing rail within captive customers. The permissible axle loads on the branch line should be standardized at 18 t, allowing up to 53 t of freight to be carried in each wagon. These actions could result in operational cost savings of up to 20%.

***Nacala – Cuamba – Nacala***

The same comments apply to the Cuamba service, where an ICD should be developed at Cuamba, allowing empty containers and wagons returning from Malawi to utilize for export from Cuamba. In addition, a specialized facility for the export of logs will need to be established at Namina. Permissible axle loads on this mainline section are already 20.5t.

***Cuamba – Lichinga – Cuamba***

A specialized freight terminal will be required at Lichinga to handle the forestry export, ideally developed and managed by the exporter. Additional or longer passing loops are unlikely to be required for some years to come.

## 3.4. PORT INFRASTRUCTURE AND STORAGE

The Nacala port is not congested at the moment, both in terms of the marine and the land (road/rail) access to the port. However, the total port area, between 25 ha and 40 ha, is considered small, with limited space for expansion, storage and logistics activities, for example, lengthening the

rail sidings accommodate full train lengths, the provision of a truck holding area, or the construction of a wood chipping plant and export facility. Detailed port planning is therefore essential, particularly in respect of infrastructure improvements which have very limited flexibility, such as the lengthening of rail sidings for both containers and bulk – and also the strategic positioning for bulk import and exports.

The second phase of the JICA financed port expansion is likely to proceed in 2018 and is critical to the future development and competitiveness of the port. It essentially entails the following elements.

- Reconstruction of the northern quay to serve as a two-berth container terminal, requiring some dredging and moving the quayside forward (already completed) to provide a quayside depth of 12 m below CD.
- The provision of two ship-to-shore container cranes, which will permit non-geared container vessels to serve Nacala, saving on both shipping and container handling costs, and increasing port capacity.
- Providing a dedicated rail serviced container terminal. The final layout has not yet been agreed.
- Improving the road access to the port, including the provision of a second access road from the south, entailing the reclamation of additional land for development within the port.

Some of the older warehouses within the port have been demolished and a temporary inflatable warehouse has been provided for bulk imports (see photo below). Additional storage space is planned to the south, which includes the area to be reclaimed and the area presently occupied by poorly utilized smaller warehouses, making a total additional area of about 20 ha.

FIGURE 13: CDN'S INFLATABLE WAREHOUSE AT NACALA PORT

Most logistics companies and warehousing are located along the EN8, between five and six km to the south of the port, including the location of TEEN. There is ample space for expansion in this area, but the major disadvantage is that this area is not rail serviced and will not be suitable for a rail connection because of the elevation above the port and the railway.

At the present time and based on current volumes, there are no serious storage constraints within the port. However, if volumes were to increase, additional storage facilities would be required. Further, the current lack of such facilities in or near the port hurts the corridor's competitiveness.

Presently bulk storage operations are sufficient and allow for smooth operations. Bulk maize transit imports are removed from the quayside to Bakhresa by road very quickly, and there is a new storage facility a few kilometers from the port for domestic imports. Likewise, domestic clinker imports are taken out of the port very quickly by road, and the same applies to containerized imports. *The basic objective of all ports is not to provide storage within the port for imports*, with the possible exception of fuel imports, due to security considerations.

However, if CDN is to target transit clinker imports for Malawi, then the required storage area will be related to the typical shipment size, say 20,000 t, to be offloaded within 3 days, less the ability of CDN to transport the clinker by rail within that period, say 4,000 t. Ideally the storage of clinker imports should be a rail serviced level and paved site outside the port. Beira port has had a serious problem with clinker imports for Malawi because of the limited capacity of road transport and fact that there is no direct rail connection to Malawi except via Moatize. This could provide an opportunity for CDN. The storage required will be wholly determined by CDN marketing as it involves up-front investment.

For exports, particularly for bulk exports, storage will be required within the port in order to allow for a contracted export shipment size to be built up—for example for maize exports from Zambia or future woodchip exports, or graphite exports. Ideally the storage area should be close to the bulk berths to allow for conveyor loading, and this may be difficult at Nacala, given the space constraints. For large volumes of bulk exports, a dedicated finger terminal and storage area outside the existing port may be a solution. CDN has already provided an inflatable warehouse with a capacity of 12,000 t, with the advantage that it can be moved as port planning is finalised. CDN confirmed in December 2017 that they have acquired two additional inflatable warehouses with similar capacities, to be erected at Nacala port and Chipata. This is a planned marketing initiative rather than demand driven.

For the inland terminals, storage is almost always provided by the importer or exporter, with the exception of ICDs, which can be funded and operated by either the rail company or the private sector. CDN/CEAR have shown no interest or initiative to develop ICDs at the own cost, except for the warehouse at Chipata, which is related to marketing. However, CDN/CEAR or the governments could provide cost or tariff incentives for the private sector to invest in improved ICDs and private rail sidings.

In conclusion, the demand for additional storage in or near the port will require up-front investment, and will be linked to long term contracts, primarily with exporters, or as a speculative CDN marketing strategy to attract a targeted commodity.

## 3.5. BEIRA AND NACALA CORRIDOR PERFORMANCE COMPETITOR ANALYSIS

Recent and planned improvements in Nacala corridor infrastructure should continue to make the corridor more competitive, but in some ways, it is too soon to make a judgement due to the ongoing works. However, the one thing that is clear is that when the transport system works smoothly, transporting cargo by rail on the Nacala corridor is significantly less expensive than by road via Beira. The rehabilitated Nacala corridor railway has been operating since 2015 and is attracting more and more traffic. Use of railway infrastructure has great potential to reduce

transport costs and provide high volume and reliable access to and from ports and remote inland and landlocked destinations.

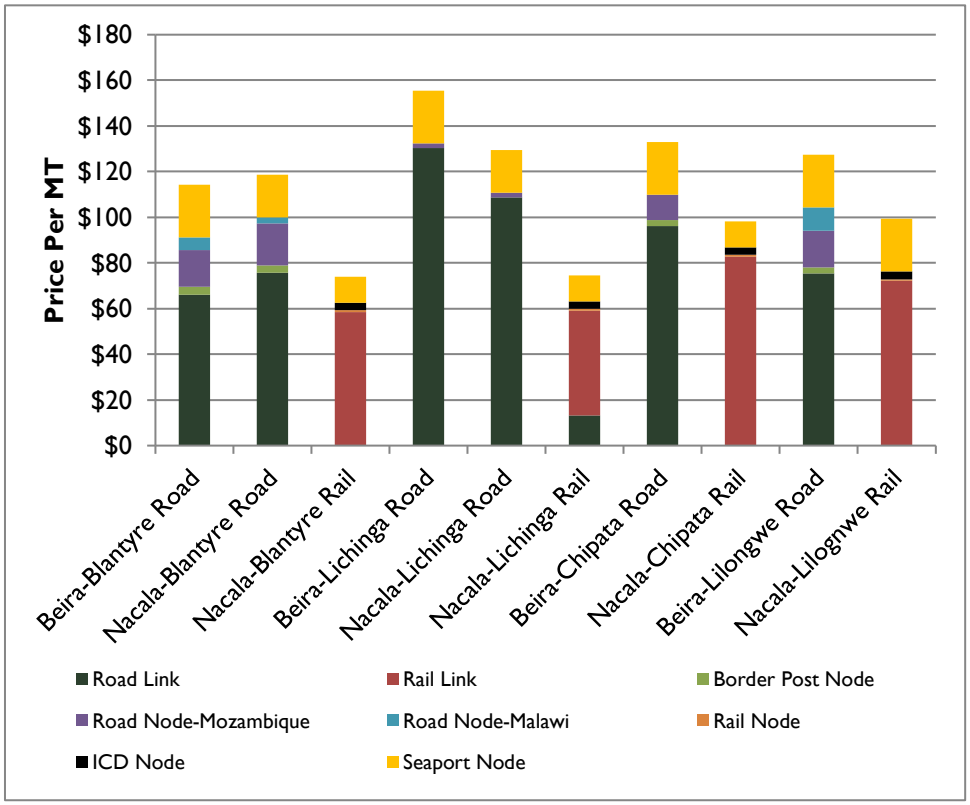
Figure 21 shows the price per tonne for containerized imports from port to destination on the Nacala and Beira corridors. For example, cargo to Blantyre is 35% less expensive. Within the Nacala corridor, the rail can bring cost savings of 50% from Nacala to Lichinga.

While significant, these potential cost savings do not consider drayage from the warehouse/factory to the rail terminal except for on the Nacala-Lichinga line where these costs added $13/t.

The rail also has disadvantages when it comes to transport time, both on the rail links (traveling at an average speed of 25 km/hr compared to 50 km/hr on the road), and time spend loading and offloading at the port and inland points. Further, work is still to be done in rehabilitating Malawi portions of the rail line, which are currently unsafe and risk derailment, such as which happened last year with clinker wagons.

Many potential clients are hesitant to risk switching to the railway until its performance has been proven to be reliable and free of washaways during the next rainy season. User perception is an issue, and many potential customers seemed to be aware of the improvements in service that have been made in recent years. Large rail users that have been able to move operations to the railway are very satisfied with the service they are getting, but other potential users cited cost and time of door-door service using the rail compared to road as an issue. The railway will become more competitive due to economies of scale as volumes increase, and as its inland terminals become more efficient.

FIGURE 14: PRICE PER TONNE ON THE NACALA AND BEIRA CORRIDORS




*Source: FastPath2 (2017)*

On the road transport side, Nacala has historically been much less competitive than Beira. Roads to Beira are in better condition, and from Malawi/Zambia, truckers have a much better chance of returning with backhaul cargo, reducing transport costs. While recent investments have greatly improved Nacala corridor roads, some roads remain to be rehabilitated. Nevertheless, truckers and freight forwarders indicated that the road corridor is now open for business and that volumes are picking up. However, the trucking industry to Beira has more capacity and is a more established market. Besides local traffic (within Nacala and as far as Nampula and up to Pemba), most transport on the Nacala corridor is still via rail.

Nacala port in its present state remains one of the largest constraints to the competitiveness of the Nacala corridor. Phase 2 of the JICA project has been delayed, and it is only after the JICA project that the port will be competitive in terms of performance. Using ship's gears, the port is currently able to move approximately six containers per crane-hour, which typically amounts to 12 containers per ship-hour. In comparison, performance at Beira was stated to be 60 or more moves/hour. Nacala attracts fewer ship calls than Beira, and this is unlikely to change until after the rehabilitation.

However, a positive development is that Syrah Resources will soon export 350,000 tons per year of graphite from its mine in Balama, Cabo Delgado. The key impact of this is that it will increase the number of ship calls to the Nacala port and thereby enhance the port's competitiveness. Storage and warehousing space at Nacala is also an issue. However, Nacala port is naturally a deeper port than Beira, requiring no expensive maintenance dredging, so has lower operating costs, and is less congested. So as performance improves after the rehabilitation, its ability to become more competitive than Beira will increase.

The following section provides an overview of the envisaged future traffic projections along the corridor and an elaboration of the cost build-up of the priority value chains that are expected to underpin future cargo flows.

# 4. VALUE CHAIN AND TRAFFIC FORECAST ANALYSIS

## 4.1. VALUE CHAIN ANALYSIS

### 4.1.1. NACALA CORRIDOR PRODUCTION OVERVIEW

The geographic coverage of the value chain assessment is the current/potential catchment area of the Nacala Corridor in Mozambique, Malawi and Zambia. The primary sector that would benefit from the development of the corridor is the agriculture sector and would in turn contribute to the socio-economic development of regions surrounding the corridor.

Some industrial activity exists between Nampula and Nacala city, but its volume is small compared with that of agriculture. There is also fishing and related activities in the coastal areas. Due to the importance of the agriculture sector to the Nacala Corridor, as well as the large share of population that would be affected by its development, our study focuses on the agriculture sector and trace four commodities across their supply chains.

The population in the catchment area of the Nacala Corridor is generally poor and rural. Most of them are smallholder agricultural farmers who engage in subsistence farming, producing cassava, maize, beans, and horticultural products. Crops produced for commercial purposes include cotton, cashew, sesame, macadamia, soya, tea, bananas, sugar, pigeon peas, groundnuts, and tobacco and forestry products.

Commercial enterprises, rather than smallholders, represent the larger share in the production of the following products: sugar, cotton, tea, macadamia, tobacco, and forestry. Smallholder farmers can be involved in production with these large firms in contract farming or out grower schemes.

Smallholder farms are usually small and fragmented, which makes it difficult to achieve economies of scale. Farmers are usually not informed of efficient farming techniques, and the use of chemical fertilizer and improved seeds is very low. As a result, crop yields are low and crop quality is not optimal. For the agriculture sector to perform better and grow, productivity needs to increase, and costs need to decrease along the Corridor. Finding sustainable ways to connect farmers to markets is also essential. Improved road and rail infrastructure, supply chain efficiencies, electricity, and irrigation systems are also key factors for the agriculture value chains to function more efficiently and grow along the Nacala Corridor.

### 4.1.2. VALUE CHAIN SELECTION

In order to select the priority value chains to analyze across the Nacala Corridor, we used multiple criteria to rank and score commodities produced in the region. For Mozambique, the following long list was considered: sugar, wood/forestry, cotton, tobacco, maize, sesame seed, pulses, cashews, groundnuts, and bananas. As a sub-sector product, poles and woodchips in the forestry sector were considered, which are expected to be significant new exports for the region. For Malawi, the following long list was considered: sugar, tobacco, cotton, groundnuts, pulses, forestry/sawn wood, tea, plywood, fiberboard and maize.

The study team employed the following criteria to select value chains:  exports in volume; economic growth prospects; spatial distribution of export production; prospects for economic and social

impact (number of smallholder farmers); export market share by 2020; and modal split (railway/road) target by 2020.

Data was collected on all criteria for all the long-list commodities in both countries. Based on the data, commodities were ranked, which served as scores for selection. We then added up the scores per commodity and selected those with the top scores.

- Top-ranked commodities for Mozambique were plantation forestry, pulses, cotton, and sesame seed.
- Top-ranked commodities for Malawi were pulses, cotton, sugar, and tea.

A value chain prioritization was developed as part of the traffic forecast module and the excel worksheet on which this short-list was developed is contained in the traffic forecast model. For the purposes of further analysis by the FastPath2 tool to assess corridor performance cotton (in Mozambique) and tea (in Malawi) were selected as existing export sub-sectors, and plantation forestry (in Mozambique) was selected as a potential new export sub-sector.

### 4.1.3. SELECTED VALUE CHAIN DESCRIPTIONS

***Cotton***

**Current Situation.** Cotton is an important commodity for Mozambique's agriculture sector. It is a strategic commodity for exports; in 2015 cotton represented 2.8%[22] of the country's total exports. The price of cotton is expected to increase in international markets in the next few years, which will improve prospects for Mozambique's cotton sector. However, in the past few years, the international market price of cotton fell from 80USc/lb. two years ago to 60USc/lb[23] as of August 2017, because Brazil, China, India and the United States had good harvests in the past years, as well as existing cotton stocks.

The value chain for cotton in Mozambique is not very complex due to the oligopsony[24] nature of the market. Ginning companies are the only buyers in the cotton market and they ensure their right of first purchase through concession contracts with the government. The Cotton Institute of Mozambique (IAM) is the government entity representing the interests of all stakeholders in the cotton industry. OLAM and SAN/JFS are two of the large ginning companies operating in Northern Mozambique, which our team met with.

OLAM and JFS together work with 54,000 farmers in total, regularly (JFS: 35,000; OLAM: 19,000[25]). Per their concession agreement with the government, JFS is responsible for transport from farm to ginnery and from ginnery to port; as well as for providing inputs to farmers on favorable terms. They provide the following to the farmers: free seeds; pesticides and sprayers (as credit to be paid back at harvest time); tractors for planting season; financing (for larger farmers); empty bags; and maize seed (so that farmers can grow something to eat/food security).

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[22] Own calculation based on UN Comtrade data.

[23] Field interviews. Unless referenced otherwise, all figures are obtained from field interviews.

[24] This refers to a market where there are only a few buyers (see https://stats.oecd.org/glossary/detail.asp?ID=3265).

[25] Field interviews.

JFS establishes a network of its farmers through mobile phones, providing 12,000 phones with SMS service, as well as telecom facility for reception. Through this system, they facilitate communication with farmers (including prices) and increase farmers' traceability. JFS also installs GPS tracking system in farms, and keeps farmer profiles. For a new farmer to join their network, the only screening required is an inspection of the farmer's land.

The planting of cotton takes place from May to July and the harvest happens in September and October. After harvest, ginneries (JFS, OLAM, etc.) buy the harvest directly from the farmers. There are no buying agents or cooperatives as exist in some other African countries, due to the oligopsony nature of the market. JFS has a field team that inspects the fields and informs the main office that production is done. They have 475 collection points, very close to the farms. Farmers come to the collection points with their harvest and fill the bags provided by JFS. JFS sends trucks to bring the bags to their ginning facility. Sometimes farmers place alien objects in the bags to replace the raw cotton, which is monitored by JFS.

The next step in the value chain is the ginning process, consisting of cleaning, sorting, and grading (there are two types of cotton, one and two, and one is superior); and separating lint from seed. JFS sends their own trucks to collect and stuff the cargo (lint) in containers (FEUs) at 22.5 tons in one box. Cottonseed in bagged into 50 kg bags and transported as break-bulk to regional markets. The export process is handled directly by the ginners.

Most of the cotton produced is exported.

- 3,600 tons of fiber annually is exported by rail and sea to South-East Asia (primary market) and Portugal (secondary market).
- 3,000 tons of seeds annually are exported by road to Malawi and South Africa for animal feed.

Some raw cotton stays in the country for domestic trade and value addition. Approximately 300 tons of fiber and 1,000 tons of seeds stay in Mozambique. One case of domestic value addition on raw cotton is making thread out of fiber, which goes to Marracuene (a town near Maputo). It is a second level processing operation. Another company, MCM, buys from the company in Marracuene to process and then exports thread.

It would be ideal if Mozambique could extend the value addition on the cotton value chain to apparel/clothing production, as it did prior to 2009. In that case, Mozambique could also take advantage of U.S. Government's Africa Growth and Opportunity Act (AGOA) in exporting apparel products to the United States

The government sets a minimum price for cotton farmers, incorporating market outlook, international market price, exchange rate, price differential for cotton quality, and price of CIF. Ginning companies claim that they take on the burden of price fluctuations, without reflecting it onto the farmer. On the other hand, our team also heard from another stakeholder that JFS collects larger margins on prices due to the quality certification on cotton (Cotton Made in Africa and Better Cotton Initiative). Farmers do not have the means to obtain this certification, and JFS does it for them. This allows JFS to get the larger margin on the price. Other big companies do not procure locally, because the farmers do not have this certificate.

**Supply Chain Cost Breakdown.** The list below shows costs/prices along the supply/value chain for cotton in Mozambique. The largest share of the costs belongs to processing costs for cotton. As

stated previously, the government sets the farm gate price, which is the second largest component in the cost build up. The FOB transport cost amounts to only 4.5% of the total cost.

Farm gate Price (24%)[26] = 23,000 MT (US$375) per ton
FOB Transport Cost (4.5%) = 4,200 MT (US$70) per ton
Special Export Terminal (0.5%)[27] = 600 MT (US$10) per ton
End Market Shipping Cost (3%) = 3,000 MT (US$50) per ton
Value chain/Processing Costs (48%) = 45,800 MT (US$760) per ton
Assumed Margin (20%) = 19,000 MT (US$300) per ton
International Market Price (100%) = 95,000 MT (US$1,540) per ton

**Trade and Transport Facilitation Bottlenecks.** The cotton industry exports via two transport options.

- Containers by road from Ribaué to the Nacala port (OLAM)
- Break-bulk by rail from Cuamba to the Nacala port (JFS/SAN)
- The three main bottlenecks for the cotton sub-sector in Mozambique are elaborated below.
- The main issue facing the cotton industry in Mozambique is that the feeder road network to consolidation points within concession growing areas is in a poor condition, but this is a problem that faces all agricultural sub-sectors. The scale of the problem is one that makes it difficult to resolve in the short-to-medium term.
- JFS/SAN already use the railway but are currently transporting cotton bales in break-bulk in covered wagons, which is not an optimal logistics solution. Stuffing of containers takes place in the port, but there are space constraints to scaling up this operation, and it has been proposed that there is a need to find additional space for stuffing/destuffing containers in the port, which would attract more cargo to rail.
- Both OLAM and JFS/SAN registered their complaints about the obligatory use of the TEEN facility and the associated costs. However, now that TEEN is no longer required, their main concern is how to ensure that there will be cost-effective processing of offsite third-party inspection and verification, customs clearance and payment.

### *Tea*

**Current Situation.** Tea is an important cash crop in Malawi's agricultural production and ranks third in Malawi's exports after tobacco and sugar. Tea is a more stable product than tobacco and sugar. Malawi is the second largest tea producer and exporter in Africa after Kenya. The tea value chain in Malawi mainly consists of smallholder farmers, tea estate owners, brokers, and intermediate buyers who sell to end buyers. Tea estates dominate tea production, which also do the processing on site. Four of these estates buy from smallholder producers. The number of smallholder tea farmers is around 17,000. Tea farmers enter into out grower contracts with estates. After buying from farmers at designated points and at scheduled times, the tea is processed in a short amount of time (within 12 hours ideally). Estates provide inputs to farmers at favourable terms, as well as extension services support. Green leaf tea is then processed through withering, drying, cutting, curing, and grading. Most of the crop (about 70%) is produced and sold between December and May.

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[26] Figures are obtained from field interviews.

[27] The government has passed a new regulation that no longer requires exports to go through this terminal, so these costs are provided for indicative purposes only.

Once processed, there are two channels for selling the black leaf tea: through the Limbe Auction and through direct purchase from the estates. The contribution from the estates to the auction is approximately 17,000 tons. Samples of tea are sent to brokers (five active brokers), who catalogue them and provide them to potential buyers. After purchasing, the processors deposit the product in warehouses to be exported. Prices are determined based on cost of production and margins in the auction process.

The Tea Association of Malawi (TAMA) is composed of nine large companies/estate owners that make up the tea industry. Eastern Produce and Lugeri, two of these nine companies, have 70% of the market share. The highest quality of tea is exported, and the lower quality stays in Malawi. Most tea exports are sent by road to Beira.

Using the railway to Nacala was tested in the past, but this is currently not preferable, principally because of concern with a security on the railway. The incidents on the railway have been significant enough to as to involve Interpol. Since tea is a high value cargo, producers do not want to take this risk, even though the security situation seems to be slightly better at present.

Another issue related to the railway was offloading. The operations at the port were inefficient, and it took a long time to offload. Tea is a perishable product, so this hurts the quality of shipment in a short span of time. Therefore, the reliability of transport and logistics system is very important to the tea industry, in order to get the high-quality product to the buyer paying the premium price.

**Supply Chain Cost Breakdown.** It was not possible to obtain full information on the tea sub-sector from interviews. The most recent information the team could access was for 2011, which is presented below.[28]

Farm gate Price: 20,800 MWK[29]/ton (6.8%)
Base Price (Cost of Production, mainly labor): 64,780 MWK/ton (21%)
Transport Cost (Field to Factory): 3,000 MWK/ton (1%)
Special Export Terminal: Transit goods do not pay
Marketing (Factory to buyer in Blantyre): 32,000 MWK/ton (10.4%)
Transport from Blantyre to Mozambique border: 2,147 MWK/ton[30] (0.7%)
Value chain-Processing/Handling Costs: 35,612 MWK/ton (11.6%)
Assumed Margin: 149,735 MWK/ton (48.6%)
International Market Price: US$~1,600/ton
FOB Malawi: US$~1,900/ton =~ 308,074 MWK

**Trade and Transportation Facilitation Bottlenecks.** The tea industry in Malawi exports via four transport options.

- Break-bulk by road on the North-South Corridor to Durban port (Eastern Produce)
- Containers by road on the Beira Corridor to Beira port (various)
- Containers by road on the Nacala Corridor to Nacala port (Lugeri)
- Containers by rail on the Nacala Corridor to Nacala port (various)

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[28] Figures are obtained from FAO. 2015. Analysis of price incentives for tea in Malawi. Technical notes series, MAFAP, by Cameron, A., Mkomba, F., Rome; and own calculations based on this source.

[29] Malawian Kwacha in October 2011 was applied with historical exchange rates used to getter US$ equivalent.

[30] Includes the cost of a phytosanitary certificate at 500 MWK.

There are five main bottlenecks for the tea sub-sector in Malawi (below).

- The product is time-sensitive, so the need to ensure that the single electronic window platform operates seamlessly is a key concern of the industry. Occasional problems with the contramarker linked to the 'Janela Unica' in Mozambique were cited as a concern, particularly when transporting by rail, but we understand that these incidents have been dramatically reduced over the last couple of years.
- The industry is interested in using the Nacala Corridor but feels that there is a need to improve the inter-modal facility in Blantyre to allow for more tea to be exported from there in the future. Similarly, improved port handling equipment at the Nacala port would also improve loading times, but these enhancements are likely to be taken care of in the infrastructure proposed in the Nacala Port Improvement Project.
- Lugeri tea estate in the Mulanje district of Malawi, which is the second largest in Malawi, has indicated a strong commitment to transport by road to the Nacala Corridor. With approximately 300 trips annually, the company could be a potential participant in a pilot the implementation of an Approved Economic Operator (AEO) scheme to promote self-regulation of transporters to comply with cross-border clearance procedures.
- The tea industry channels approximately 30-40% of its total output (17,000 tons) through the auction in Blantyre, which can then be transported by road to Beira or rail to Nacala. To be able to capture additional market share for the Nacala Corridor the tea industry would like rail transport to connect to ships calls as seamlessly as it does in Beira, which may require additional assurances from the railway that they can offer a similar service.
- The tea industry believes that the transport, storage, and handling tariffs on the railway via the Nacala port are more cumbersome and expensive than a similar offering on the Beira Corridor. This is in part due to what they are used to, but there is a need to increase the level of awareness that the Nacala offering is more competitive than Beira. The tea industry's participation in a time-cost tracking pilot of flows could be useful.

***Plantation Forestry (Poles and Woodchips)***

**Current Situation.** There have been significant investments in the plantation forestry sector in the provinces of Niassa, Nampula, and Zambezia over the last decade. The two largest investors include a US$2.2 billion[31] investment proposal from Green Resources and a US$2.3 billion investment proposal from Portucel Mozambique. Portucel plans to establish +/-35,000 ha of plantation by 2021, all of which will be under eucalyptus. However, the Green Resources investments in Niassa and Nampula are the most advanced and represent the short-term opportunity on the Nacala Corridor.

In Niassa province, Green Resources has established +/-13,500 ha of plantation, of which +/-6,000 ha is under pine and +/-7,500 ha is under eucalyptus. The company has stopped planting pine and will focus on eucalyptus in the future. These plantations are now reaching maturing, and the envisaged volumes that will be ready to harvest over the next 10 years will peak at 591,000 tons in 2021.

In Nampula, the company has acquired 120,000 ha of land with plans to establish +/-60,000 ha under plantation. Since 2012 Green Resources has established +/- 4,000 ha, all under eucalyptus. These plantations are still growing with forestry operations still focused on thinning and maintaining the asset. However, this species of eucalyptus is fast growing, and the plantations will soon reach

[31] Figures in this section are obtained from field interviews.

maturity with the envisaged volumes ready to harvest over the next 10 years peaking at 160,000 tons in 2022.

However, for the last two years the company has stopped planting in both Niassa and Nampula provinces because of concerns about the market. Indeed, the immediate concern is how to monetize the forestry resource from the maturing plantations in Niassa province. The current market strategy hinges on two markets. The first is supplying transmission poles for Electricidade de Moçambique (EDM), the national Electricity Utility Company, and the second is the international market for woodchips.

Value chains for poles and woodchips are simple in structure, particularly given the nascent nature of the industry in Mozambique. For poles, the process consists of cutting (trees), drying, cutting (logs into poles), and transporting them to a treatment facility and treatment. For woodchips, the process is cutting the trees, drying, transportation to chipping plant (planned to be established at the Port of Nacala), and, if needed, heat treatment to kill bugs.

The companies as well as their contracted employees and transporters are the value chain actors. Leading companies in this sector are Green Resources and Portucel, both of which the study team interviewed. The leading firms interviewed by the study team mentioned the following constraints faced by the sub-sector: poor road infrastructure; concerns about security of product on the railway; the availability of specialised rolling stock (anticipated); the need for a dedicated logistics (including woodchip berth) operations at the port (anticipated); and the reliability of power supply to operate a chipping mill in Nacala (anticipated).

**Value Chain Cost Breakdown.** Below are cost approximations based on industry information and interviews.

Growing Cost, including land preparation, forest establishment, and tending cost: Approximately US$16,000[32] to US$20,000 per hectare, divided by 800 mature trees per hectare based on US$20-25 per standing tree.

Transport Cost

- Railway: US$50-55/ton or 6 to 6.5 USc/ton/km
- Road/Trucking: 10 USc/ton/km

Special Export Terminal (TEEN) Cost: Approximately, US$20/ton, including Kudumba tax (30-35% of the value of product).

Harvesting/Replanting Cost: Approximately US$40-50+/ton

Margin: Data unavailable

FOB Price for Eucalyptus Logs: US$65/m3 for Portuguese market

International Market Price

- Sawn Timber - US$300/m3

[32] Figures in this section are obtained from field interviews.

- Poles - US$292/m3
- Saw Logs - US$25/m3

**Trade and Transportation Facilitation Bottlenecks.** The plantation forestry industry in Mozambique will export via one transport option, namely break-bulk by rail from Lichinga and Namina to the Nacala port (Green Resources).

**Plantation Forestry Sub-Sector.** There are four main bottlenecks for the plantation forestry sub-sector in Mozambique.

- The main issue facing the plantation forestry industry in Mozambique in the future will be to develop a world class dedicated woodchip export facility at the Nacala port. This will require the integration of rail, conveyor and port offloading/loading capabilities, similar to those developed at Richards Bay and Durban harbors in South Africa, to ensure that large woodchip vessels can berth in the Nacala port.
- A related challenge will be the need to design and optimize a specific logistics system for the transportation of fiber inputs from the two consolidation points at Lichinga and Namina on the line of rail directly into the dedicated woodchip export facility at the port. This will entail the need to lease specialized rolling stock and the scheduling of train slots to ensure the integrity of other rail services on the line are not compromised.
- In the pilot test run last year Portucel, in collaboration with Green Resources, registered their complaints about the obligatory use of the TEEN facility and the associated costs. However, now that this is no longer required, their main concern is how to ensure that there will be cost-effective processing of offsite third-party inspection and verification, customs clearance, and payment.
- Transport costs are going to be a key determinant of viability of any new woodchip industry in the future. Consequently, a detailed understanding of the transport, storage, and handling tariffs for rail and at the port will be essential to knowing what is possible in this regard. Therefore, a possible pilot to review benchmark prices for this possible industry should be explored to assess its future competitiveness.

An in-depth consideration of the potential for developing a new export product based on the South African success story is elaborated in the following section.

**Cotton, Tea, and Plantation Forestry Value Chains**. The four key concerns voiced during discussion on the cotton (in Mozambique), tea (in Malawi), and plantation forestry (in Mozambique) value chains, ranked in order of importance, include the following.

- Concerns relating to infrastructure are the most important to value chain stakeholders, particularly those relating to the Nacala port.
- Concerns with policy relating to seamless integration of the transport logistics supply chain and transport tariffs for the transport, storage, and handling of cargo.
- Concerns with policy impeding trade facilitation, notably the obligatory use of the TEEN facility and how services will be provided cost-effectively in the future.
- Concerns with the implementation of the single electronic window platform for time-sensitive goods, which may be impacted because of bureaucratic delays.

### 4.1.4. WOODCHIP EXPORT INDUSTRY

***Plantation Forestry***

This section introduces the plantation forestry sub-sector in northern Mozambique, with a specific focus on domestic market opportunities. Since the Green Resources investments in Niassa and

Nampula provinces are the most advanced and represent the best-short term opportunity for the Nacala Corridor this section will focus on the interviews held with them.

***Green Resources Forestry Plantations***

In Niassa province, Green Resources has established +/-13,500 ha of plantation, of which +/-6,000 ha is under pine and +/-7,500 ha is under eucalyptus. The company has stopped planting pine and will focus on eucalyptus in the future. Table 14 shows that these plantations are now reaching maturity and the envisaged volumes that will be ready to harvest over the next 10 years will peak at 591,000 tons in 2021.

TABLE 14: GREEN RESOURCES LICHINGA – VOLUMES TO HARVEST (000'STONS)

| 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 8 | 18 | 218 | 591 | 276 | 149 | 58 | 78 | 218 | 201 |

*Source: Interview with Green Resources (2017)*

In Nampula, the company has acquired 120,000 ha of land with plans to establish +/-60,000 ha under plantation. Since 2012 Green Resources has established +/- 4,000 ha, all under eucalyptus. These plantations are still growing with forestry operations still focused on thinning and maintaining the asset. However, this species of eucalyptus is fast-growing, and the plantations will soon reach maturity. Table 15 summarizes the envisaged volumes ready to harvest over the next 10 years will peak at 160,000 tons in 2022.

TABLE 15: GREEN RESOURCES NAMPULA – VOLUMES TO HARVEST (000'STONS)

| 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 80 | 105 | 160 | Not specified | | | | |

*Source: Interview with Green Resources (2017)*

Table 16 shows that the combined volumes that could move on the Nacala Railway are significant, peaking at approximately 700,000 tons in 2021, which represents the single largest off-take prospect for CDN-CEAR in the short term.

TABLE 16: GREEN RESOURCES – TOTAL VOLUMES TO HARVEST (000'STONS)

| 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 8 | 18 | 298 | 696 | 436 | 149 | 58 | 78 | 218 | 201 |

*Source: Interview with Green Resources (2017)*

However, for the last two years the company has stopped planting in both Niassa and Nampula provinces, because of concerns about the market. Indeed, the immediate concern is how to monetize the forestry resource from the maturing plantations in Niassa province.

The current market strategy hinges on two markets. The first is supplying transmission poles for Electricidade de Moçambique (EDM), the national Electricity Utility Company, and the second is the international market for woodchips. However, the woodchip market is currently constrained by high transport costs in the primary target market of Portugal, caused, in large part, by logistics bottlenecks at the port and inland locations.

Consequently, Green Resources is initially focused on the domestic market for treated[33] transmission poles. The size of this market has been indicated at +/-160,000 poles annually[34] and was valued at +/- US$7.73 million in 2015. It is a market that has been growing steadily over the period 2010 to 2015.

However, successful market entry will depend on whether Green Resources can compete with imports from South Africa and Zimbabwe (table 17).

TABLE 17: MOZAMBIQUE IMPORTS: POLES, TREATED AND PAINTED WITH PRESERVATIVES

| Indicator | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| **Value of Imports ($US million):** | 3.48 | 5.88 | 6.43 | 7.40 | 8.96 | 7.73 |
| **Percentage (%) share of imports** | | | | | | |
| From South Africa: | 98 | 79 | 92 | 73 | 78 | 78 |
| From Zimbabwe: | 0 | 20 | 8 | 27 | 21 | 15 |
| From Other Countries: | 2 | 1 | 0 | 0 | 2 | 7 |

*Source: Observatory of Economic Complexity-Massachusetts Institute of Technology (2016)*

A follow-up interview with EDM highlighted the difficulties Green Resources faces in displacing South African suppliers. The key takeaways from the EDM interview are summarized below.

- EDM indicated that, based on its budget, the size of the domestic market for electricity poles is approximately 30,000 poles annually, of which approximately one-third are for the northern Mozambique segment, the natural catchment for Green Resources.
- EDM does have a long-term contract with a supplier that expires in March 2018 and will be replaced with annual contracts that will be procured through competitive tendering in an open market.
- EDM's pole specifications do not include the CCA treatment of poles, because of a long-standing preference for creosote treatment, which could prejudice Green Resources who have a CCA plant.
- EDM has indicated that treatment specifications could be changed, and that Green Resources could qualify under a 'buy Mozambique' preference policy for local suppliers, provided that they meet the technical specifications and volume requirements (A 2016 meeting revealed that Green Resources could not meet volume demand and quality parameters.).
- EDM confirmed that they have depots in the following locations: Maputo City, Maputo Province, Xai-Xai, Chokwe, Inhambane, Chimoio, Beira, Mavuzi, Chicamba, Quelimane, Mocuba, Tete, Nampula, Nacala, Angoche, Pemba, Cuamba and Lichinga and the highlighted locations fall within the catchment of the Nacala Corridor.
- EDM include a detailed schedule of transport cost guidelines based on a payload of 30 tons per truck (approximately 150 poles, each weighing approximately 200 kilograms), which could advantage Green Resources if they choose to use rail to transport poles from either Lichinga (Niassa) and/or Namina (Nampula) to depots in northern Mozambique.
- In summary, the size of this market is not as large as Green Resources has indicated in interviews. Moreover, the company still needs EDM to confirm that CCA treatment is permissible. Nonetheless, Green Resources is on the radar of EDM and, with a focused effort, is securing the northern segment of the domestic market should be within reach of

[33] Green Resources prefer to treat transmission poles using an environmentally friendly Copper Chrome Arsenate (CCA) preservative, based on their highly successful Tanzanian saw-milling operation.

[34] 160,000 poles was the figure provided in the interview with Green Resources August 2, 2017 in Lichinga, but a figure of 30,000 poles was confirmed by EDM in a follow-up interview on October 16, 2017 in Maputo.

the company. However, it is clear that the bulk of fiber resource will have to be absorbed by the woodchip market (table 18).

TABLE 18: FIBER ALLOCATION BETWEEN POLES AND WOODCHIPS (000 TONS)

| Product | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Fiber Use | 8 | 8 | 18 | 298 | 696 | 436 | 149 | 58 | 78 | 218 | 201 |
| Fiber to Poles* | 8 | 8 | 18 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| Fiber to Chips | 0 | 0 | 0 | 264 | 662 | 402 | 115 | 24 | 44 | 184 | 167 |
| % Allocated to Poles | 100 | 100 | 100 | 11 | 5 | 8 | 23 | 58 | 43 | 16 | 17 |
| % Allocated to Chips | 0 | 0 | 0 | 89 | 95 | 92 | 77 | 42 | 57 | 84 | 83 |

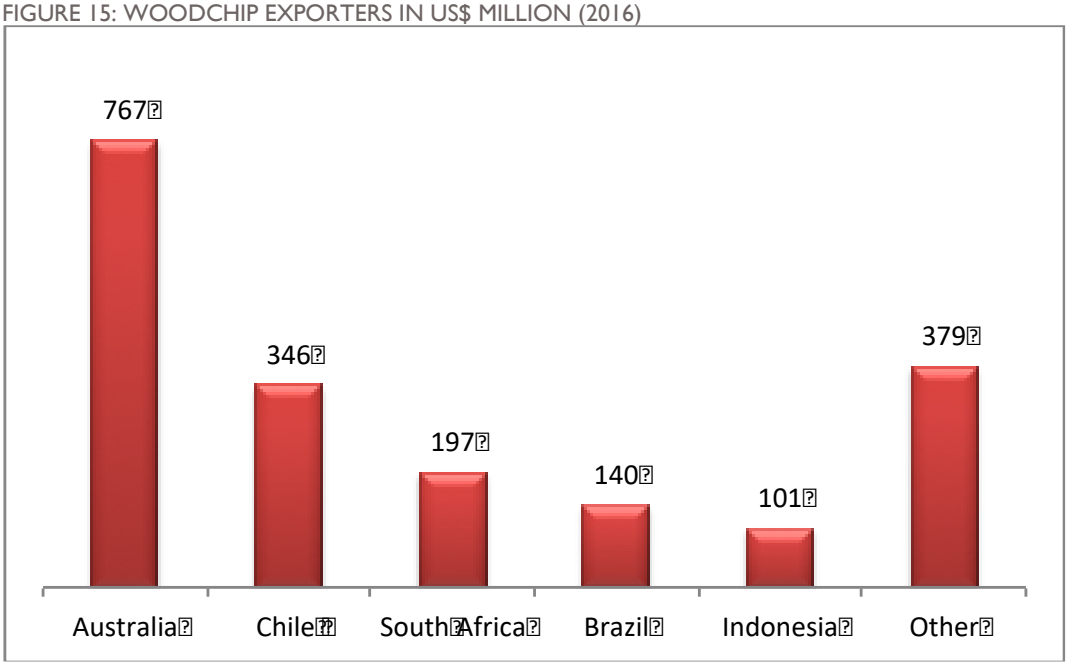
** Based on supplying northern Mozambique with up to 50,000 poles annually.*

### *Woodchip Export Transport Cost Benchmarks*

This section identifies transport cost benchmarks for the plantation forestry sub-sectors based on competitive FOB prices for export of woodchips at the port.

Based in the success of South Africa, which in 2016 was the third-largest woodchip global exporter after Australia and Chile, Green Resources has ambitions to enter this market (figure 21).

FIGURE 15: WOODCHIP EXPORTERS IN US$ MILLION (2016)




*Source: Observatory of Economic Complexity-Massachusetts Institute of Technology (2016)*

Over the period 2010 to 2016, South Africa has exported on average +/-US$225 million annually, with Japan being the primary export destination (table 19).

TABLE 19: GLOBAL MARKET WOODCHIPS AND SOUTH AFRICA'S MARKET SHARE

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Global Exports (US$ million) | 2,809 | 3,270 | 2,660 | 2, 700 | 3 450 | 3 580 | 1, 930 |
| South African Exports (US$ million) | 286 | 266 | 208 | 197 | 227 | 205 | 197 |
| % Global Market Share | 9.9 | 8.8 | 7.8 | 7.3 | 6.6 | 5.7 | 10 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| % South Africa Exports Going to Japan | 88 | 90 | 97 | 90 | 81 | 82 | 79 |

*Source: Observatory of Economic Complexity-Massachusetts Institute of Technology (2016)*

South African supply chain costs in the woodchip sub-sector provides a regional benchmark for Green Resources to use to assess a competitive cost structure for future woodchip exports from northern Mozambique to Japan.

Japan has limited hardwood fiber resources and imports approximately 88% of its hardwood fiber requirements. In order to do this cost effectively, Japan has developed a large fleet of custom-designed freight ships that specialize in the transport of woodchips. The mechanization of loading and unloading woodchips has also reduced costs. Japanese pulp mills have consistently improved their efficiencies to absorb the transport cost, which means that the cost of paper produced out of this process in not substantially higher than imported paper.

Table 20 highlights that, based on the South African woodchip supply-chain costs, the benchmark transport cost price is approx. US$50 per ton. If the cost structure is similar for Green Resources, then this is a cost ceiling for transport to compete in global market.[35]

TABLE 20: SOUTH AFRICAN WOODCHIP VALUE CHAIN: TRANSPORT COST COMPONENT

| Year | Tons (000's) | Value (US$ million) | FOB Price per Tonne (US$) | Value Chain Cost Allocation (US$ Per Tonne)* | | |
|---|---|---|---|---|---|---|
| | | | | Production | Extraction | Transport |
| 2010 | 1,590 | 286 | 180 | 54 | 45 | 81 |
| 2011 | 1,445 | 266 | 184 | 55 | 46 | 83 |
| 2012 | 1,030 | 208 | 202 | 61 | 50 | 91 |
| 2013 | 1,220 | 197 | 161 | 48 | 40 | 73 |
| 2014 | 1,235 | 227 | 184 | 55 | 46 | 83 |
| 2015 | 1,585 | 205 | 129 | 39 | 32 | 58 |
| 2016 | 1,770 | 197 | 111 | 33 | 28 | 50 |

**Production = 30% of cost allocation; Extraction = 25% of cost allocation and Transport = 45% of cost allocation*

*Sources: Van Zyl (2009)[36], Swaine (2017)[37] and Observatory of Economic Complexity-Massachusetts Institute of Technology (2016)*

### *Woodchip Exports Transport/Logistics Bottlenecks*

This section presents the main challenges posed by high-transport costs and/or logistics bottlenecks that need to be addressed if competitive benchmark prices for target export commodities are to be met.

South African suppliers of woodchips to the Japanese market only exported hardwood chips (eucalyptus and wattle (acacia)) because this is where a supply gap exists in terms of domestic

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[35] Based on a pilot with Portucel in 2016, Green Resources were quoted US$55 per ton to transport fiber for woodchips to Portugal. The FOB price at Nacala was US$65 per ton, which meant that the transport cost from Lichinga to Nacala could not be more than US$30 per ton. However, this price is much lower than FOB prices ex. South Africa destined for Japan, which are estimated at US$200 per ton.

[36] Van Zyl, James (2009): Is Rail Transport a Thing of the Past – Focus on Forest Engineering Conference, Howick, South Africa, 4th November 2009 (Commercial Manager NCT Forestry Cooperative Limited, South Africa)

[37] Swaine, John (2017): Africa Fibre Resource Availability and Woodchip Suppliers, RISI International Wood Fibre Resource and Trade Conference, February 2017, Da Nang, Vietnam (Commercial Manager TWK Agri, South Africa).

production in Japan. The main South Africa exporting firms must meet stringent quality standards of the main Japanese importing firms. Hardwood chips are screened to ensure that the quality of the chips conform to the dimensions required by the Japanese pulp mills. Woodchips that do not conform are still exported, but lower prices are paid for woodchips of a lower quality.

In response to these demands, South African exporters have pursued and achieved two important quality drivers. The first is high levels of Forestry Stewardship Council (FSC) certification on sustainable forestry practices and the second has been to develop excellent supplier/buyer relationships that have resulted in long-term off take supply contracts for South African exporters, which have provided high levels of confidence and certainty in the market.

Based on the interviews held, our assessment is that Green Resources is quite capable of meeting the required quality standards to enter the Japanese market. However, South African exporters had to overcome some significant transport cost and logistics constraints to ensure the integrity of the woodchip supply chain from South African foresters to Japanese pulp mills.

A case study of NCT in South Africa provides some important lessons for how the rail, road, and port infrastructure investment on the Nacala Corridor could be leveraged to accelerate the development of the forestry plantation sub-sector.

NCT Forestry Cooperative was formed 60 years ago and now comprises 2,000 independent growers and 600 small-scale timber growers who collectively own approximately 270,000 hectares of forests capable of producing approximately 2.5 million tons annually. It is a diversified forestry producer targeting three markets.

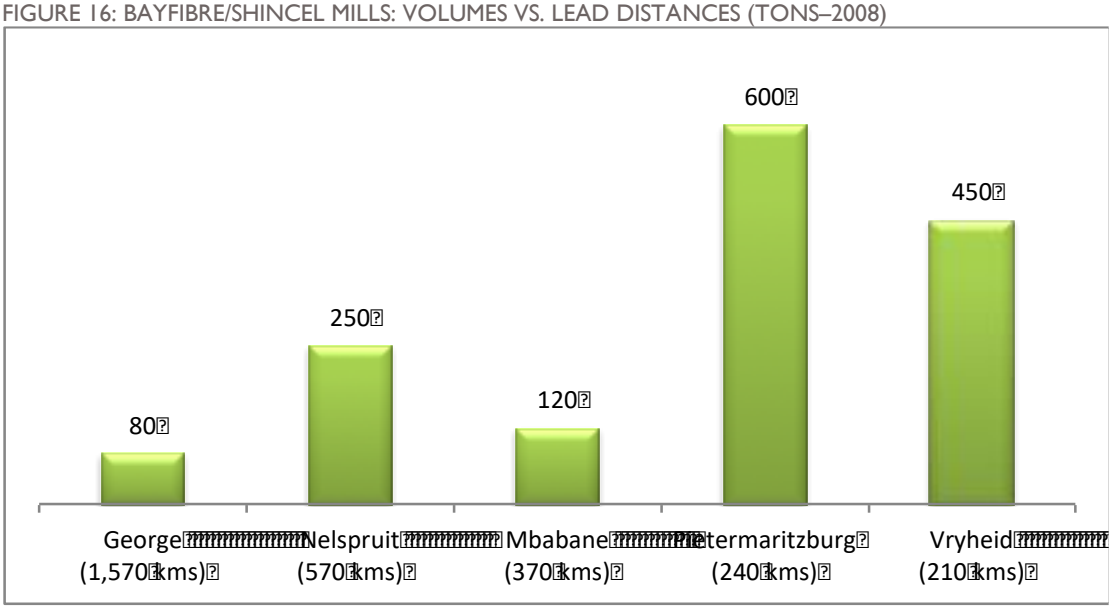
- Local markets: Sawn timber, treated poles, and mining timber
- National markets: Medium-density fiberboard and pulp
- International markets: Woodchips (Japan and India)

In 2008, of the 2.5 million tons produced annually, approximately 1.5 million tons (60%) was allocated for woodchip exports. The imperative of securing access to a sufficient and secure supply of timber is the biggest stumbling block into entering the woodchip market.

This is why owners of fiber resources have established chip mills. Fiber for woodchips is sourced from multiple locations within a 200-600 km radius of the main NCT owned chipping mills (Bayfibre and Shincel)[38] close to the Richards Bay port (figure 22).

[38] NCT has purchased Richards Bay Woodchips from Mondi since 2008. The chipping plant, with a capacity of 750,000 metric tons annually was re-commissioned and resumed production and exports in 2016.

FIGURE 16: BAYFIBRE/SHINCEL MILLS: VOLUMES VS. LEAD DISTANCES (TONS–2008)

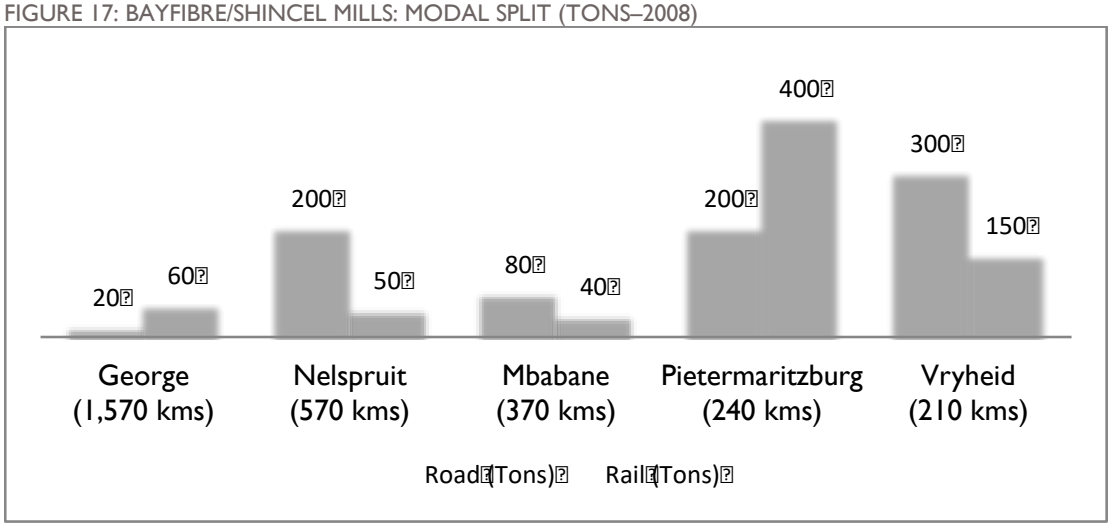



*Source: Van Zyl (2009)*

NCT's also diversifies its transport risk by allocating approximately 47% of fiber requirements by rail (700,000 tons) and 53% by road (800,000 tons). However, what is interesting about this allocation is that the use of rail is not a function of distance, but rather dependent on available capacity on the network.

For example, from Vryheid in northern KwaZulu-Natal one-third (150,000 tons) is allocated to rail compared to Pietermaritzburg in the Natal Midlands two-thirds (400,000 tons) is allocated to rail, despite the distance to Richards Bay being similar (figure 23).

FIGURE 17: BAYFIBRE/SHINCEL MILLS: MODAL SPLIT (TONS–2008)




*Source: Van Zyl (2009)*

The size of the plantation to support a sustainable supply of variable levels of fiber to chipping mills, at an average yield of 14 tons of woodchips per hectare, is as follows (table 21).

| TABLE 21: WOODCHIP PLANTATION SIZES, PRODUCTION, YIELDS BY PLANT SOURCE | | | | | | |
|---|---|---|---|---|---|---|
| Type of Plantation | **Acreage (Ha)** | Share of Acreage % | Forest Production (mt/year) | Wood Chip Production (mt/year) | Share of Woodchip Production % | Average yield (mt/ha) |
| Eucalyptus | 637,500 | 51 | 8,200,000 | 1,200,000 | 15 | 13 |
| Wattle | 87,500 | 7 | 1,400,000 | 1,300,000 | 97 | 16 |
| Pine | 525,000 | 42 | 6,100,000 | 0 | 0 | - |
| Total | 1,250,000 | 100 | 15,700,000 | 2,500,000 | 16 | 14 |
| **Based on the above data and mix of wood sources, an annual woodchip supply of…** | | | | | | |
| **Metric Tons** | | | | | | |
| 750,000 | 1,000,000 | 1,250,000 | 1,500,000 | 1,750,000 | 2,000,000 | 2,500,000 |
| **Requires planting of forests of…** | | | | | | |
| **Hectares** | | | | | | |
| 54,000 | 71,000 | 89,000 | 107,000 | 125,000 | 143,000 | 179,000 |

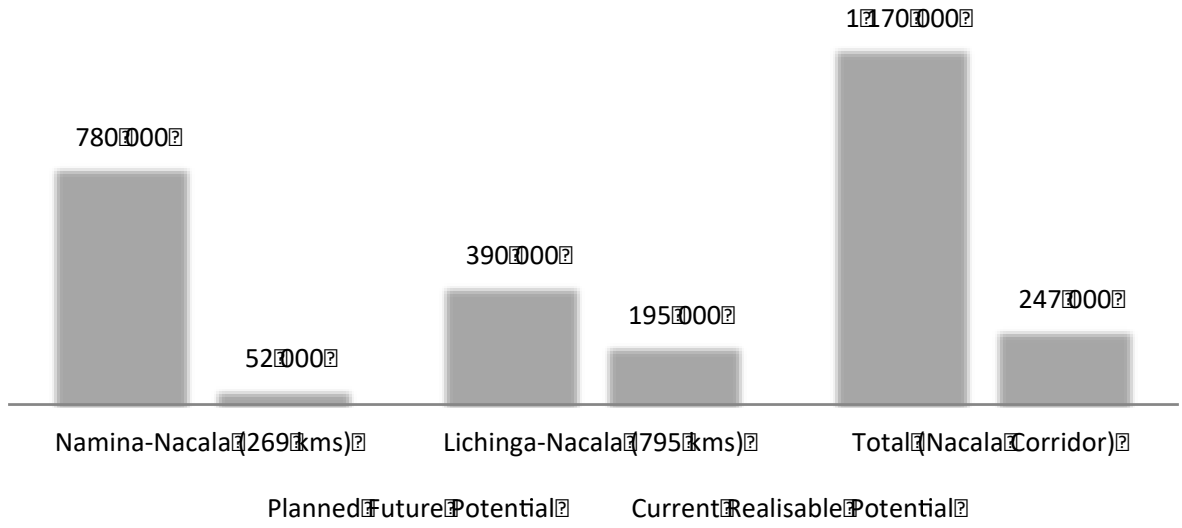
*Source: Swaine (2017)*

The lesson here is that for a chipping operation to be efficient, it must either be located close to a domestic buyer of pulp or to a transport hub that can provide cost effective access to domestic or international buyers of fiber. In most cases, the latter location criteria would dominate as non-integrated chip mills target the export market. This means that potential chipping operations are limited to coastal cities with sufficient port facilities or to places that can cost effectively be linked to such ports through rail transport. At the same time, chipping plants must be within cost effective reach of plantations as the transport costs are substantial relative to the value of unprocessed wood, particularly if the fiber sources are not integrated with the chipping operations and will therefore not profit out of the overall operation. Once again, effective rail transport can expand the potential serving area of a chipping mill.

This is the essential difference between NCT operations in South Africa and potential future operations of Green Resources in Mozambique. The narrative above has showed that the NCT operations in South Africa are optimized around a 'multi-modal hub and spoke' model within a 600 km radius of the port.

By contrast, given the significant investment in the infrastructure backbone of the Nacala Corridor and the large sector-based investments in the plantation forestry sub-sector by Green Resources, the potential to establish a 'rail-based linear model' within an 800 km radius of the port, represents one of the most important opportunities outside of the minerals and oil/gas sectors in northern Mozambique (figure 24).

FIGURE 18: PLANNED FUTURE/CURRENT REALIZABLE WOODCHIP EXPORT POTENTIAL (TONS)

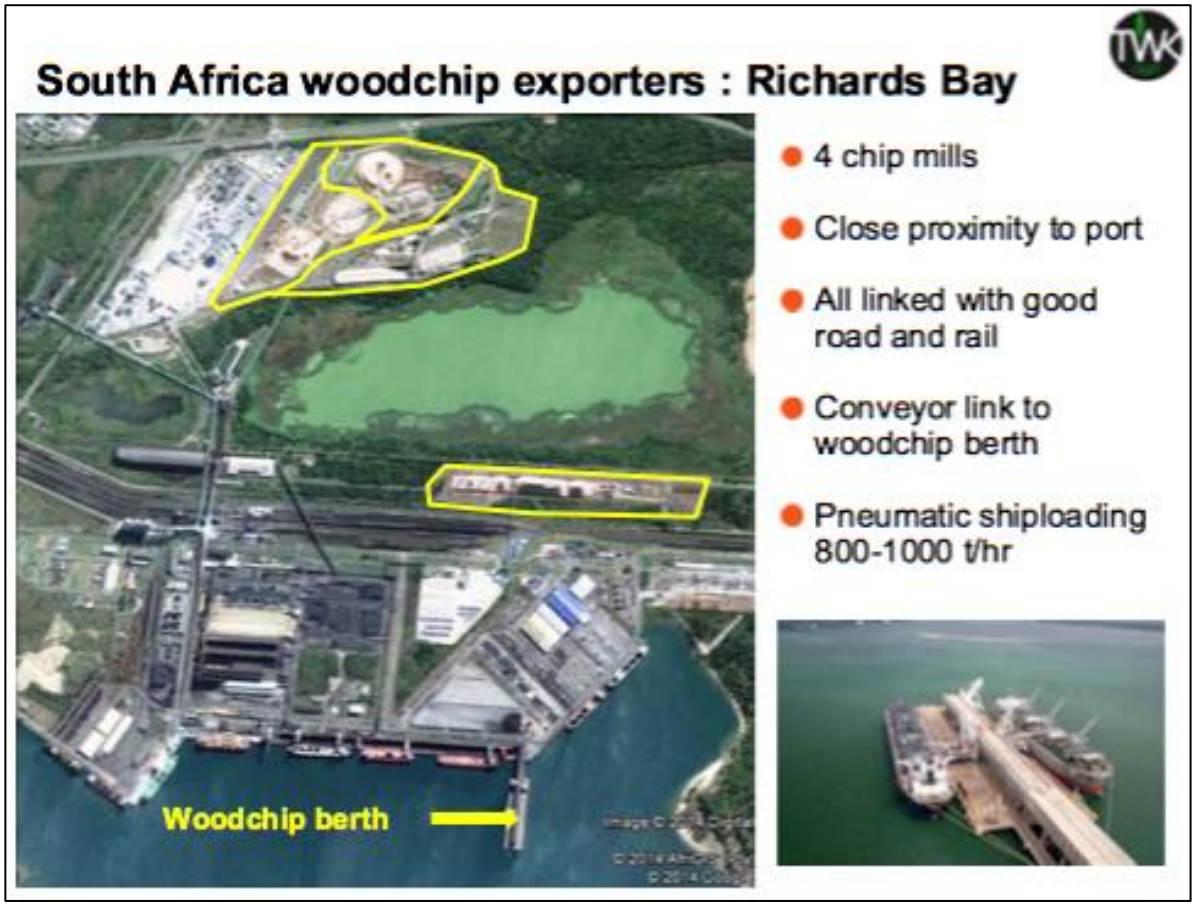



*Source: Green Resources (2017)*

The significant volumes that could be allocated to rail, essentially from two main terminals, one at Lichinga and the second at Namina, could achieve the economies of scale and agglomeration needed to drive unit transport costs to its lowest possible price. Given that transport cost amounts to approximately 45% of the overall cost structure of the woodchip exports, it will be absolutely essential that there is a seamless integration of the transport and logistics supply chain.

This is currently not in place on the Nacala Corridor and will have to be developed in tandem with the forestry fiber resource if the potential for woodchip exports are to be realized. This has been one of the main reasons for the success of South African woodchip exporters that have developed their fiber resources in tandem with a strong integration in the transport and logistics supply chain, particularly at the maritime port of Richards Bay. In 2016, Richards Bay has developed chipping capacity of 3.05 million tons from four plants, all of which are in close proximity to the port, with excellent road and rail connections and a conveyor link, supported by mechanized loading, to a dedicated woodchip berth in the port that allows for large specialized woodchip ships to come alongside.

FIGURE 19: BEST-PRACTICE TRANSPORT/LOGISTICS INTEGRATION FOR WOODCHIP EXPORTS




*Source: Swaine (2017)*

### *Scaling Up Woodchip Exports*

This section sketches further downstream opportunities for scaling up exports of woodchips at the proposed Nacala Special Economic Zone (SEZ). The basic integrated woodchip plant model that has been used to calculate the economic impact of developing a woodchip export capacity at the Nacala port is based on the entry-level platform of approximately 360 000 green metric ton woodchip mill using indicative costs from South Africa. The supply-chain steps of this entry-level platform is illustrated in figure 26 (cycle 1) and figure 27 (cycle 2).

FIGURE 20: NIASSA GREEN RESOURCES LEAD FOLLOWED BY LURIO (CYCLE 1)

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Lichinga Terminal | Rail to Nacala | Namina Terminal | Rail to Nacala | Mill at Nacala Port |
|  |  |  |  |  |
| Initial 16,000 ha allocated to Woodchips | 795 kilometers (approximately 210,000 metric tons) | Initial 10,000 ha allocated to Woodchips | 269 kilometers (approximately 150,000 metric tons) | 1st 360,000 green ton woodchip mill |

| | | | | |
|---|---|---|---|---|
| | US$50 per ton | | US$25 per ton | FOB Price US$200 per ton (foreign exchange receipts of US$72 million) |

FIGURE 21: LURIO GREEN RESOURCES LEAD FOLLOWED BY NIASSA (CYCLE 2)

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Lichinga Terminal | Rail to Nacala | Namina Terminal | Rail to Nacala | Mill at Nacala Port |
|  |  |  |  |  |
| Further 4,000 hectares allocated to woodchips | 795 kilometers (approximately 50 000 metric tons) | Further 22,000 hectares allocated to woodchips | 269 kilometers (approximately 310,000 metric tons) | 2nd 360,000 green metric ton woodchip mill |
| | US$50 per metric ton | | US$25 per metric ton | FOB Price US$200 per ton (foreign exchange receipts of approximately US$72 million) |
| Total of 20,000 hectares allocated to woodchips | Total of approximately 260,000 tons | Total of 32,000 hectares allocated to woodchips | Total of approximately 460,000 tons Total of 720,000 tons on the railway | Total of approximately 720,000 tons and foreign exchange receipts of US$144 million |

*Source: Green Resources (2017)*

Based on a review of the South African forestry sector[39] this is considered the entry-level plant size to enter the global woodchip market. Since Niassa Green Resources are more advanced in the planting and maintenance they would take the lead for the first cycle, which would use up their entire planted fiber resource of approximately 16,000 hectares, which could be expanded for the second cycle to approximately 20,000 hectares. For the second cycle, Lurio Green Resources would scale up its allocation from 10,000 hectares in the first cycle to 32,000 for the second cycle, because they are much closer to the Nacala port. A third cycle could also be added if there was real traction in the market.

Table 22 illustrates that approximately US$20 million is required for a 20-year woodchip mill and associated port infrastructure. To support this entry-level plant size of 360,000 green metric tons, an investment of approximately US$12.5 million would have had to be invested in the establishment of approximately 26,000 ha of eucalyptus plantation, and an additional investment of approximately US$9 million will be required to maintain these assets over a 20-year period. This analysis makes use of the concept of direct, indirect, and induced employment.[40] A 360,000-ton chipping mill would

[39] See Genesis (2005): South African Forestry Industry Market Analysis, a report prepared as part of a detailed review by the South African Department of Trade and Industry on the economics of the forestry, timber, pulp and paper industry in South Africa and provides a detailed market analysis of the various components of the forestry value chain.

[40] Direct employment refers to employment directly related to the production of forest products or services. As a result of this direct employment, employment is also generated in the businesses that supply goods and services to the forest sector. This is referred to an indirect employment. Finally, when these directly and indirectly generated incomes are spent and re-spent on a variety of items in the broader economy, they give rise to induced employment effects.

create approximately 50 direct jobs and 1,500 indirect and induced jobs and generate approximately US$72 million is foreign exchange earnings (at the FOB price of approximately US$200 per air-dried ton of woodchips).

A 360,000-ton chipping mill would need approximately 26,000 hectares of plantation to support the supply of fiber required by the mill. Approximately 20,000 jobs would be needed to establish the plantation, but these jobs would be temporary part-time employment in nature. Once the plantation is established approximately 2,200 jobs would be needed to maintain the plantation, but these jobs would be permanent full-time in nature. Based on a multiplier of 1.4 to derive indirect and induced jobs, there are an additional approximately 28,000 jobs in plantation establishment and approximately 3,080 jobs in plantation maintenance. In terms of total employment, including direct, indirect, and induced jobs, 1,550 are linked to the woodchip mill and export operations, 5,280 in the plantation maintenance, and 48,000 in plantation establishment, yielding total jobs linked to a 360,000-ton woodchip mill of 54,830.

TABLE 22: INVESTMENT AND JOBS LINKED TO WOODCHIP EXPORT PLATFORM*

| Item | Investment (US$ mil) | Forex Earnings (US$ mil) | Railway/Port Volumes (Tons 000's) | Employment | | |
|---|---|---|---|---|---|---|
| | | | | Total | Direct | Indirect/Induced |
| Plantation (26,000 ha) Establishment | 20.0 | 72 | - | 48,000 | 20,000 | 28,000 |
| Plantation (26,000 ha) Maintenance | 12.5 | - | - | 5,280 | 2,200 | 3,080 |
| Woodchip Mill & Port Operations | 9.0 | - | - | 1,550 | 50 | 1,500 |
| Total - 1st Investment Cycle | 41.5 | 72 | 360 | 55,130 | 22,250 | 32,580 |
| 2nd Cycle (cumulative) | 83.0 | 144 | 720 | 109,660 | 44,500 | 65,160 |
| 3rd Cycle (cumulative) | 207.5 | 216 | 1,080 | 208,990 | 111,250 | 97,740 |

** Based on entry-level woodchip export platform of 360,000 tons per requiring a 26,000 ha plantation, which could be increased by the same parameters for a second and third cycle of investment.*

*Sources: Global Development Solutions LLC (2016) and Swaine (2017)*

If additional investment could be attracted into the sub-sector and it developed to 1,080 million tons annually, this would be one-third the size of the Richards Bay operations. Given the capacity on the railway line and the envisaged future traffic projections, this level of operations could still easily be absorbed on the rail, but significant investment would be required at the port in the form of chipping mill capacity and port export operations.

### 4.1.5. BOTTLENECKS AFFECTING VALUE & SUPPLY CHAINS

Based on discussions with stakeholders in Mozambique, Malawi and Zambia, the main bottlenecks were identified as follows.

### 4.1.6. FARM-TO-PORT STORAGE

Storage facilities are lacking along the Nacala Corridor, primarily at two key locations: near farms and at the port.

Lack of storage near farms places smallholder producers at a disadvantageous position in terms of prices they can negotiate when they sell their crops, and as it leads them to incur higher post-harvest losses. Traders collect the majority of the margin on end prices, while farmers usually get a small margin. This is largely due to the fact that most of the traders own and operate storage facilities, where they store crops after buying from farmers. The number of storage facilities at distribution points is higher and therefore larger gaps tend to be near farms, with access to smallholder producer use.

Additionally, lack of storage near farms contributes to high post-harvest losses. This means less produce available to sell. The lack/inadequacy of storage facilities also reduces the reliability of the supply chain as it affects quality and traceability of goods, which in turn hampers the confidence of buyers. The stakeholders interviewed by the study team opined overwhelmingly that reliability is in most cases more important to supply chains than costs.

In Mozambique, ICM (Instituto de Cereias de Moçambique - Mozambique Cereal Institute) has grain storage facilities, which they rent out to the private sector, primarily Export Trading Group (ETG). However, these facilities are not sufficient in number, and they do not meet quality standards to preserve grains properly. There is a shortage of facilities for food staples and horticulture produce. The MIC will be privatizing the storage silos owned by the Bolsa de Mercadorias (BMM) or the Mozambique Commodities Exchange and ICM. It seems that these government-funded facilities have not been working well or meeting market needs.

There are some favorable developments as well. Export Trading Group (ETG), in a public-private partnership with USAID, is building 23 storage and input supply hubs in Tete, Nampula, Manica, and Zambezia. These hubs will allow a total of 22,900 smallholder farmers to store oil seeds and pulses for free for 90 days. While this helps alleviate the storage problem in Mozambique, it does not meet the full scale of needs, and does not provide storage for all types of agricultural produce.

Some farmer organizations also own storage facilities, but they do not have the capacity to operate and manage them. Therefore, smallholder farmers cannot make maximum use of these facilities.

The location of storage facilities is also an important factor in efficient functioning of supply chains, and usually adds to costs along the chain. There are storage facilities at distribution points in Nampula, Cuamba, and Namialo, but this does not mitigate the issues discussed. The farmers cannot benefit from these facilities as they are there built for the large-scale consumers, and the crop spends a maximum of few weeks there before they get to the buyer. Therefore, these facilities do not help improve the prices farmers receive, nor do they help the issue of post-harvest loss.

The lack of storage facilities at the Port of Nacala was stated as a reason by port users for why traders do not switch to rail from road transport.

These issues resulting from lack of adequate storage facilities in turn discourage producers from investing more into increasing production or new producers from entering the market.

**Smallholder Farm Operations.** The most critical bottlenecks in front of smallholder producers increasing production and value addition to their products are arguably the fragmented production

and the vicious cycle of subsistence farming. Smallholder farmers have difficulty scaling up operations to switch from subsistence farming to commercial businesses, especially if they are not working with a large producer/trader company. Along the Nacala Corridor, agricultural production is scattered, with farms spread out and small in size. Therefore, it is really hard to achieve economies of scale.

A major issue is that smallholders do not have access to finance, which is critical to start and sustain a commercial business. Farmers also lack knowledge of good farming techniques, which would have increased their efficiency and therefore earnings. Inputs (seeds, fertilizers, and chemicals) are too costly, and/or farmers do not know how to use them properly. Smallholder farmers cannot accumulate enough volume of their crops such that arranging transport to the buyer's site is feasible and affordable. Due to farms being scattered and crop production low, smallholders cannot accumulate large volumes, therefore do not earn much from their production. In addition, rural roads are in bad condition, and farmers do not own vehicles to bring their crops to the buyer. Traders fill this gap in the market and collect a large share of the margin as a result.

That said, it should be mentioned that this problem varies depending on the crop. Some crop producers have better scaling up opportunities than others, particularly for the cash crops of cotton, tobacco, and cashew. However, it remains true that smallholder producers do not have any market power and remain dependent on the big producers they work with. For example, the cotton production is defined by the oligopsony (few producers) nature of the market, discussed earlier in the description of cotton value chain.

Big producers assist smallholders in scaling up production. For most crops other than cashew, large buyers provide extension services, technology, and input support to smallholder producers. The nascent WRS helps this issue by filling gaps on the access to finance and storage aspects. However, there is still much to be done in this area, particularly to give smallholders more market power, and a chance to switch to more value adding activities.

### 4.1.7. TRADE FACILITATION ACTIONS AT THE NACALA PORT

Traders report that import procedures at the port are inefficient, document requirements are excessive, and official fees are high. This is important for agricultural value chains, because it applies to inputs or supporting products (e.g., chemicals, equipment) into production. There is an ongoing assignment under SPEED+, compiling import, export, and transit service fees charged by the government; as part of the TFA Implementation Strategy, to help address this issue.

Another issue at the port is that the traders are required to register with the contramarker system and obtain a new number each time they import a product. This is true even if they are importing the same product. This is inconvenient and costly for traders/producers and causes them to lose six weeks with each import shipment coming in. Their preference would be such that once a contramarker number is obtained, they can use it multiple times for the same product.

Another issue brought up by traders and freight forwarders at the Nacala Port is the non-transparent nature of regulations around contramarker. During the customs clearing process of imports and exports, traders originally had 90 days to register in the contramarker system. Customs Authority reduced this to 25 days and did not communicate the change publicly. Customs charged late penalties to traders, amounting to 5% of the value of shipment, which came as a surprise to one trader. This adds additional and unexpected costs to value chains using the Nacala Corridor.

Another issue that has been problematic for traders is regarding cases of inaccurate classification of commodities by the contramarker system and resulting taxation. A forestry company exporting

eucalyptus recounted an incidence where Customs classified the tree as 'native wood' even though it is actually an 'exotic tree.' Native wood called for higher taxes, and the producer was forced to pay the higher tax due to this incorrect classification.

### 4.1.8. NACALA PORT OFFLOADING OPERATIONS

Inefficient offloading operations at the Port of Nacala affect multiple value chains. The stakeholders interviewed by the study team reported that offloading operations at the port are not efficient and take a very long time. For one of the traders, it took between three and four days to offload cargo from the train because there are no mechanized loading/offloading facilities. It took one truck and 10 laborers to offload from the wagons and load onto the truck by hand. The doors of the wagons were also hard to open and took time, and the wagon door ended up being too narrow for forklifts. Many traders/producers complained about offloading at the port and claimed this inefficiency increases time and costs for them, as well as reliability of port operations.

### 4.1.9. TRANSPORT AND BORDER MANAGEMENT

Policy cooperation and coordination with regards to transport and border management is insufficient between corridor countries. Harmonization of border procedures is not complete, and therefore procedures are unpredictable. For supply chains to operate seamlessly across borders a harmonized transport policy is needed, which the corridor countries have not been able to agree on so far. It became apparent to the study team during the interviews that there was some resistance on the sides of individual countries to full cooperation. It is important to harmonize trade and transport policies across borders along the Nacala Corridor, particularly in order to unlock more transit trade using the railway. The lack of such cooperation results in corridor countries looking for other options than Nacala in the region, to export their products, for example, to Malawi.

## 4.2. TRAFFIC FORECAST ANALYSIS

This section of the report reviews the traffic forecasts by commodity, transport mode, and cargo type for both import and export flows along the Nacala Corridor.

To compile these forecasts an existing traffic model for the Nacala Corridor was updated for the period 2015-2030. The base year of 2015 was selected because data was available for other corridors. The traffic model has three drivers. The first is an economic growth rate by commodity in Zambia, Malawi, and Mozambique, the second is a gradual increase in the Nacala Corridor's market share of Malawian cargo from 8% in 2015 to 39% in 2030, and the third is a steep increase in the railway market share of Malawian cargo from 51% of traffic in 2015 to 95% of traffic in 2030.

The traffic forecasts presented in this section are elaborated in the excel-based traffic model, which provides interested stakeholders with a tool to explore alternative traffic forecast scenarios. Included in this model is a link to a value chain prioritization module, discussed in the previous section, and an economic impact module that is discussed later in this chapter. The effect of changing (a) sub-sector economic growth rates; (b) shift-share ratios between the Nacala Corridor and its competing corridors (Dar es Salaam, Beira and North-South); and (c) modal-split (road and rail), by commodity, on the Nacala Corridor, can be explored to assess the impact on export flows, import flows and changes in the configuration of cargo (containers and bulk).

### 4.2.1. DESCRIPTION BY COMMODITY/MODE

Table 23 shows that the overall traffic forecasts for the Nacala Corridor will grow from 1.92 million tons in 2015 to 4.64 million tons in 2030 at an average annual growth rate of 6.1% for all traffic, 4.9% for import traffic and 9.1% for export traffic over this period. The sharper rise in the growth of exports is due to the emergence of new export cargoes, notably the graphite from Balama, Cabo Delgado and the possible woodchip exports from Lichinga, Niassa and Namina, Nampula.

TABLE 23: TRAFFIC FORECASTS FOR NACALA CORRIDOR (2015–30) (METRIC TONS)

| Imports / Exports | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|
| Imports | 1,477,976 | 2,095,766 | 2,511,383 | 3,015,715 |
| Exports | 442,186 | 1,390,289 | 1,401,703 | 1,622,514 |
| TOTAL | 1,920,162 | 3,486,055 | 3,913,086 | 4,638,229 |
| Average Annual Growth (2015-30) - IMPORT | | | | 4.9% |
| Average Annual Growth (2015-30) - EXPORT | | | | 9.1% |
| Average Annual Growth (2015-30) - ALL | | | | 6.1% |

*Source: Nathan Associates*

Table 24 shows that while there is an expected average annual growth rate of 6.1% for all traffic, there is a much higher anticipate growth of 19.8% for rail traffic and a much lower anticipated growth of 2.3% for road traffic over this period. This reflects the anticipated shift from road to rail in the future, but it should be noted that road-based transport will continue to be the dominant mode because of the main flow will continue to be imports into and exports from Mozambique within a 500 km radius of the coast, which falls within the natural catchment for road transport.

TABLE 24: TRAFFIC FORECASTS FOR NACALA CORRIDOR BY ROAD AND RAIL (2015–30) (METRIC TONS)

| **Road / Rail** | **2015** | **2020** | **2025** | **2030** |
|---|---|---|---|---|
| Road | 1,777,081 | 2,123,065 | 2,229 799 | 2,501, 342 |
| Rail | 143,081 | 1,362,990 | 1,706,018 | 2,161,982 |
| TOTAL | 1,920, 162 | 3,486,055 | 3,935,817 | 4,663,325 |
| Average Annual Growth (2015-30) – ROAD | | | | 2.3% |
| Average Annual Growth (2015-30) - RAIL | | | | 19.8% |
| Average Annual Growth (2015-30) - ALL | | | | 6.1% |

*Source: Nathan (2017)*

Table 25 shows that the overall traffic forecasts for cargoes to/from Mozambique grew from 1.68 million tons in 2015 to 2.90 million tons in 2030 at an average annual growth rate of 3.7% for all traffic, 26.2% for rail traffic and 2.6% for road traffic over this period.

TABLE 25: TRAFFIC FORECASTS FOR MOZAMBIQUE ON NACALA CORRIDOR (2015–30)

| **Mozambique** | **2015** | **2020** | **2025** | **2030** |
|---|---|---|---|---|
| Road | 1,663,754 | 2,045,354 | 2,171,901 | 2,432,912 |
| Rail | 14,288 | 560,690 | 446,206 | 466,625 |
| TOTAL | 1,678,042 | 2,606,045 | 2,618,108 | 2,899,537 |
| Average Annual Growth (2015-30) - ROAD | | | | 2.6% |
| Average Annual Growth (2015-30) - RAIL | | | | 26.2% |
| Average Annual Growth (2015-30) - ALL | | | | 3.7% |

*Source: Nathan (2017)*

Table 26 shows that the overall traffic forecasts for cargoes to/from Malawi grew from 0.23 million tons in 2015 to 1.52 million tons in 2030 at an average annual growth rate of 13.4% for all traffic, 18.2% for rail traffic and -3.3% for road traffic over this period.

TABLE 26: TRAFFIC FORECASTS FOR MALAWI ON NACALA CORRIDOR (2015–30) (METRIC TONS)

| Malawi | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|
| Road | 113,327 | 77,711 | 57,898 | 68,431 |
| Rail | 117,793 | 668,856 | 1,035,984 | 1,448,518 |
| TOTAL | 231,120 | 746,568 | 1,093,882 | 1,516,949 |
| Average Annual Growth (2015-30) - ROAD | | | | -3.3% |
| Average Annual Growth (2015-30) - RAIL | | | | 18.2% |
| Average Annual Growth (2015-30) - ALL | | | | 13.4% |

*Source: Nathan (2017)*

Table 27 shows that the overall traffic forecasts for cargoes to/from Zambia grew from 0.01 million tons in 2015 to 0.25 million tons in 2030 at an average annual growth rate of 23.0% for rail traffic over this period. It should be noted that Zambian traffic is the difficult to predict at this juncture. There is much speculation about the prospects for the movement of grains and minerals from the Eastern Province to the railhead at Chipata. However, the market for grain is not steady-state with significant fluctuations on both the supply (rainfall dependent) and demand (market volatility) sides of the market. With respect to minerals, notably copper and cobalt from the Zambia/DRC Copperbelt, highly established export routes, notably on the Dar es Salaam and North-South (to Durban) corridors have been developed.

TABLE 27: TRAFFIC FORECASTS FOR ZAMBIA ON NACALA CORRIDOR (2015–30) (METRIC TONS)

| Zambia | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|
| Road | 0 | 0 | 0 | 0 |
| Rail | 11,000 | 133,443 | 223,827 | 246,840 |
| Total | 11,000 | 133,443 | 223,827 | 246,840 |
| Average Annual Growth (2015-30) - ROAD | | | | 0.0% |
| Average Annual Growth (2015-30) - RAIL | | | | 23.0% |
| Average Annual Growth (2015-30) - ALL | | | | 23.0% |

*Source: Nathan (2017)*

### 4.2.2. DETAILED TRAFFIC FORECASTS BY COMMODITY/MODE

The following section details the traffic forecast on the Nacala Corridor for each commodity by road and rail for Mozambique, Malawi and Zambia.

#### *Mozambique*

This section will review traffic flows by commodity in terms of export flows, import flows, and configuration of national cargoes, i.e. containers and bulk by road and rail in Mozambique.

**Exports.** Table 28 summarizes the detailed traffic forecasts for Mozambique exports between 2015 and 2030. The most prospective in terms of growth is soybean, but this sub-sector is rising from a low base. Because this is a relatively new, untested market, it is unclear whether the focus of firms in this sub-sector is on the domestic market (as inputs into chicken feed) or export markets. Growth in cashew nuts is expected to remain buoyant and bananas are expected to rebound following a period of stagnation as a result of being inflicted with the banana wilt disease. For the other

traditional export commodities, notably tobacco, cotton, sesame seed, tea, and hardwoods are expected to grow moderately at between two and three percent per year between 2015 and 2030.

In terms of volume growth, the prospects for new graphite exports from the Syrah Resources mine in Balama, Cabo Delgado and the potential for establishing a woodchip export industry as discussed in the previous section are obvious candidates. The graphite will be transported by road in exported 1-ton bags, stuffed into 20' containers at a warehouse in Nacala and exported via the port. For a woodchip export industry to be established in Nacala a plant would have to be developed proximate to the port, which would receive fiber in the form of stripped cut logs by rail from forestry consolidation points at Lichinga and Namina loaded onto waiting specialist vessels via conveyor linked to the plant. Pigeon pea was initially considered highly prospective on the back of a Memorandum of Understanding (MOU) between the Governments of Mozambique and India, which committed India to importing from Mozambique an initial minimum quantity of 100,000 tons for the 2016-17 season, increasing annually by 25,000 tons, up to a final level of 200,000 tons for 2020-21.

TABLE 28: TRAFFIC FORECASTS FOR MOZAMBIQUE EXPORTS (2015–2030) (METRIC TONS)

| Commodity | 2015 | 2020 | 2025 | 2030 | Growth (%) |
|---|---|---|---|---|---|
| Tobacco | 35,000 | 38,643 | 42,665 | 47,105 | 2.0 |
| Pigeon Peas | 35,000 | 40,575 | 47,037 | 53,999 | 2.9 |
| Cashew | 40,000 | 56,102 | 78,686 | 110,361 | 7.0 |
| Cotton | 15,000 | 16,971 | 19,201 | 21,724 | 2.5 |
| Sesame | 50,000 | 57,964 | 67,196 | 77,898 | 3.0 |
| Bananas | 6,000 | 8,029 | 10,745 | 14,379 | 6.0 |
| Tea | 7,500 | 8,403 | 9,415 | 10,549 | 2.3 |
| Soybean | 10,000 | 21,012 | 28,431 | 39,061 | 9.5 |
| Hardwoods | 180,000 | 198,735 | 219,419 | 242,256 | 2.0 |
| Plantation Forests-Niassa | 0 | 218,086 | 77,891 | 0 | n.a. |
| Plantation Forests-Lurio | 0 | 80,000 | 0 | 0 | n.a. |
| Graphite | 0 | 355,000 | 355,000 | 355,000 | n.a. |
| Total | 378,500 | 1,099,519 | 955,686 | 972,334 | 6.5 |

*Source: Nathan (2017)*

However, it remains unclear whether this MOU was actually signed. Indeed, in a statement in the online brief 'Further Africa' on August 16, 2017, the head of ETG Mozambique, in response to the ban on pigeon pea imports to India (August 5, 2017), said that the company "could not risk making further purchases from farmers because we have considerable amounts of pigeon peas in our warehouses, which we bought from producers in the previous agricultural campaign."

**Imports.** Table 29 summarizes the detailed traffic forecasts for Mozambique imports between 2015 and 2030. Imports into northern Mozambique have a captive market with the bulk of imports destined to the main consumption and/or consolidation center of Nampula city. Consequently, growth trends are expected to be more steady-state, which explains why growth rates range within a narrow band of between 2.5% and 3% between 2015 and 2030.

TABLE 29: TRAFFIC FORECASTS FOR MOZAMBIQUE IMPORTS (2015–30) (METRIC TONS)

| Commodity | 2015 | 2020 | 2025 | 2030 | Growth (%) |
|---|---|---|---|---|---|
| Fuels | 210,000 | 243,448 | 282,222 | 327,173 | 3.0 |
| Clinker | 367,146 | 425,623 | 465,090 | 539,166 | 2.6 |

| Commodity | 2015 | 2020 | 2025 | 2030 | Growth (%) |
|---|---|---|---|---|---|
| Wheat | 133,209 | 154,426 | 168,745 | 195,622 | 2.6 |
| Rice | 9,451 | 10,956 | 11,972 | 13,879 | 2.6 |
| Vehicles | 442 | 512 | 560 | 649 | 2.6 |
| Other | 579,294 | 671,561 | 733,832 | 850,713 | 2.6 |
| Total | 1,299,542 | 1,506,525 | 1,662,422 | 1,927,202 | 2.7 |

*Source: Nathan (2017)*

Exports and Imports. Table 30 summarizes the detailed traffic forecasts for Mozambique exports and imports, by containerized or bulk cargoes, between 2015 and 2030. The ratio of containerized to bulk cargoes is expected to stay the same at 45% to 55% between 2015 and 2030. The modal split between road and rail will shift from 1.5% in 2015 to 20% in 2030, but could change if woodchip exports boom.

TABLE 30: FORECASTS FOR ALL MOZAMBIQUE TRAFFIC (2015–30) (METRIC TONS)

| Mode | 2015 | 2020 | 2025 | 2030 | Growth (%) |
|---|---|---|---|---|---|
| Road | 1,663,754 | 2,045,354 | 2,171,901 | 2,432,912 | 2.6 |
| Containers (Tons) | 772,786 | 804,881 | 884,894 | 1,041,670 | 2.0 |
| % of road traffic | 46 | 39 | 41 | 43 | |
| Bulk (Tons) | 890,968 | 1,240,474 | 1,287,007 | 1,391,242 | 3.0 |
| % of road traffic | 54 | 61 | 59 | 57 | |
| Rail (Cuamba) | 11,040 | 277,890 | 296,043 | 394,030 | 26.9 |
| Containers (Tons) | 5,008 | 101,543 | 155,642 | 210,402 | 28.3 |
| % of rail traffic-Cuamba | 45 | 37 | 53 | 53 | |
| Bulk (Tons) | 6,032 | 176,347 | 140,401 | 183,628 | 25.6 |
| % of rail traffic-Cuamba | 55 | 63 | 47 | 47 | |
| Rail (Lichinga) | 3,248 | 308,636 | 200,081 | 151,329 | 29.2 |
| Containers (Tons) | 0 | 38,671 | 46,590 | 52,452 | 3.1 |
| % of rail traffic-Lichinga | 0 | 13 | 23 | 35 | |
| Bulk (Tons) | 3,248 | 269,965 | 153,491 | 98,876 | 25.6 |
| % of rail traffic-Lichinga | 100 | 87 | 77 | 65 | |
| Road and Rail | 1,678,042 | 2,631,880 | 2,668,025 | 2,978,270 | 3.9 |
| Containers (Tons) | 777,794 | 945,095 | 1,087,126 | 1,304,524 | 3.3 |
| % of total traffic | 46 | 36 | 41 | 44 | |
| Bulk (Tons) | 900,248 | 1,686,785 | 1,580,899 | 1,673,746 | 29.2 |
| % of total traffic | 54 | 64 | 59 | 56 | |

*Source: Nathan (2017)*

### *Malawi*

This section will review traffic flows by commodity in terms of export flows, import flows, and configuration of national cargoes, i.e. containers and bulk by road and rail in Malawi.

**Exports.** Table 31 summarizes the detailed traffic forecasts for Malawi exports between 2015 and 2030. In terms of growth rate, the most prospective sub-sector is tea, although it is rising from a

very low base. Nonetheless, there is significant interest within the tea industry in Malawi to scale-up the use of the Nacala Corridor. The other prospective sub-sector is tobacco, but this will require certain pre-conditions, notably the establishment of a seamless logistics supply chain linking the stuffing and fumigation of tobacco in 40' containers in Malawi to the vessel stack at the Nacala port via the Nacala railway. Cotton is slightly less prospective and is coming of a low base, but the sector is also known to be quite volatile and therefore unreliable. Sugar is likely to remain a mainstay of the corridor.

As with Mozambique, Pigeon peas were highly prospective, but unlike their neighbor, Malawi did not enter into an MOU with the Indian government, so when the import ban was instituted by India, the export of pigeon pea stopped.

TABLE 31: TRAFFIC FORECASTS FOR MALAWI EXPORTS (2015–30) *(VALUES IN TONS)*

| Commodity | 2015 | 2020 | 2025 | 2030 | Growth (%) |
|---|---|---|---|---|---|
| Sugar | 28,266 | 61,682 | 137,575 | 257,748 | 15.9 |
| Tobacco | 400 | 13,937 | 30,776 | 50,969 | 38.1 |
| Tea | 150 | 15,209 | 23,127 | 32,730 | 43.2 |
| Pigeon Peas | 12,104 | 28,505 | 39,241 | 57,463 | 10.9 |
| Cotton | 1,384 | 5,120 | 9,269 | 14,419 | 16.9 |
| Other Exports | 10,382 | 32,873 | 46,066 | 60,520 | 12.5 |
| Total | 52,686 | 157,327 | 286,053 | 473,849 | 15.8 |

*Source: Nathan (2017)*

**Imports.** Table 32 summarizes the detailed traffic forecasts for Malawi imports between 2015 and 2030. In terms of growth rate, prospective imports include fuel, since only a limited amount is imported via Nacala. Fertilizer represents a significant opportunity because the largest importer has committed to the corridor. Other imports represent a swing from the Beira Corridor, so will have to be captured.

TABLE 32: TRAFFIC FORECASTS FOR MALAWI IMPORTS (2015–30) (METRIC TONS)

| Commodity | 2015 | 2020 | 2025 | 2030 | Growth (%) |
|---|---|---|---|---|---|
| Fuels | 5,270 | 40,984 | 75,415 | 99,917 | 21.7 |
| Fertilizers | 30,139 | 143,344 | 203,481 | 249,622 | 15.1 |
| Clinker | 0 | 87,429 | 160,880 | 195,388 | 8.4 |
| Wheat | 119,145 | 157,877 | 183,023 | 212,174 | 3.9 |
| Other Imports | 23,880 | 159,608 | 185,029 | 285,999 | 18.0 |
| Total | 178,434 | 589,241 | 807,829 | 1,043,099 | 12.5 |

*Source: Nathan (2017)*

**Exports and Imports.** Table 33 summarizes the detailed traffic forecasts for Malawi exports and imports, by containerized or bulk cargoes, between 2015 and 2030. The trend, as expected shows a shift from road to rail with bulk cargoes being slightly higher than containerized cargoes but evening out by 2030.

TABLE 33: TRAFFIC FORECASTS FOR ALL MALAWI TRAFFIC (2015–30) (METRIC TONS)

| Mode | 2015 | 2020 | 2025 | 2030 | Growth |
|---|---|---|---|---|---|
| Road | 113,327 | 77,711 | 57,898 | 68,431 | -3.3 |
| Containers (Tons) | 18,262 | 44,077 | 20,037 | 23,014 | 1.6 |

| | | | | | |
|---|---|---|---|---|---|
| % of road volume | 16 | 57 | 35 | 34 | |
| Bulk (Tons) | 95,065 | 33,634 | 37,861 | 45,417 | -4.8 |
| % of road volume | 84 | 43 | 65 | 66 | |
| Rail | 117,793 | 668,856 | 1,035,984 | 1,448,518 | 18.2 |
| Containers (Tons) | 58,304 | 272,857 | 451,046 | 736,834 | 18.4 |
| % of rail volume | 49 | 41 | 44 | 51 | |
| Bulk (Tons) | 59,489 | 395,999 | 584,939 | 711,683 | 18.0 |
| % of rail volume | 51 | 59 | 56 | 49 | |
| Road and Rail | 231,120 | 746,568 | 1,093,882 | 1,506,038 | 13.4 |
| Containers (Tons) | 76,566 | 316,935 | 471,082 | 748,938 | 16.5 |
| % of total volume | 33 | 42 | 43 | 50 | |
| Bulk (Tons) | 154,554 | 429,633 | 622,799 | 757,100 | 11.2 |
| % of total volume | 67 | 58 | 57 | 50 | |

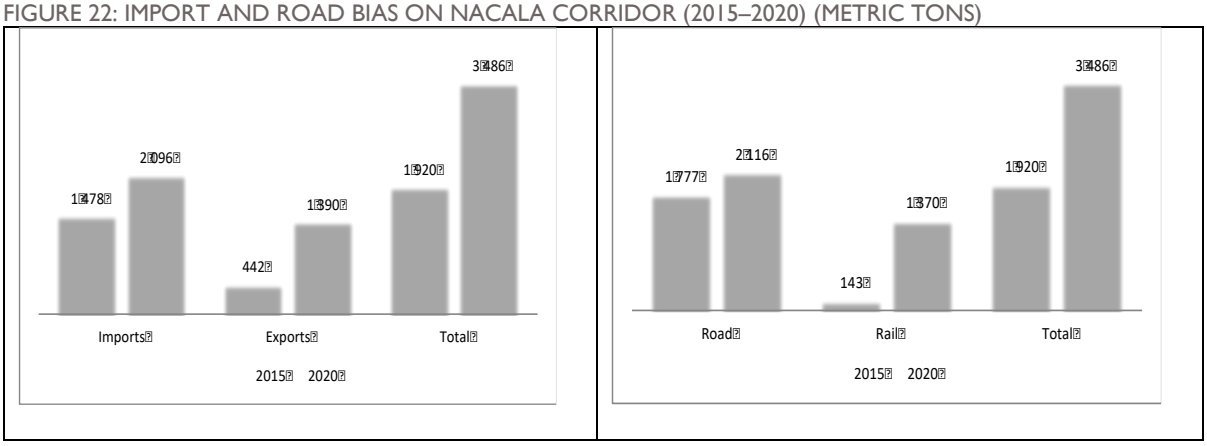
*Source: Nathan (2017)*

### 4.2.3. SUMMARY OF SHORT-TERM TRAFFIC FLOWS

The results from the traffic forecast model show that in 2015, 77% of traffic was imports but this is expected to drop to 60% by 2020 as the export sector develops. Nonetheless, absolute growth in imports will increase from 1.48 million tons in 2015 to 2.10 million tons by 2020. Similarly, absolute growth in exports will rise from 0.44 million tons in 2015 to 1.39 million tons in 2020. Total absolute growth in all cargo will rise from 1.92 million tons in 2015 to 3.45 million tons in 2020.

This potential shift is expected to coincide as the new and proposed new improvements in the rail and port system enhance efficiencies on the corridor. Hence, road-based traffic is expected to increase marginally from 1.78 million tons (or 93%) in 2015 to 2.17 million tons (or 61%) in 2020. By contrast rail-based traffic is expected to increase from 0.14 million tons (or 7%) in 2015 to 1.37 million tons (or 39%) by 2020 (figure 28).

FIGURE 22: IMPORT AND ROAD BIAS ON NACALA CORRIDOR (2015–2020) (METRIC TONS)

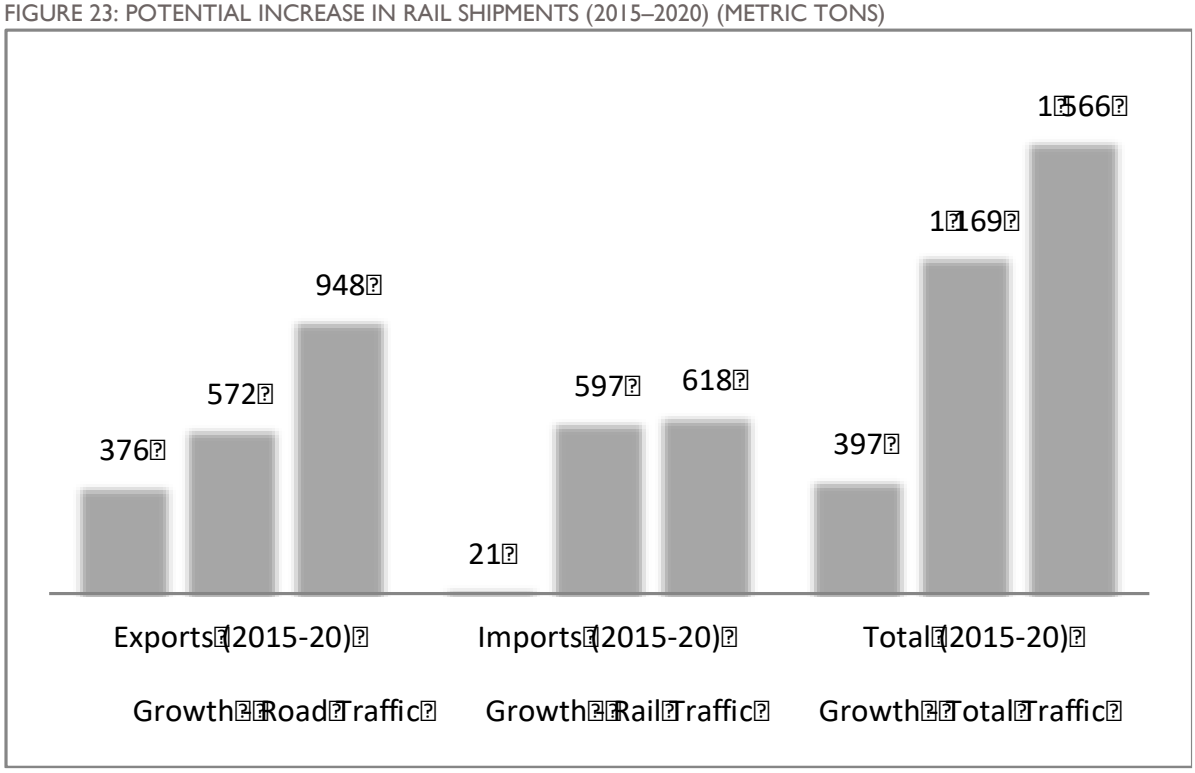



*Source: Nathan (2017)*

Indeed, growth in exports using the rail is expected to increase by 572,000 tons and growth in imports by 597,000 tons over the period 2015-2020 (figure 29). However, this will only happen if nascent export growth sectors, notably plantation forestry emerges and bulk transit cargoes, notably

containerized imports and bulk fertilizer imports, take advantage of improving corridor efficiencies and lower transport costs.

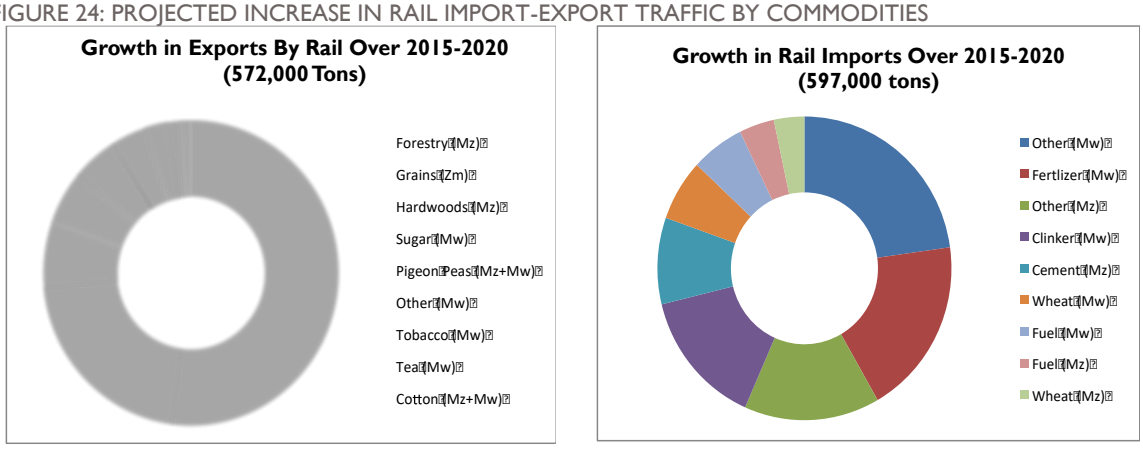
FIGURE 23: POTENTIAL INCREASE IN RAIL SHIPMENTS (2015–2020) (METRIC TONS)




*Source: Nathan (2017)*

Figure 30 provides detail on the commodities included increase in exports (572,000 tons) and imports (597,000 tons) over the period 2015-2020. It shows that on the export side that the top five exports are forestry (Mozambique), grains (Zambia), hardwoods (Mozambique), sugar (Malawi) and Pigeon Peas (Malawi and Mozambique) and on the import side, the top five imports are other containerized cargo (Malawi), fertilizer (Malawi), other containerized cargo (Mozambique), clinker (Malawi) and cement (Mozambique).

FIGURE 24: PROJECTED INCREASE IN RAIL IMPORT-EXPORT TRAFFIC BY COMMODITIES




*Source: Nathan (2017)*

# 5. CONCLUSIONS AND RECOMMENDATIONS

## 5.1. BACKGROUND

The overall objective of this assignment was to provide recommendations on how to better use the high potential and capacity that the Nacala Corridor offers, in order to foster more trade and economic development for Northern Mozambique, as well as for Malawi and Zambia, where the Corridor runs.

The decision by Vale to anchor coal exports out of Nacala rather than Beira was the game changer for the Nacala Corridor. Between 2013 and 2017, US$3 billion was invested in rehabilitating existing and constructing new rail and port infrastructure. This upgrade ensured that the corridor had the capacity to export up to 18 million tons of coal and four million tons (coal equivalent) of general cargo annually.

In addition to this initial investment the railway company, CDN-CEAR has invested a further US$170 million in the recovery and upgrade of those sections of the general freight railway network that are not on the heavy-haul railway line. The Governments of Malawi, Mozambique, and Zambia have invested US$348 million in the Nacala Corridor Road Project and the Government of Mozambique has invested US$350 million in the Nacala Port Development Project.

However, despite the sizeable investment in regional transportation networks, supported by a careful structuring of the concession agreements to ensure third-party access for general freight cargo and the repeal of the requirement for the mandatory use of the Nacala Special Economic Terminal (TEEN), some bottlenecks remain that undermine the realization of the system's capacity.

Nonetheless, while there has been appreciable volume growth in cargo handled through the port of Nacala, corridor flows have been dominated by growth in imports transported by road to the provincial capital of Nampula, the largest city along the corridor. By contrast, volume growth in transit cargoes, best suited for transport by rail, destined for landlocked Malawi, has been sluggish, despite the cost competitiveness of rail when compared to road transport. Unlocking this capacity will be critical to lowering transport costs in the hinterland regions of Mozambique (Zambezia and Niassa) and deep hinterland landlocked countries (Malawi and Zambia).

## 5.2. POTENTIAL ECONOMIC IMPACTS

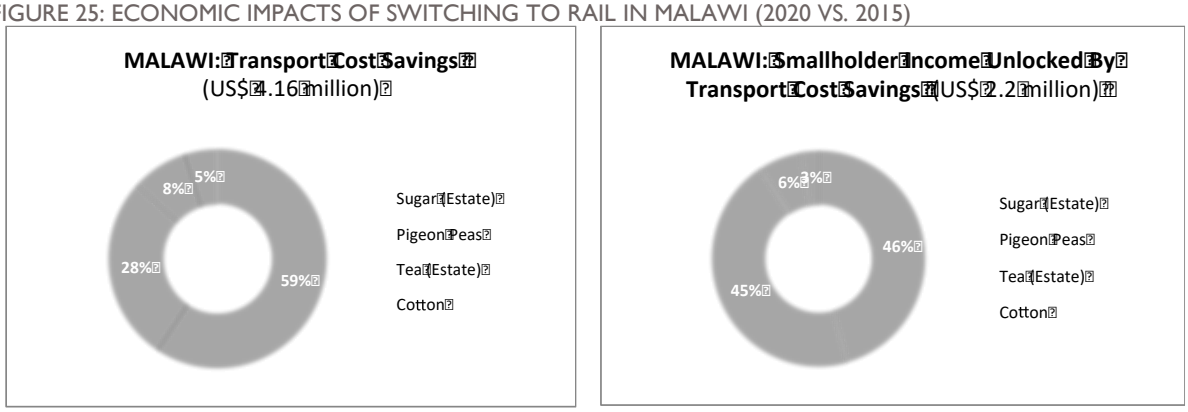
Since imports still dominate corridor flows, in part because production is still relatively low, one of the keys to unlock this capacity is to grow exports. From the value chain analysis export sub-sectors with the greatest potential developmental impact were plantation forestry, pulses, cotton, and sesame seed in Mozambique and pulses, cotton, sugar, and tea in Malawi.

The principal trigger for improving transport efficiencies along the Nacala Corridor is by shifting future traffic onto the railway and by removing the obligatory use of TEEN. It is envisaged that the proposed improvements to the port under the Nacala Port Improvement Project will both improve the capacity and enhance the efficiency of port operations. The remaining investment gap is the inland terminals and specialized terminals at the port, which are likely to be addressed as the demand to use the railway increases. The largest economic impact, for the year 2020, can be summarized as follows:

In 2020, by shifting 535,000[41] tons of exports onto the Nacala Corridor railway system and removing the direct and indirect costs associated with the compulsory use of TEEN, it is estimated that US$28 million in costs savings can be achieved. If these savings are directed into investment, an additional 116,000 tons of export product will be generated, creating a further 30,000 jobs, either as employment or livelihood opportunities, and an additional US$17 million in income, at an average per worker/smallholder producer of US$580 per year. Table 34 summarizes the economic impacts for selected commodities in Malawi and Mozambique. Key findings for Malawi and Mozambique follow.

In Malawi, the cost savings for the year 2020, resulting from switching to rail, amount to nearly US$4.2 million, which translates into 5,890 tons of additional production of sugar, pigeon peas, tea and cotton in total. It is estimated that this surplus production will lead to the creation of 12,390 jobs and the additional income per worker/smallholder producer for each job created is estimated to be US$180. In Malawi, the sub-sector that benefits the most from switching to railway use is the sugar industry. This is mostly in terms of cost savings, but also creates additional income for farmers/workers in this industry. This is followed by pigeon peas. Although the cost savings for pigeon peas is smaller compared to that of sugar, it translates generously as additional income for farmers/workers, primarily because this sub-sector is dominated by smallholder production (figure 31).

FIGURE 25: ECONOMIC IMPACTS OF SWITCHING TO RAIL IN MALAWI (2020 VS. 2015)




*Source: Nathan (2017)*

[41] This figure is for Malawi and Mozambique rail-based traffic only. It does not include Zambian cargo as these flows were not included in the economic impact analysis because of the uncertainty about how robust these flows will be over the short-term, i.e. the next five years.

TABLE 34: MALAWI AND MOZAMBIQUE–ECONOMIC IMPACTS OF TRANSPORT COST SAVINGS, 2020

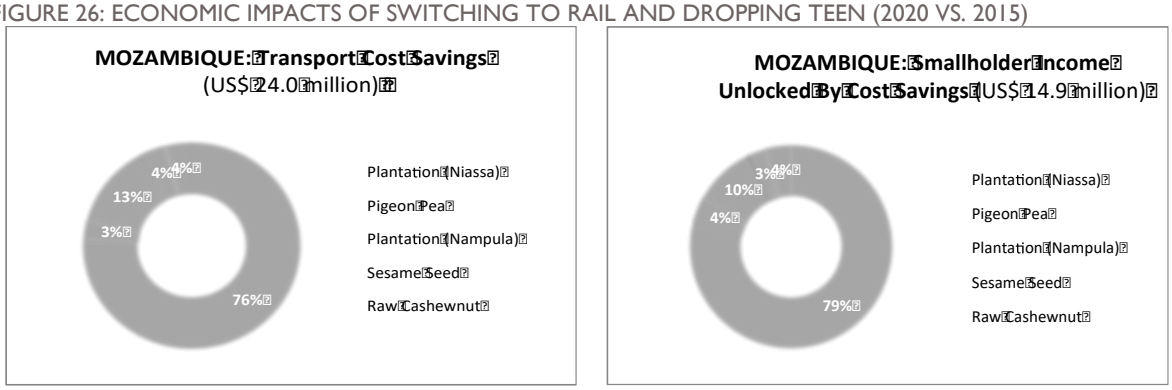
| | Exports (Tons) | US$ Saving (Total) | Production + Tons | Jobs + | Additional Income (Farmers / Workers) + US$ | Income Per Farmer / Worker + US$ |
|---|---|---|---|---|---|---|
| **Blantyre (Limbe)-Nacala (807 kms)** | | | | | | |
| Sugar (Estate) | 61,682 | 2,467,292 | 3,525 | 326 | 1,014,472 | 3,107 |
| Pigeon Peas | 28,505 | 1,140,206 | 2,000 | 10,669 | 1,000,181 | 94 |
| Tea (Estate) | 8,691 | 347,642 | 195 | 46 | 142,939 | 3,107 |
| Cotton | 5,120 | 204,808 | 169 | 1,349 | 63,212 | 47 |
| **Sub-Total (Malawi)** | **103,999** | **4,159,947** | **5,888** | **12,390** | **2,220,804** | **179** |
| **Lichinga-Nacala (795 kms)** | | | | | | |
| Plantation Forestry (Estate) | 218,086 | 18,319,224 | 91,596 | 1,755 | 11,817,177 | 8,316 |
| **Cuamba-Nacala (533 kms)** | | | | | | |
| Pigeon Pea | 12,172 | 749,332 | 1,315 | 7,011 | 657,308 | 94 |
| Cotton | 6,788 | | | | | |
| **Namina-Nacala (269kms)** | | | | | | |
| Plantation Forestry (Estate) | 80,000 | 3,075,200 | 15,376 | 295 | 1,430,507 | 8,316 |
| **Nampula-Nacala (192kms)** | | | | | | |
| Sesame Seed | 57,964 | 927,419 | 521 | 3,473 | 385,556 | 111 |
| Cashewnut (Raw) | 56,102 | 897,633 | 1,320 | 4,800 | 660,024 | 138 |
| **Sub-Total (Mozambique)** | **431,113** | **23,968,808** | **110,128** | **17,335** | **14,950,573** | **862** |

*Source: Nathan (2017)*

In Mozambique, it is assumed that cost savings will happen as a result of two factors: switching from road to rail and not having to having to use TEEN and pay its fees. The cost savings from those factors are estimated to be nearly US$24 million, which translates into 110,128 tons of additional production in plantation forestry, pigeon pea, cotton, sesame seed, and cashew nut, and a further 17,340 jobs, at an average of US$860 per worker/farmer. The scale of economic impact is greater in Mozambique and this is largely due to the large potential of the forestry industry, and to a smaller extent the added factor of savings from the removal of the mandatory use of TEEN.

The pie chart clearly shows that in Mozambique, the cost savings mostly attach to the plantation forestry sub-sector. When the shares of Lichinga and Namina plantations are added, forestry makes up for 89% of savings due to changes in transport conditions. The same total share applies for additional income to be generated by the plantation forestry sub-sector. Cashew nut, sesame seed and pigeon pea have smaller and relatively similar shares, both in terms of cost savings and additional income (figure 32).

FIGURE 26: ECONOMIC IMPACTS OF SWITCHING TO RAIL AND DROPPING TEEN (2020 VS. 2015)




*Source: Nathan Associates (2017)*

Recent and planned improvements in Nacala corridor infrastructure should continue to make the corridor more competitive, but in some ways, it is too soon to make a judgement due to the ongoing works. However, it is clear for Malawi imports and exports, that the potential to lower transport costs by using the railway to Nacala compared to moving goods by road to Beira is very high. The rehabilitated Nacala corridor railway has been operating since 2015 and is attracting more and more traffic every year. It is this trend that supports the growth forecasts in the traffic model.

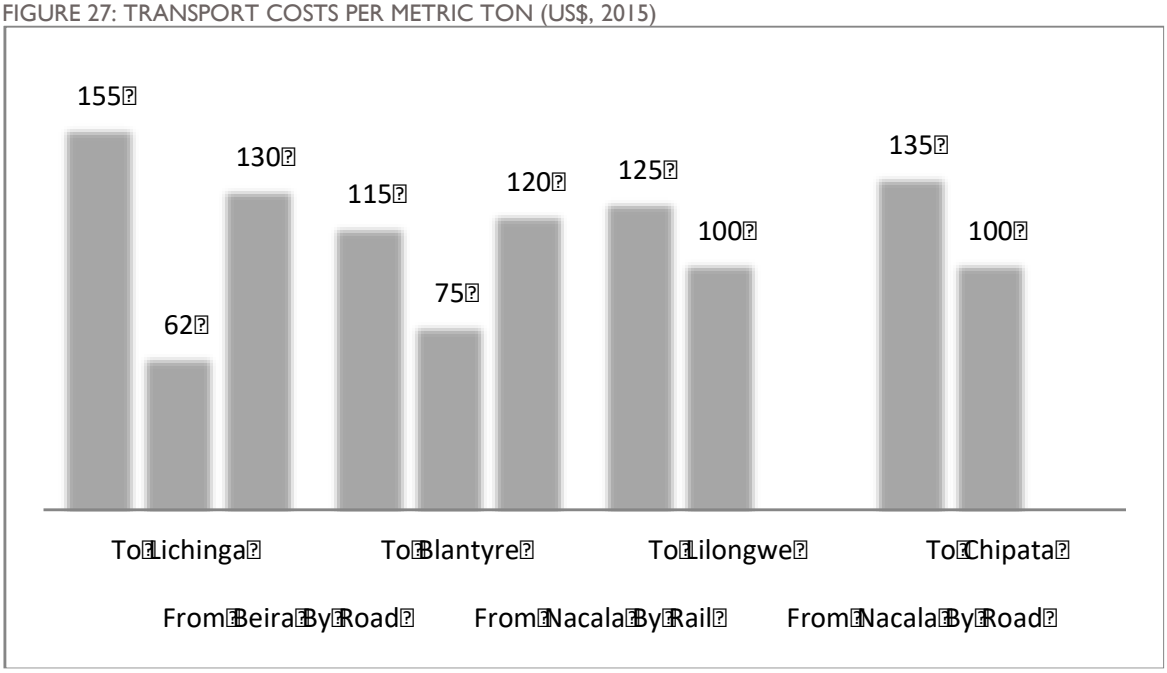
Another significant reform has been the repeal of the obligatory use of the TEEN. Indeed, following years of dissatisfaction, in July 2017 the MEF decided that "the customs clearing procedures for exports must occur in free manner, in any of the terminals legally recognized by the Government." While this lifted the mandatory us of TEEN, thereby responding to exporters request, in the second article of that decision the Minister stated that" unless otherwise indicated, based on a selective risk management criteria and promotion of efficient customs control mechanisms, the use of TEEN is optional."

This second article opens a lot a room for interpretation, as infers that the GoM can call for mandatory use of TEEN for specific cargo or situations. During interviews held at TEEN in July 2017, staff there indicated that the intention of the GoM is to be able to define special exports that can only obtain customs clearance at TEEN.

### 5.2.1. TRANSPORT COST SAVINGS FROM MIGRATING TO RAIL 2015 AND 2020

Figure 33 summarizes the results from the FastPath2 analysis of the transport costs per metric ton to/from Beira and Nacala by road/rail to Lichinga, Blantyre, Lilongwe, and Chipata. It clearly shows that on a metric ton basis rail costs are significantly lower than road costs.

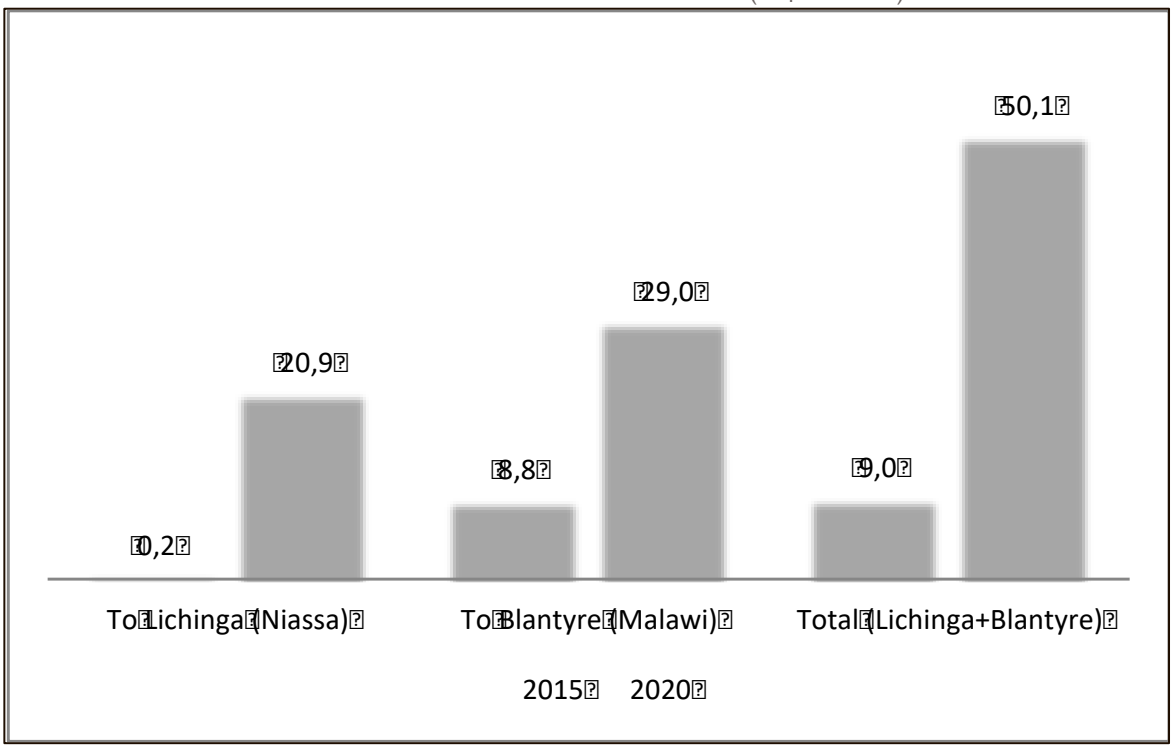
FIGURE 27: TRANSPORT COSTS PER METRIC TON (US$, 2015)




*Source: Nathan FastPath2 analysis, 2017*

Figure 34 takes these benchmark costs and compares the difference in the transport costs for exports/imports to/from Lichinga and Blantyre. The results speak for themselves, with actual savings of approximately US$50 million in 2020.

FIGURE 28: TRANSPORT COST SAVINGS ACHIEVED IN SHIFT TO RAIL (US$ MILLION)




*Source: Nathan FastPath2 Analysis (2017)*

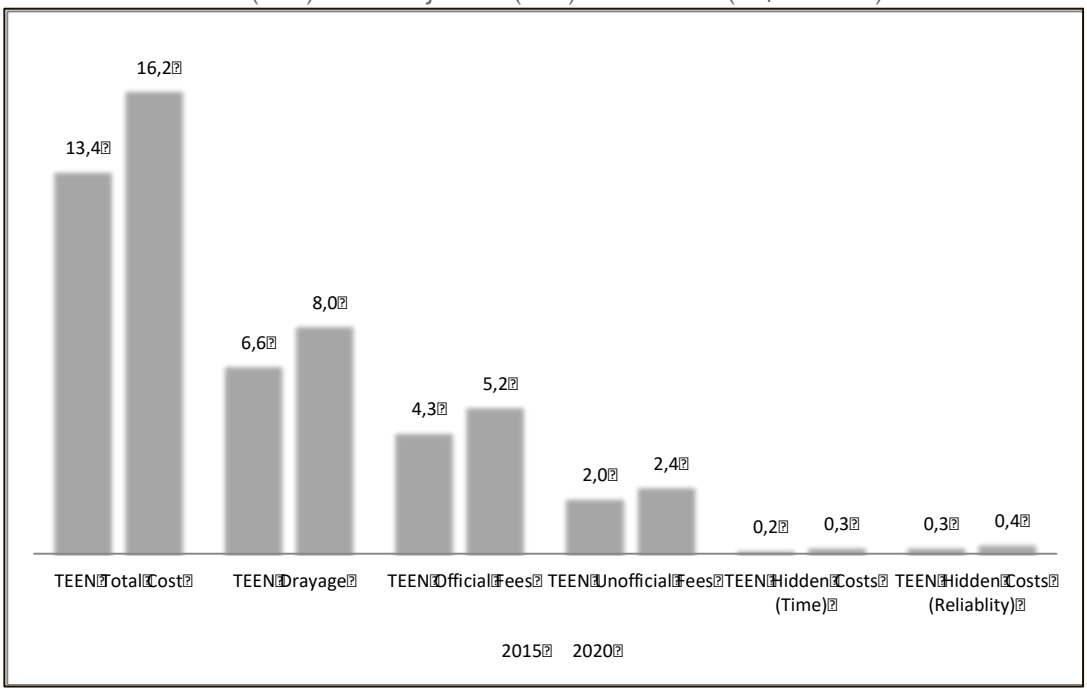
Nonetheless, the news has been well received by exporters who use the Nacala port who felt aggrieved at being forced to use the facility. According to one exporter "the fees are expensive for what they provide. Official fees are 7,800MT for a TEU and 14,400MT for a FEU and as a result it is a good mechanism for making money. Our company paid direct costs of US$400,000 to TEEN last year. So, if the regulation is fully implemented it will a bonanza for us!"[42]

The impact of this cost must also be taken into account when considering its detrimental effect on the competitiveness of the Nacala Corridor vis-à-vis the Beira Corridor. The Beira port is estimated to be approximately $100 more expensive than Nacala for imports due to higher customs and yard fees, but less expensive than Nacala by over $100 when considering consolidation costs for exports at Nacala. When considering TEEN costs, Nacala becomes nearly double the cost of Beira for national exports.

Figure 39 highlights that the cost of having to use the TEEN in 2015 was US$13.4 million and in 2020 would have increased to US$16.2 million.

[42] Quote from a major user of the Nacala Corridor when asked his/her views on the impact of TEEN on promoting local exports from northern Mozambique.

FIGURE 29: ESTIMATED (2015) AND PROJECTED (2020) TEEN COSTS (US$ MILLION)




*Source: Nathan FastPath2 Analysis (2017)*

The figure shows that the obligatory use of TEEN layered in considerable indirect costs resulting drayage[43] moving to/from exporters to TEEN facility, unofficial fees to expedite processing, and additional hidden costs due to more time and less reliability in the logistics supply chain. The removal of these costs plus lower rail transport costs is key to enhancing the competitiveness of the corridor. The proposed improvements under the Nacala Corridor Port Improvement Project are equally important.

The Nacala port is not congested at present, but the port area is very limited in respect to total area (about 25 ha) and also the landside width of the port (250 m). There is very limited storage space within the port. For this reason, there is no free storage time provided for containers, which is a service offered by its competitors. For example, the Beira port offers between 5 and 15 days of free storage for import containers, as it does not have the same space constraint. The capacity of the present container terminal is set at 180,000 TEUs per year, and the fully equipped new two berth terminal on the north quay is planned at 250,000 TEUs per year. A modern container berth, fully equipped with gantry cranes and a width of 500 m, should have a capacity of about 250,000 TEUs per year per berth.

For the African east coast ports, the efficiency, costs, and capacity of a port is largely determined and influenced by how quickly the imports, both containers and bulk, can be moved away from the quayside and out of the port. At present, this works quite well at Nacala, because both bulk and containers are moved away from the quayside fairly quickly. As volumes increase, rail will play an important role in reducing port congestion, because rail is able to move large quantities in a much shorter time than road. Indeed, the key objective for Nacala, with the expected increase in freight

[43] Drayage is the transport of goods over a short distance in the shipping industry and logistics industry and is often part of a longer overall move, such as from a ship to a warehouse.

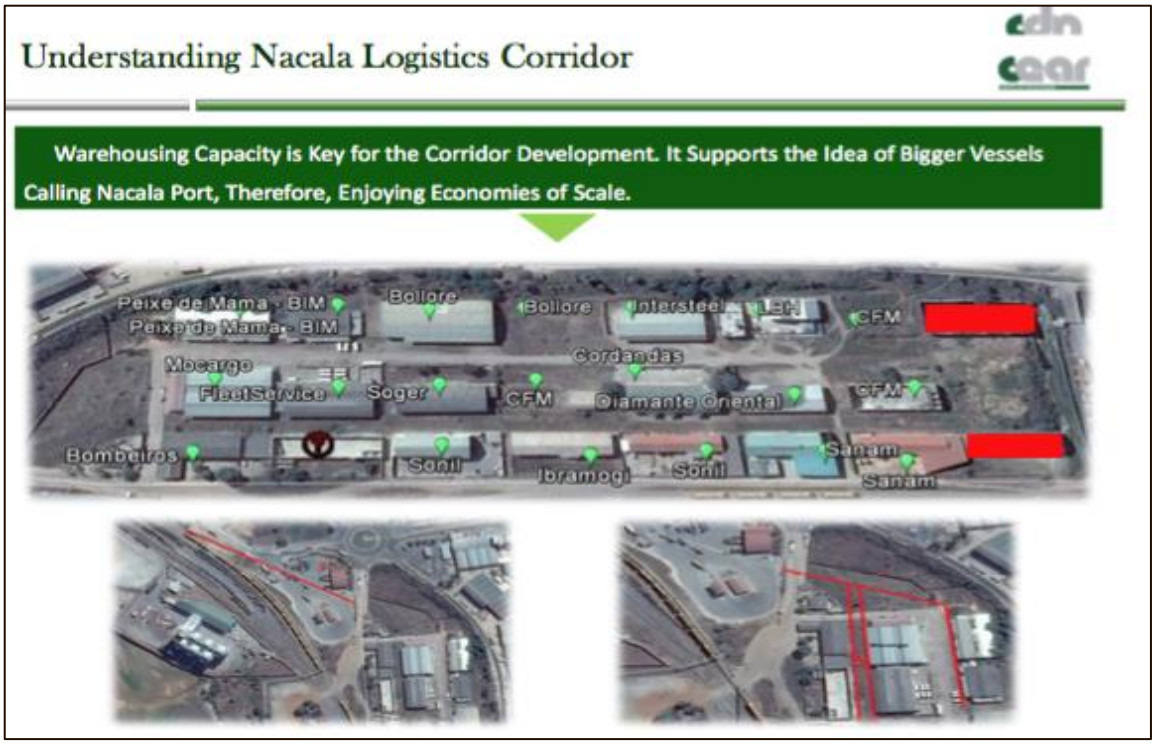
volumes, is to leverage the CDN/CEAR rail service with additional storage and better loading offloading facilities linked to the railway to consolidate exports and imports within/proximate to the port precinct. This will allow cargoes to be evacuated quickly onto ships vessels (exports) and onto wagons (imports) to minimize truck congestion. In this regard, the redevelopment of the underutilized storage facilities in the back of port area, which do have rail access, next to the existing port, are likely to become more important (figure 40).

FIGURE 30: BACK-OF-PORT REDEVELOPMENT OF STRATEGIC FUTURE IMPORTANCE


*Source: Nathan Rail-Capacity Analysis (2017)*

The redevelopment of this area to enhance the integration between the port and the railway is clearly understood by the CDN/CEAR. However, redevelopment will not be an easy process because of the multiple landowners of underutilized warehouses (figure 37).

FIGURE 31: STRATEGIC IMPORTANCE OF THE BACK OF PORT PRECINCT FOR WAREHOUSING




*Source: CDN-CEAR Nacala Corridor Presentation (2017)*

The Rail Capacity Analysis has also highlighted the importance of improving the capacity of the branch-line network and inland terminals, initially at Blantyre and Liwonde (in Malawi), but also Lilongwe (in Malawi), Chipata (in Zambia), and Lichinga and Cuamba (in Mozambique). The key proposals are to lengthen the sidings at Blantyre and Liwonde, initially to handle between 20 and 25 wagons, and later to full train lengths. A modern rail serviced logistics hub would provide an incentive for existing and potential rail customers to relocate their operations to within the logistics hub, thus reducing transport costs and providing rail within captive customers. The permissible axle loads on the branch line should be standardized at 18 t, allowing up to 53 t of freight to be carried in each wagon. These actions could result in a transport cost savings of up to 20%.

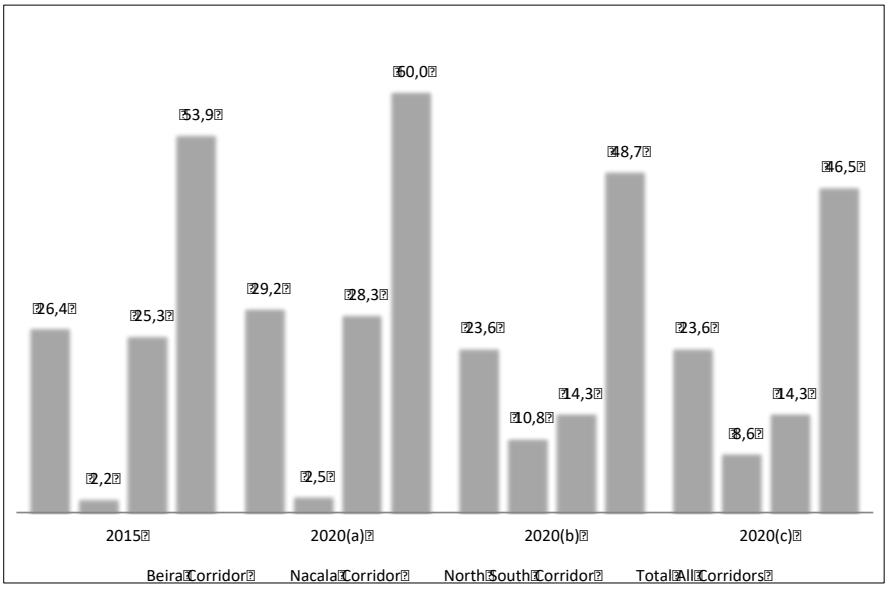
Figure 38 highlights that the impact of a 20% cost saving on import transport costs of fertilizer to Malawi could amount to US$13.5 million in 2020 (US$60 million [2020a]–US$46.5 million [2020c]).

The potential impact of this saving on smallholder farmers could be considerable, even in the short term. In 2015 Malawi imported 370,000 tons of fertilizer and this is expected to rise to 410,000 tons by 2020. Fertilizer demand in southern Malawi, which is the natural catchment of the Nacala Corridor, was 200,000 in 2015, and this is expected to increase to 225,000 in 2020. The Fertilizer Import Subsidy Program (FISP) accounts for 45% of the market, which translates into 90,000 tons in 2015 and 185,000 tons in 2020 for southern Malawi. The FISP targets 1.5 million smallholders of which 725,000 (55%) are in the southern region.

Figure 39 shows the impact of lower rail transport costs on fertilizer costs in Malawi. The figure shows that with improved efficiencies in the logistics supply chain of the Nacala Railway, the transport costs of importing fertilizer into the southern region, which is the natural catchment of the corridor are much lower than in other regions, and as a result, smallholder farmers are likely to pay

a lot more for their fertilizer. Hence, the focus should on trying to increase the use of the railway to supply more of Malawi's fertilizer market from Nacala as the costs of getting it into the country is considerably lower than by road.

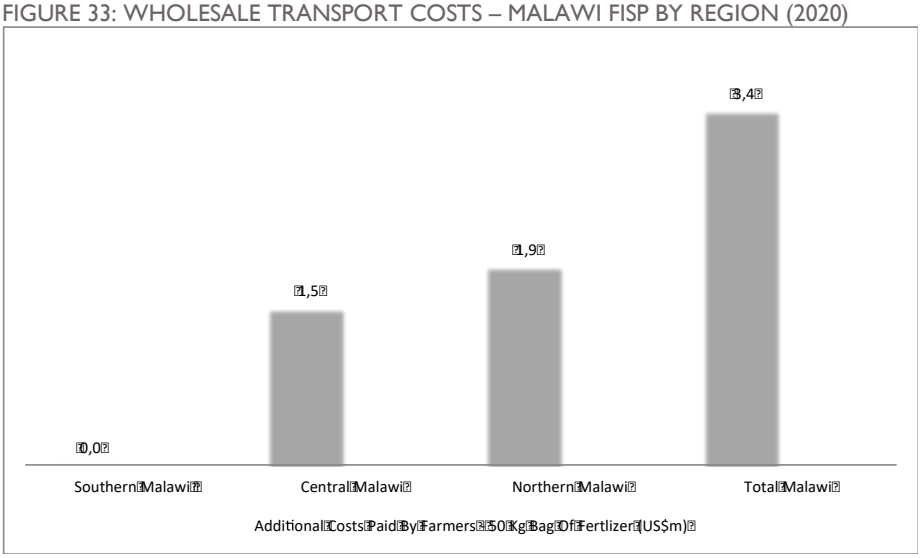
FIGURE 32: POTENTIAL ADDITIONAL COST SAVINGS ON NACALA RAILWAY FOR FERTILIZER IMPORTS




*Source: Nathan (2017)*

*Notes: 2020(a) - 62% to Beira Corridor, 8% to Nacala Corridor and 30% to North-South Corridor; 2020(b) - 50% to Beira Corridor, 35% to Nacala Corridor and 15% to North-South Corridor and 2020(c) – same as (b) with an additional 20% cost saving.*

FIGURE 33: WHOLESALE TRANSPORT COSTS – MALAWI FISP BY REGION (2020)



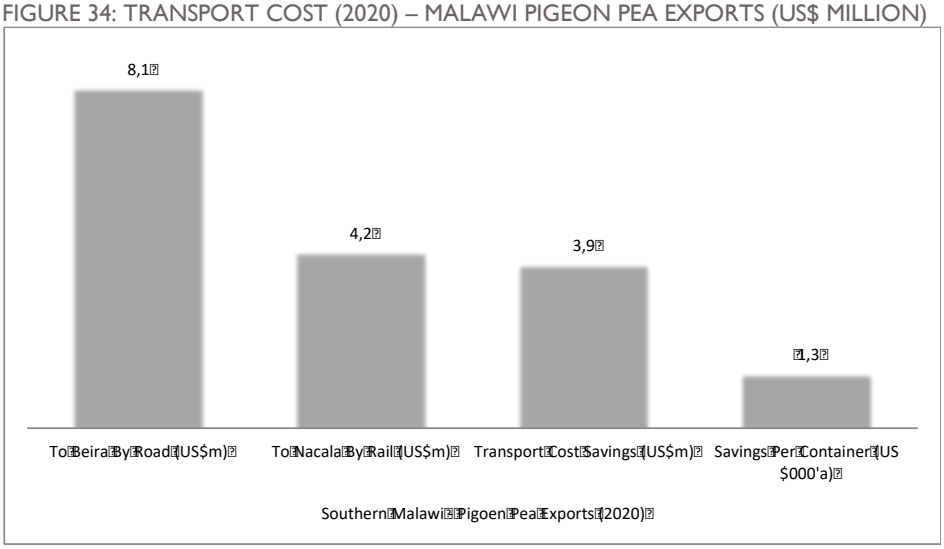

*Source: Nathan (2017)*

Another example of the potentially positive impact of lowered costs and enhanced efficiencies on the railway on smallholder producers is the benefit to be derived from the shifting the export of pigeon peas from the southern region of Malawi.

Figure 40 shows the potential transport cost savings that could be achieved in the export if Malawi pigeon pea was exported by rail via Nacala. The figure illustrates that if an estimated 70,000 tons of

pigeon peas are exported via the Nacala port by rail in 2020, the savings are estimated at US$1,300 per container, which equates to a total cost saving of US$3.9 million. When one considers that there are over one million smallholder producers involved in the pigeon pea production, the positive impact of transport costs savings could be transferred to the farmers in higher farm gate prices, which could act as an incentive to expand production, provided that robust market conditions remain in play.

FIGURE 34: TRANSPORT COST (2020) – MALAWI PIGEON PEA EXPORTS (US$ MILLION)




*Source: Nathan (2017)*

However, the biggest potential impact of lowered rail transport costs, enhanced logistics efficiencies and better port infrastructure, is the development of new export sub-sector. The value chain analysis concluded with a brief review of the prospects for establishing a woodchip export facility at the Nacala port, based on the successful South African experience.

Figure 41 summarizes the links in the woodchip supply-chain concept, from the Foresty Plantation at Lichinga to the Woodchip Mill at the Nacala Port. From 78,000 ha of eucalytus forest, established by an US$ 207.5 million investment, an estimated US$ 216 million will be generated as foreign exchange earnings per annum. This will require an input of wood of approximately 1,080,000 tons with approximately 209,000 jobs, comprising of an estimated 111,000 direct and 98,000 indirect/induced jobs.

FIGURE 35: NACALA CORRIDOR GAME CHANGER: WOODCHIP EXPORT SUPPLY-CHAIN

| Link 1 | Link 2 | Link 3 | Link 4 | Link 5 |
|---|---|---|---|---|
| Lichinga Terminal | Rail to Nacala (295 kms) | Namina Terminal | Rail to Nacala (269 kms) | Woodchip Mill at Nacala Port (Capacity: 1.5 million tons per year) |
|  |  |  |  |  |

| Link 1 | Link 2 | Link 3 | Link 4 | Link 5 |
|---|---|---|---|---|
| 24,000 hectares of eucalyptus | Estimated at US$50 per ton. | 54,000 hectares of eucalyptus | Estimated at US$25 per ton. | FOB Price US$200 per ton |

| Eucalyptus Plantation Size | Investment (US$ millions) | Foreign Exchange Earnings | Railway/Port Volumes (Tons 000's) | Employment | | |
|---|---|---|---|---|---|---|
| | | | | Total | Direct | Indirect/Induced |
| 78,000 hectares | 207.5 | 216 | 1,080 | 208,990 | 111,250 | 97,740 |

*Source: Nathan (2017)*

## 5.3. TRANSPORT AND LOGISTICS RECOMMENDATIONS

### 5.3.1. POLICY RECOMMENDATIONS

*1. Support to customs in implementing inspections post-TEEN.*

As noted above, the recent policy change to remove the requirement of TEEN is a positive development towards removing a major constraint to Nacala corridor exporters. However, shippers were concerned that the policy change itself was not enough, and that removing the constraint still requires additional implementing steps. While the July 2017 decree removed the TEEN mandate, national exports still must be inspected by customs. In practice, this means that exports must either be inspected at the port, or still go to TEEN for inspection as there are currently[44] no other customs bonded areas in Nacala as there are in Beira. Shippers worried about the availability and willingness of customs officers to conduct inspections at the port, and also that there would be issues with the availability of physical space. With these constraints still in place, there was concern that while TEEN was no longer mandated in theory, that in practice it would be hard to avoid.

In order to ensure that the post-TEEN context is not a constraint to national exports, SPEED+ recommends:

- Technical assistance to customs and training of customs officers so that all officers understand the implications of the decree and that management properly allocates staff.
- Work with the private sector and customs to develop off-site customs bonded warehouses at the location of the warehouses of key exporters.

**Case Study: Quantifying the Potential Direct Impact of Removing TEEN Costs to Shippers**

TEEN was frequently cited as being a major constraint to Mozambican exporters using the Nacala corridor and port. The special terminal affected Mozambican road exporters shipping through Nacala, but not transit cargo, rail users, or exporters using Beira. Exporters estimated direct costs of TEEN to include the following.

- Official costs of $130 per TEU or $234 per FEU
- Unofficial costs (bribes) ranging from $35 to $80 per container
- Transport costs to/from the warehouse to TEEN of $180-$200 per truckload
- Hidden costs including a loss of 2 hours to 2 days of time

This amounts to approximately $6.6 million/year in additional costs to Mozambican exporters. Costs to the Nacala corridor are higher, as it also diverted cargo to Beira.

*2. Enforcement of axle load restrictions and weighbridge calibration.*

Axle load restrictions aim to limit truck freight carrying capacity to 30 tons in both Mozambique and Malawi, but information from interviews indicates that these rules are not followed by informal operators or enforced by authorities. Further, it is our understanding that some of the corridor weighbridges are broken, but that transporters are still charged fees for these weighbridges, fueling corruption. This lack of proper enforcement unfairly affects competition between truckers who do not follow the rules, and truckers who follow the rules and the railway, as it distorts the price per tonne of shipping cargo.

[44] As of the assignment field mission in July/August 2017.

For example, we found that the price charged by informal truckers who overload and carry 40 tons/truckload instead of 30 impacted the perceived trucking price and willingness of some potential clients to pay for railway services. Enforcement of axle load restrictions also prevents further deterioration of the corridor's road conditions. There has been much recent investment in Nacala corridor roads, and many segments are finally in good condition, but this will not last if overloaded trucks travel the roads. We recommend that governments increase enforcement of axle load restrictions including fixing broken weighbridges such as between Cuamba and Lichinga, ensuring proper calibration of weighbridges, enforcing violations with fines, and working to reduce corruption by officials operating these stations.

3. *Improvement of automatic bond release processes.*

Customs authorities only charge duties and taxes for national cargo, with transit cargo being exempt from these duties. However, shippers or freight forwarders are required to post a transit bond on behalf of their customers to cover the duties and taxes point of entry into the country (port or land border). This is most often offset against a consolidated bond amount or guarantee provided by the freight forwarder that are then returned when the cargo exits the country. Freight forwarders using the Nacala corridor noted that transit bonds should be automatically released when the truck crosses the border, but this is not currently the case. Revenue authorities should work to improve the process and single window system so that transit bonds are automatically released when cargo leaves the country.

4. *Improve process of customs global import lists for large projects.*

For projects over a certain value threshold, project managers must submit global lists to customs detailing all items that are intended to be imported (construction equipment, etc.), which will then be re-exported at the end of the project. The general director of customs then signs off on the list and issues a certificate so that no taxes are charged. However, stakeholders mentioned issues with the process, including that changes to the list of intended items means that the process must be restarted, and that the requirements to re-export even damaged or expended equipment were overly burdensome. To spur investment, we suggest that the processes are reviewed and simplified.

5. *Modernize port regulations.*

Effective port regulation, administration, and management are key to improving port performance. In recent years many governments have foregone operational responsibilities, which were transferred to the private sector, and instead have assumed a stewardship role over port lands and common access facilities and regulate the activities within their jurisdictions. Regulation addresses a variety of forms, including competition regulation, tariff setting, operational regulation, safety and security, environmental regulation, performance monitoring, and contract vehicles governing the provision of port services.

The current operator of Nacala port noted that the present port regulations were developed before the container, and therefore are outdated and need updating. It is our understanding that updated regulations were drafted a few years ago and are awaiting review and approval by the MTC. The MTC should work to modernize and harmonize the country's port regulations. If required, technical assistance could be obtained to assist with the process, and also for training and capacity building to develop the capacity of regulators to properly conduct their responsibilities.

### 5.3.2. SYSTEMS RECOMMENDATIONS

1. *Improve contramarker system to allow for pre-clearance.*

While customs pre-clearance is allowed by law in Mozambique, in practice it is not possible to pre-clear cargo before vessel arrival and berthing due to the contramarker system. When vessels dock at the port, they receive a contramarker number, which is a unique number identifying the vessel and call. Cargo cannot be pre-cleared without the contramarker number, and under the current system, the contramarker number cannot be circulated prior to vessel docking, therefore pre-clearance is not possible for imports.

Corridor users estimate that this causes a delay ranging between a few hours and one day, but when the one-day delay is on a Friday, it could mean a delay of up to three days when considering the weekend. This can also result in demurrage charges by the shipping line if the container is not returned within the free window. The government should consider revising the system to make it easier for traders to use, which would reduce the time it takes to trade goods.

2. *Establish trucking appointment system.*

Nacala port is located in the Nacala city, with space constraints. There is currently only one access road, which backs up with trucks during peak times such as Friday afternoons. The port rehabilitation has plans for a second road access point, which should alleviate some congestion. However, as volumes increase at the port, a trucking appointment system should be considered to alleviate congestion given the space constraints.

Such a system would require physical components at the entry/exit points (e.g., gates) of the port and truck waiting areas, and technological components, including a system that validates permit requests of truckers, sets appointments, and monitors the physical movement of the trucks through the trucking control system zone. To mitigate costs to the government, a PPP arrangement could be considered. However, finding available physical space for a truck holding area/parking lot near the port could be a constraint.

3. *Develop freight exchange to match backhaul and reduce transport costs.*

Transport costs are significantly higher if a transporter is only transporting goods in one direction and returning with an empty haul. While there are no statistics on the percentage of cargo transported on the Nacala or Beira corridors that has back-haul, it is our understanding that the percentage is low, driving up transport costs. The scarcity of information concerning the market for transport services leads to higher costs for general freight on the railway as well as truckers and shippers who have to use informal channels and inefficient networking methods to identify potential shipments and face higher costs for shipments which have only one-way freight with no backhaul. It is also an inefficient use of available trucks and railway wagons.

An effective method to supplement this missing market information and to match up supply and demand is to create a virtual freight exchange that is open to all shippers and transporters on a subscription basis as has been done in other regions and countries.

Such an exchange can be set up on a data server operated by a chamber of commerce or an association of shippers and transporters. It could also be initially hosted by CDN-CEAR as a service for shippers. It would involve first identifying the organization that would host the service, getting the agreement of shippers and transporters to support it, then buying the software which operates it and creates shipping contracts. There are also some customs issues to resolve for international shipments. This exchange system would also be linked with the Customs Authority, in order to make sure all is aligned with customs regulations and procedures.

**Freight Exchange Example: CARAVANA**

In Central America, the USAID RTMA Grants Program funded the development of CARAVANA, a virtual platform for connecting land freight carriers and client companies. With CARAVANA, the customer uses a web or mobile platform to fill out a single form indicating all of the information about the cargo in question. The form is sent simultaneously to all qualifying service providers. In addition, CARAVANA gives road haulers the opportunity to publish a transport offer to potential customers. The platform enables the customer to quickly obtain the best price, overcoming the issue of asymmetrical information and reducing logistics costs. A similar system could be used for both rail and road cargo on the Nacala corridor.

If successful, the exchange could significantly lower transport costs. For example, one trucking company noted that it would charge $2,500/truck for import cargo from Nacala to Blantyre, but only $1,000 for a return haul. If importers and exporters shared the cost savings this would reduce the cost of each from $2,500 to $1,750/truckload, or 30%. It would also reduce the number of trucks on the road, lessening congestion and road damage (but could have negative employment impacts on truckers).

### 5.3.3. INFRASTRUCTURE RECOMMENDATIONS

1. *Develop Nacala Port and intermodal operations and infrastructure.*

It is strongly recommended that all the elements of the second phase of the JICA program should proceed as soon as possible. As soon as an implementation program is finalized, this should be conveyed to all the existing and potential future users of the port.

The container rail terminal should be provided with rail sidings, which ideally should be long enough to accommodate a full train length, which is presently about 600 m. When train lengths are increased in future, there should be at least three tracks in order to handle a full split train in one operation with a rail-mounted gantry.

The planned new access road from the south, providing direct access to the bulk berths, crosses the main rail access to the port. It should be considered to provide a grade separation at this point by way of a road-over-rail bridge. A similar situation exists at the (old) Mombasa container terminal, which is a significant capacity constraint.

A holding area for trucks should be planned, with a booking system for access to the port, in order to avoid congestion (See systems recommendation number 3).

2. *Invest in railway track rehabilitation and maintenance in Malawi and improve rail operations.*

The present capacity of the general freight has been given as 2.4 mtpa by CEAR, based on maximum train lengths of 40 wagons, effectively two trains per day in each direction. As import volumes

increase above 0.9 mtpa, it will be necessary to lengthen the general freight trains and to use the longer coal train passing loops, or to lengthen the general freight passing loops.

The branch lines in Malawi, from Nkaya to Limbe and Lilongwe join the main line at Nkaya, and it would be logical to have a freight yard and interchange point at Nkaya, with a holding area for train assembly and splitting, and for locomotive changes.

The recently upgraded branch lines have been designed to carry 18 t axle loads, which should permit a freight capacity of 53 t per wagon. The wagons on the branch lines are presently limited to carry 40 t, which very often prevents 2 x 20' containers. Similarly, the new grain wagons are able to carry more than 40 t. Efforts should be made to increase the permissible axle load on the Nkaya–Limbe and Cuamba–Lichinga lines to 18 t. This would increase rail capacity and lower unit costs.

FIGURE 36: NEW CDN GRAIN WAGON 54.5T LOAD, BUT LIMITED TO 40T BECAUSE OF THE 15T AXLE


*Source: Nathan (2017)*

The currently repair and upgrade on the Nkaya–Lilongwe line should be completed as soon as possible with the prime objective of making the line safe. It has been prone to flood damage during the rainy season and customers are reluctant to commit to long term contracts unless safety can be guaranteed.

The line from Lilongwe to Mchinji was built in the early 1980s to a good standard but has since deteriorated due to erosion of the formation, leaving the track poorly supported in many areas. The

line remains operational and was recently used for maize exports from Zambia. However, it requires urgent repair and maintenance to be safe and reliable. Zambia Railways (ZR) have placed a locomotive and about 70 wagons at Chipata for use on the Nacala Corridor, but these have not yet seen any use, mainly because the wagons and locomotive are equipped with only vacuum brakes, which are not permitted in the mainline and can only be used on the branch line to Blantyre. These wagons should be returned to Zambia Railways at Kabwe (hauled via Nkaya, Moatize, Blantyre, Harare, Bulawayo and Vic Falls) or be converted to dual systems. The locomotives also need to be upgraded to the CDN/CEAR train control system.

Consideration could be given to reopening the line to Luchenza, to the south of Limbe, in order to promote the export of sugar and tea. This was operational until a few years ago.

3. *Invest in inland terminals.*

Offloading and loading at inland terminals is delayed due to limited rail siding length and lack of equipment. It should be noted that TEEN is not an inland intermodal terminal: it is not rail serviced and is not suitable to be rail serviced. TEEN therefore operates similarly to the near port road serviced ICDs and CFSs in Dar es Salaam and Mombasa, where the primary function is to reduce port congestion, but adds additional cost and time. Ideally, the inland terminals should be developed as logistics parks, road and rail serviced, customs bonded, able to attract logistics companies and importers/exporters to relocate to within or close to the terminal. There are many examples of such developments in Europe and the USA.

The Blantyre ICDs are located at Chirimba Industrial Area in Blantyre, operated by the private sector. The rail sidings lengths are limited to accommodating 10 wagons, requiring the train to be split at Limbe and shunted in an out of Chirimba. It can take up to four days to handle a full-length container train. There appears to be enough space at the existing ICDs to lengthen the sidings, initially to handle up to 20 wagons, which could save two days. Consideration should be given to developing a modern rail serviced freight hub to serve the Limbe–Blantyre area, with an area large enough to attract major logistics companies and importers/exporters. This should be a private sector initiative with support from government and CEAR/CDN.

There is no formal ICD at Kanengo in Lilongwe. There is a rail yard able to handle up to 30 wagons (sufficient for the current train lengths on the Nkaya–Lilongwe line). Short sidings serve individual warehouses and factories in Kanengo by shunting from the rail yard. This practice is no longer used because it is expensive and time consuming. Kanengo could possibly be developed and equipped as an ICD to serve the industrial area.

In Liwonde, Farmer's World imports bagged fertilizers in containers and open wagons, but the sidings are limited to handling 10 wagons with a labor-intensive unloading system. It takes four days to handle a 40-wagon import train from Nacala. Farmer's World is planning to upgrade the siding and equipment. In the first instance it should be lengthened to 20 wagons, which will result in lower freight costs due to higher wagon utilization.

The Chipata ICD has been planned (now being planned by CDN) but is not yet developed. There is currently no paved area, no warehousing, and no equipment. The commencement of maize exports from Zambia by rail through Nacala could promote further investment in the ICD. The possibility of fuel imports to eastern Zambia via Nacala could be investigated.

In Mozambique, both Cuamba and Lichinga stations have rail yards with 450 m sidings, but no ICDs or equipment to handle and store containers. At the present time, cotton is exported in bulk box

wagons and transferred to containers in Nacala. Formal ICDs would allow empty containers returning from Malawi to Nacala to be used for exports from Cuamba and possibly Lichinga.

4. *Mitigate storage constraints at the port and terminals.*

The additional area to the south of the port, including the existing poorly utilized warehouses and area to be reclaimed, is clearly high value prime and strategic land to be incorporated into the port secure area. This should be carefully planned in order to maximize its value to the port. Additional areas for storage and processing, with rail access, should be investigated in the area about 2 km to the south of the port.

5. *Upgrade electricity infrastructure at border posts.*

The electricity supply to the Milange border post, only available from 0600 to 1300, is clearly a capacity constraint, although the border post is not yet congested. It is understood from one of the largest road transporters, that this is a serious problem at the Mwanza and Dedza border posts also and can cause delays of up to three days. This also affects border security. It should be a simple task to provide a 24- hour diesel standby generator or solar energy storage systems.

## 5.4. VALUE CHAIN RECOMMENDATIONS

Increased production, value/supply chain development, market development, and increased exports are essential to reducing transport and trade costs along the Nacala Corridor. One key linkage between the two is related to goods being mostly transported in one direction, returning with empty haul. This is due to the fact that there are more imports coming through Nacala port than exports going out. If production is increased, more exports will go through the Nacala Corridor and will send trucks/wagons loaded back with exports, as opposed to the current situation of returning with empty haul. This will lead to a reduction of transport costs along the corridor and make it more competitive.

Value chain stakeholders identified the following bottlenecks, which are included throughout chapter 5.

- Traders report that importation procedures at the port are inefficient, document requirements are excessive and official fees are high.
- Storage is a problem for the Nacala Corridor along value chains, starting from the farm to the port.
- Smallholder farmers cannot scale up operations to switch from subsistence farming to a commercial business.
- Inefficient loading/offloading operations at the port of Nacala affect multiple value chains, including bulk, break-bulk, and container cargoes.
- Insufficient policy co-operation and co-ordination between participating states on the corridor.
- In response to these bottlenecks, the key recommendations include the following.

1. *Improve trade facilitation for imports at the Nacala Port.*

Contramarker regulations should be reviewed and adjusted, allowing a trader to use the same number multiple times, as long as it applies to the same import product. It could be good to start piloting this with traders/producers belonging to GAZEDA SEZ. This will make customs operations more efficient and save traders/producers considerable amount of time. Also, in terms of contramarker classification of commodities, producers/traders should have a mechanism for recourse if they believe that their product has been classified incorrectly at customs.

Regarding changes in regulations, the Customs Authority needs to clearly communicate any changes affecting traders, particularly those that will increase cost/time to traders, in a timely manner. This communication needs to be accessible to public and disseminated widely.

2. *Establish storage facilities for agricultural crops along Nacala Corridor, particularly near farm locations providing access to farmers.*

Having access to storage facilities will help farmers fight post-harvest loss (30% in Nampula, 20% in Malawi), keep a larger share of their crop to sell in better quality, and have more capacity to negotiate selling price as opposed to rushing to sell their crops. All of this contributes to smallholder farmers having more market power. Big traders like ETG and OLAM, who pick up the largest margins, currently dominate these markets. Also, having storage/warehousing facilities that preserve the quality of transported produce increase confidence in the transport/logistics system across the corridor and are more attractive for producers/traders. Preservation of quality also contributes to the perceived reliability of the corridor.

In terms of financing and operating these storage facilities, the recommendation is for the private sector to take this on, with donor and government support. One of the objectives of government and donor support should be to keep prices affordable for farmers. Currently, there are storage facilities near some farms, but farmers do not have the capacity to operate them. Therefore, it would be best if the operators specialize in the business.

Regarding storage facilities, Warehouse Receipt Systems (WRS) should also be developed in Mozambique, given that access to finance is a binding constraint for farmers. These systems are based on warehouse receipts, which are issued to depositors (farmers, farmer groups, processors, or traders) as evidence that they have deposited a specified commodity, of stated quantity and quality, at a specified location.[45] The depositor can then use this receipt as collateral to obtain a loan from a bank.

USAID's SATIH project has already established a Warehouse Receipt System in Mozambique, working on several pilot programs at the moment, operating through the Mozambican Commodity Exchange (BMM). This is a very welcome development, and if executed successfully will contribute to the reduction of trade and transport costs along the Corridor. The location of storage facilities should be selected keeping in mind the goal of reducing post-harvest loss for agricultural producers. The pilots should be scaled up as quickly as possible, as the scale of operations would have increasing returns to the users of the system.

The legal framework is very important for this system to function efficiently. The SPEED program worked on the Legal Framework for WRS in 2014. The outputs of this study should be reviewed and if necessary updated, to ensure that all parties constituting the system will be on board: storage facility managers, IT developers/managers, financial institutions, and agricultural producers. For example, for financial institutions, the legal definition indicating the basis of lending for warehouse receipts is very important. Another aspect that requires attention is proper communication with and education of users on how this system works, particularly because it is new and unfamiliar.

For example, in other African countries where WRS is in place, farmers at times have the incorrect assumption that after the storage period, the price of their commodity will certainly increase.

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[45] International Trade Centre (ITC) at http://www.intracen.org/What-are-warehouse-receipt-systems.

Clearly, prices fluctuate with market movements, and this leads to farmers incurring losses. Adequate trainings should also be in place, particularly for the IT components.

The study team met with Agricultural Commodity Exchange (ACE) in Malawi, an NGO with commercial operations that grew to where it is with USAID support. One function of ACE is to manage a Warehouse Receipt System with 50 sites and eight participating banks. Other functions of ACE are to aggregate farmers' produce/serve as a consolidation point, lead commodity auctions, help farmers with market linkages/securing buyers, provide a market information platform to actors of supply chains to track pricing, and provide export finance that smallholder producers can access.

This is a successful model that fills a gap and makes a difference for smallholder producers. Last year ACE aggregated approximately 50,000 tons in the WRS receipt system for a range of products (maize, soy, cowpea, pigeon pea, beans, and groundnuts), while as recently as 2011 such aggregation was non-existent. Provided this is an export-oriented business, ACE removes the risk from the transaction and the WRS allows for commodities to be aggregated into tradable quantities by quality (of grade), ideally of at least 1,000 tons to be of interest to large traders. ACE also operates 22 of 57 warehouses owned by farmer associations that do not have the capacity to manage them.

The presence of ACE in the market impacted farmers in the following ways.

- In the last 5 years the income of ACE famers has increased on average by 20%.
- In the case of pigeon pea, the income of ACE farmers has increased on average of 100%.

Business models like that of ACE can transfer a share of market power from large traders like ETG and OLAM to smallholder farmers. Such companies also invoke confidence in the supply chain system for logistics companies or buyers. The recommendation is to replicate this model along the corridor, particularly in Mozambique. Mozambique Cereals Institute (ICM), which owns silos and storage facilities and currently is planning to privatize those facilities, is scheduled to visit ACE to discuss its business model. This indicates interest on the side of Mozambique to create a similar establishment there.

3. *Increase value addition in agricultural production.*

Adding value to raw commodities should be a common objective that applies to many products in the agriculture/forestry sector. For example, in forestry there is a potential to enter the global woodchip market and the existing market for this can be developed through collaboration with firms in the region, such as those in South Africa, who have successfully done so. To be able to accelerate such initiatives a similar program to the Beira Agriculture Growth Corridor (BAGC) Initiative, should be considered for the Nacala Corridor.

The linkage of increased value addition to enhancing the potential of Nacala Corridor is the following. Profitable commercial activities will attract more investment to the region, and therefore increase volumes of production. With increased volumes in exports and transit trade, rail wagons and trucks will return loaded as opposed to being empty. This is one of the key necessities to reduce transport costs.

4. *Improve offloading efficiency at the Nacala Port, given it impacts multiple value chains.*

This issue is largely being addressed by the improvements proposed under the Nacala Port Improvement Project.

5. *Increase trade and transport policy and facilitation coordination/collaboration between Mozambique and Malawi, in order to reap more of corridor benefits.*

The governments of Malawi and Mozambique should consider re-activating a stalled regional growth-pole program that the World Bank was trying to design, using resources from the Mozambique Growth Pole program. It is also recommended that studies be commissioned that evaluate the potential economic and development impacts of increased collaboration. This can be done by SPEED+. Such studies should be presented to and considered by the GoM when shaping policies on cross-border collaboration.

# APPENDIXES

# APPENDIX A. TRANSPORT SECTOR INSTITUTIONAL AND POLICY FRAMEWORK

# Transport Sector Institutional and Policy Framework

POLICY, INSTITUTIONAL, AND REGULATORY OVERVIEW

## *Malawi*

### Legal and Regulatory Framework

The responsibility for the regulation and monitoring of the road sector in Malawi rests with the Ministry of Transport and Public Works (MTPW) and is accomplished through the Transport Planning Unit (TPU), the Road Traffic Directorate (RTD), and the Department of Roads (DoR). The mission statement of the TPU is "to formulate policies that foster a coordinated transport system through the promotion of effective fair competition and private sector participation in the provision and operation of the transport services in order to reduce poverty in Malawi."

The prevailing policy environment enables the operation of a deregulated liberalized competitive market for the Malawi Road Freight Industry withfew or no barriers to entry resulting in a large number of differentiated carriers that are not subject to any rate regulation by the Government of Malawi (GoM). The National Transport Policy (NTP), published in 2004, is the foundation policy providing guidance on the transport sector in Malawi. The NTP was updated in 2013, but is still awaiting ratification by the GoM.

The GoM is finalizing the adpotion of the National Transport Master Plan (NTMP). The primary objective of the NTMP is the development of a plan to guide the sustainable development of an integrated multi modal transport sector between 2016 and 2036. It has identified the requirements of the sector in terms of the transport provision required for freight and passenger services under each mode of transport and potential inter-modal transfer facilities. It is intended to include a prioritized time bound plan for institutional reform and capacity building in all sub-sectors. It covers integrated transport, and sub-sectoral modes: road, rail, inland water, urban and rural transport, and aviation.

**Road.** The mandate of the RTD is prescribed in the Road Traffic Act (1997), which provides a legal framework for the road transport industry. Under this Act, the RTD is charged with the responsibility to administer regulatory provisions governing motor vehicle administration, driver licensing administration, operator authorization and permit control, and other issues related to traffic management and control. The RTD's authority is further derived from the provisions of the NTP, which includes adherence to transport protocols developed by SADC and COMESA to regulate the transport sector at the regional level. The RTD also provides advisory services to public and private sector stakeholders in the national road transport industry.

Historically roads have received the largest portion of public funding for transport in Malawi. This reflects the dominant role of roads in the transport sector and the reason why the DoR was set up. The DoR is responsible for policy direction and quality control of construction and maintenance of roads. The DoR is set to devolve all responsibilities for district roads to local government, but the delayed ratification of the updated NTP (2013) has resulted in a situation where unclear institutional responsibilities and insufficient funding for rehabilitation and maintenance is prolonging the uncertainty in the roads sub-sector.

In 1997, the GoM set up a National Roads Authority and a Roads Fund. The National Roads Authority (RA) is responsible for the maintenance of the public road network. The Public Roads Act enacted in 1962, the Local Government Act enacted in 1998, and the Urban (Public and Private Streets) Act enacted in 1956 define the five categories of roads: main roads, secondary roads, tertiary roads, urban roads, and district roads.

In 1997 the RA administered the Roads Fund and was responsible for the entire classified network of approximately 15,451 km. In 2006, under the Roads Authority and Roads Fund Administration Act, responsibility for the Roads Fund was transferred to the Roads Fund Administration (RFA) and the RA was made responsible for the management of designated roads.

Local authorities (district and city assemblies) are responsible for maintaining urban and district roads, tracks, and trails. However, at present the RA maintains these roads in order to facilitate necessary processes, such as planning, tendering, construction, implementing, and monitoring road projects because most local authorities do not have adequate personnel, equipment, and funding to undertake this mandate.

There are two main sources of funds for roads under the RA. The largest part comes from the GoM's Development Budget, including development partner grants and loans. This budget is used mainly for major road improvements, construction of new roads, upgrading of unpaved roads to either paved roads or all-weather roads, and rehabilitation and periodic maintenance. The second source is the Recurrent Budget funded by the Roads Fund, which raises revenue from the fuel levies, transit fees, and various other minor sources, and provides this money to finance the maintenance and rehabilitation of public roads and surveys and monitoring related to maintenance and rehabilitation of public roads. The Roads Fund is also supplemented by GoM grants.

**Rail.** The NTMP highlights the importance of the railway sector in lowering high transport and logistics costs associated with importing and exporting goods to/from Malawi. As a result, there is a strong emphasis on improving the operational efficiency and commercial viability of the existing railway system.

The Railway Division in MTPW was established in March 2010 as an administrative department for the concession and operation of the CEAR railway. The purpose of the Railway Division is to ensure a safe, efficient and reliable railway transport system to assist the movement of goods, people, and services. The Railway Division is responsible the following functions in order to achieve this purpose.

- Ensure the proper management of railway transport operation systems
- Facilitate the development of railway infrastructure
- Regulate the railway transport system

The importance of the Nacala Railway Network, which incorporates the Malawi Rail Network, was recently highlighted with the signing of an amendment to the Nacala Corridor Agreement of 2000, which was signed between the governments of Malawi and Mozambique on September 15, 2017.

**Air.** The Department of Civil Aviation (DCA) within the MTPW is the primary agency responsible for civil aviation related matters in Malawi. The DCA has both regulatory and operational responsibilities. DCA's regulatory and safety oversight responsibilities include licensing aircraft and issuing airworthiness certificates, along with economic regulation of the civil aviation sector. The DCA also represents Malawi in the International Civil Aviation Organization (ICAO) and other aviation-related matters.

DCA's operational responsibilities include managing Malawi's major airports, other than Lilongwe International Airport, and related infrastructure, as well as providing ATM services. The DCA and the government-owned Airport Developments Limited (ADL) jointly operate Lilongwe International Airport. DCA is responsible for the airside operations, air navigation, and technical services, whereas the ADL is responsible for operating the terminal and related facilities.

**Inland Waterways.** The Marine Department (MD) under the MTPW is responsible for all matters relating to the inland waterway transport sub-sector. The mandate of the MD is prescribed in the Inland Waters Shipping Act (1995), which provides a legal framework for the inland waterway transport sub-sector. The Marine Department is responsible for the registration and issuance of licenses and securing the seaworthiness of all commercial vessels, the supervision of management of all ports and harbors, and the supervision of the manning requirement of all vessels.

### *Mozambique*

#### Legal and Regulatory Framework

On April 14, 2015 the Mozambican government's five-year plan was passed into law under Resolution 12/2015. The plan, known as Plano Quinquenal do Governo 2015-2019 (PQG), is designed to orient the government and other stakeholders. Activities that involve the government should be linked to actions in the PQG, which will help to give them relevance and indicate to government stakeholders how a specific reform or activity will move the government towards achieving its stated objectives.

The PQG defines five priorities and three pillars relating to improving the country's competitiveness, transforming agriculture, accelerating industrialization, expanding infrastructure networks, promoting exports, and developing human resources. Interventions in these areas will be key to assist in the transformation of the country's economy. The importance of maintaining mutually beneficial intra-African partnerships, particularly under the framework of the SADC Infrastructure Master Plan, is highlighted.

The Transport Policy No. 5/96 allows private sector participation in the construction, rehabilitation, operations, and management of transport infrastructure assets and consequently airport, road, rail, and port concessions are permitted by law. Private sector participation is more prevalent in the transport sector when compared to other sub-sectors, with some notable successes, such as the ports of Maputo and Beira, the Nacala Corridor Heavy-Haul Coal Railway and Terminal, and the Maputo Corridor N4 Toll Road.

The Ministry of Transport and Communications (MTC) developed a "Strategy for the Integration of the National Transport Systems in Mozambique" (2009). The strategy is three-fold.

1. Develop a North-South railway linking the existing East-West railways to provide an alternative to road transport for the haulage of cargoes over distances greater than 500 km.
2. Develop efficient regional hub-ports to optimize Mozambique's strategic position on the eastern seaboard of southern Africa to service landlocked regions and countries in the hinterland and to distribute cargo by cabotage services to other smaller national ports that serve provincial hinterlands within Mozambique.
3. Liberalize air transport services to support the development of a tourism industry in Mozambique by lowering the costs of accessing tourism "hot-spots" in more remote parts of the country.

The institutional framework for the management of the transport sector in Mozambique comprises the following key entities.

- *The Ministry of Economy and Finance (MEF), which* sets investment priorities for the sector to ensure that it aligns with the objectives of the PQG (2015-2019).
- *The Ministry of Transport and Communications (MOTC), which* sets policy and regulations for road, rail, air, and ports.
- *The Ministry of Public Works and Housing (MOPH), which i*s responsible for construction and operations and supervises the National Roads Administration (ANE) and the Road Fund (FE). *ANE* is in charge of all road works, maintenance, and repairs. The FE obtains its revenue from a combination of fuel levies, bridge tolls and transit charges.
- *Mozambique Ports and Railway Company (CFM),* a state owned enterprise comprised of four branches: CFM North, CFM Central, CFM South, and CFM Zambezia, which operate railway lines in these geographic zones. In addition, CFM is responsible for port infrastructure and services.
- *The Airports Company of Mozambique (ADM)*, created by Decree 10/80 of 1 November as a public company subordinated to the MTC. The main purpose of the ADM is to establish and operate public services in support of the civil aviation sector, and its secondary purpose is to monetize commercial opportunities linked to airports.
- *The National Institute of Surface Transport (Instituto Nacional do Transportes Terrestres– INATTER)*, created on July 5, 2011 to regulate, monitor, and supervise activities involved in land transport, with respect to the transport needs of people and goods, promotion of security, and rights of users of road and rail transport.

**Road.** The National Roads Administration (ANE) is in charge of all road works, maintenance, and repairs. The Roads Fund (FE) obtains its revenue from a combination of fuel levies, bridge tolls, and transit charges.

ANE and FE (Roads Fundr) has prepared a core strategy to guide management of roads and bridges infrastructure during the implementation of PQG 2015-19 and for medium-term planning through PQG 2020-24. The Roads Fund recognizes that the need for improved roads and bridges infrastructure is great and that not all good and desirable improvements will be possible in the short- and medium-term. It acknowledges that the strategy is ambitious but achievable.

Three pillars guide the management, planning, and resource allocation within the Road Sector.

1. Asset Preservation through Proper Maintenance. The sustainability of the existing road sector infrastructure is the *sine qua non* of road sector management and must not be compromised.
2. Inter-Urban Connectivity through a Strong National Core Network. The network of main arterial and connecting roads linking provincial capitals, ports, and border crossings must provide a good level of service and be upgraded and expanded according to a coherent long-run vision.
3. Rural Mobility by Ensuring Transitability on Rural Roads. The vast network of rural roads must be managed and adequately financed so that rural populations have uninterrupted access to markets and services through appropriate upgrade, maintenance, and targeted interventions.

In addition to these pillars, the Road Sector is also committed to principles of "Good Governance and Quality Technical Performance."

The main purpose of the formulation of the network vision is to guide management of the road network rationally and efficiently. The network is divided into a *National Core Network the Non-Core Network*, mainly unpaved tertiary and vicinal roads. This division enables the road sector management at central and provincial levels to best achieve the objectives of ensuring asset preservation, interurban connectivity, and rural mobility.

**Road Terminals.** Two road terminals have been established that are of interest in Mozambique. The first is the Ressano Garcia International Road Terminal on the Maputo Corridor, and the second is the Special Economic Terminal on the Nacala Corridor. The policy rationale, legal basis, and regulatory set-up of these two terminals are reviewed briefly below.

**KM4 Terminal (Maputo Corridor).** Situated four kilometers from the border between South Africa and Mozambique, the Ressano Garcia International Road Terminal, commonly known as Km4, covers an area of 1.700 m, with 300 m of warehousing space, as well as support services, banks, restaurants, and parking capacity for 180 trucks. It has a mandate to facilitate and improve the logistics of international trade along the Maputo Corridor by enforcing customs clearance procedures for goods upon import, export, and transit.

Km4 is governed under the International Cargo Terminals (TIMs), a legal framework the Government of Mozambique established through Decree 57/98, of 11 of November, and Regulation on International Cargo Terminals, Ministerial Diploma 11/2002, of 30 of November. The first decree institutionalizes TIMs in Mozambique. The second allows Customs to delegate powers to receive, handle, or forward imported or exported goods, including to foreign nationals that have registered corporations in Mozambique.

While Mozambique introduced its TIMs legal framework in 1993, Km4 only came into operations in December 2014 under the One-Stop Border Post investment with South Africa. It is a public-private partnership with a 15-year concession awarded to Sociedade de Gestão de Terminais, SA SGT. The stakeholders at Km4 includes MCNet and Kudumba, which are able to provide Single Electronic Window (JUE), a trade facilitation electronic system that allows for the clearance and monitoring of goods movements, as well as non-intrusive inspection (NNI), which allows for scanning of vehicles entering Km4 for clearance during its business hours (06h00 to 22h00). While SGA enjoys some autonomy in enforcing customs procedures, key decisions such as the establishment of tariffs, inspection of cargo, etc. are still subject to Customs interventions.

About 90% of the cargo at Km4 originates from South Africa into Mozambique, some destined for international trade and the remaining in transit resulting from imports and exports by South Africa, carried out through Maputo Port.

**Special Economic Terminal (Nacala Corridor).** On February 2010, the GoM approved the creation of a new port terminal, the Nacala Special Export Terminal (TEEN). As stated by the proponents, this decision stemmed from the need to optimize operations, as well as alleviate traffic going to the overloaded Nacala International Maritime Terminal. Between 2010 and 2012, both TEEN and the maritime terminal were operational, providing the same services to exporters and imports. On January 18, 2012 Customs Authority passed Internal Service Order No, 04/GD/DGA/2012 that made the use of TEEN mandatory and required that all exports, with the exception of transit cargo, pass through this terminal.

Occupying 15 hectares, with an annual capacity of 100,000 TEUs with 552 ground slots, TEEN became the single option for road cargo inspections. Despite its efforts to provide all services,

including the availability of full-time agents from Customs Authority, MoA, MIC, and others, users frequently contested the legality of the mandatory use, citing that Article 7 of Ministerial Diploma 11/2002, of November 30 required that the selection of operators of new freight terminals should be made through an international (open) tender, which must specify the purpose of the terminal and the geographic area of influence. In the case of TEEN, users contested that there was no evidence that this condition was met. Furthermore, users indicated that TEEN aggravated costs and efficiencies of exporting out of Nacala, first because of its location 9 km from Nacala Port, and second, because tariffs charged were higher than other terminals in the region.

Following years of dissatisfaction, in July 2017 the Minister of Economy and Finance decided that "the customs clearing procedures for exports must occur in free manner, in any of the terminals legally recognized by the Government." While this lifted the mandatory use of TEEN, thereby responding to exporters request, in the second article of that decision the Mozambique Minister of Economy and Finance, Mr Adriano Afonso Maleiane, further stated that "unless otherwise indicated, based on a selective risk management criteria and promotion of efficient customs control mechanisms, the use of TEEN is optional." This second article opens a lot a room for interpretation, because it implies that the GoM can call for mandatory use of TEEN for specific cargo or situations. During interviews held at TEEN in July 2017, staff there indicated that the intention of the GoM is to be able to define special exports that can only obtain customs clearance at TEEN.

**Port and Rail.** The Mozambique Ports and Railway Company (CFM) is a state-owned enterprise with four branches: CFM North, CFM Central, CFM South, and CFM Zambezia, which operate railway lines in these geographic zones and is also responsible for port infrastructure and services.

CFM has entered into a number of public private partnerships (PPP) with private sector firms in both the port and railway sub-sectors.

- Beira Port Concession (1998), *with the following shareholders: Cornelder (Netherlands) 67% and CFM Central 33% for a duration of 20 years. The Beira Port is considered to be one of the more successful concessions by the GOM and will be up for renewal soon.*
- *Nacala Port and Rail Concession (1998 but re-structured over the period 2009-2015), with the following shareholders: SDCN 51% and CFM North 49%, covering both the CEAR and CDN railway network, for an initial duration of 20 years. This was extended for another 20 years in 2015, following the restructuring of the concession to include additional concessionaires CLN, with a current shareholding of Vale 80% and CFM 20% and VLL, wholly owned by Vale to operate coal shipments from Moatize to the new coal terminal at Nacala-a-Velha. In addition, in 2012 this restructuring resulted in the Nacala Port being sub-concessioned to PN, with a current shareholding of local investors (Mozambique) 70% and CFM 30% until the end of the original concession period in 2018, whereupon the GoM will need to decide whether to extend or re-tender the concession.*
- Maputo Port Concession (2003)*, with the following shareholders: Maputo Port Development Company (MPDC) 51% and CFM (South) 49%, for a duration of 15 years.*
- Beira Coal Terminal as a Design, Build, Own, Operate and Transfer (DBOOT) Concession *(2012) with the following shareholders: Essar Ports 70% and CFM 30%, for a duration of 30 years.*

Below we describe the operational status of sea and air transport infrastructure in Mozambique.

**Sea (Cabotage).** In an attempt to promote the blue economy, reduce congestion along the country's highways, and lower transport costs, the GoM recently revised its legal framework to incentivize the revitalization of the maritime cabotage service.

In its three-fold reform package, GoM first revised two ministerial decrees to lower services fees in 40% for the National Maritime Institute (INAMAR) and lower more than 50% of tariffs on navigation services fees for cabotage, also known as TANAV, charged by National Institute of Hydrology and Navigation (INAHINA).

Second, in June 2016, the MTC, the entity with the purview of designing policies for maritime transport, signed a memorandum of understanding with port concessionaires MPDC in Maputo Port, Cornelder de Moçambique in Beira and Quelimane Ports, and CDN in Nacala Port to reduce port charges for cabotage vessels by 50%, 60%, 50%, and 50% respectively.

Third, the GoM approved Decree 35/2016 of August 31, which made it possible for foreign ships registered in Mozambique to receive the same treatment and arrangements offered to those sailing under the national flag, provided they satisfy the following pre-requisites.

- Suspend the former registry for a period of 5 years.
- Fly the Mozambican flag.
- Legally register the company in Mozambique, ensuring that a Mozambicans holds at least a 35% of its shares and/or companies where the majority of shareholders are Mozambicans.
- Have a ship not older 10 years.

Air. The Airports Company of Mozambique (ADM) was created by Decree 10/80 of 1 November as a public company subordinated to the MTC. The main purpose of ADM is to establish and operate public services in support of the civil aviation sector. Its secondary purpose is to monetize commercial opportunities linked to airport activities. ADM is responsible for the management, operation, and maintenance of 19 airport facilities.

- Five international airports at Maputo, Beira, Tete, Pemba and Nampula.
- Five main aerodromes at Lichinga, Inhambane, Chimoio, Quelimane and Vilankulo.
- Nine secondary aerodromes at Angoche, Bilene, Costa del Sol, Inhaca, Lumbo, Mocimboa da Praia, Ponta de Ouro, Songo and Ulongue.
- ADM has overseen some significant recent developments in the sector. The most notable are listed below.
- 2010: The new Maputo Airport was built at a cost of approximately US$125 million with assistance from the government of the Peoples Republic of China.
- 2011: The Vilanculos Airport in southern Mozambique was revamped using ADM resources at a cost of US$10 million.
- 2014: Part of the Nacala military air base was converted into an international airport at a cost of approximately US$144 million, with assistance from the government of Brazil and the Brazilian Development Bank (BNDS).
- 2014: The Pemba Airport was rehabilitated at a cost of US$6.2 million paid from ADM resources and was opened for business in 2014.

The GOM has signed both the Chicago and the Yamoussoukro Conventions, committing in principle to liberalizing its air space. The strategy adopts a “rapid gradualism” in liberalizing the airspace, by applying various levels of “Freedom of the Air” in Bilateral Air Services Agreements (BASAs) signed with counterpart countries.

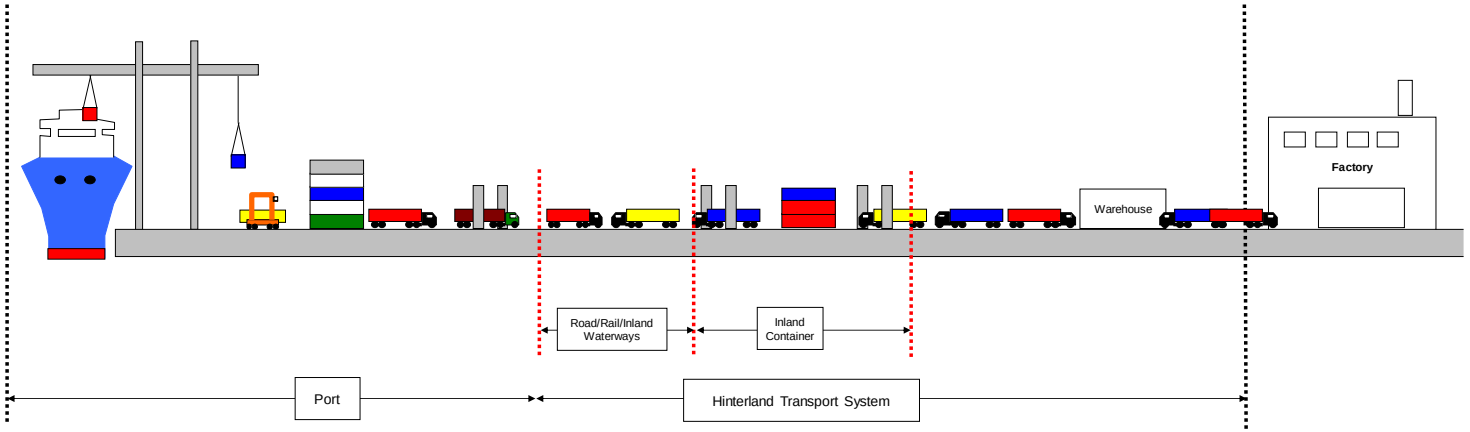
BASAs have been negotiated with 21 countries, and 10 have been concluded and signed. The strategy commits to achieving the following schedule.

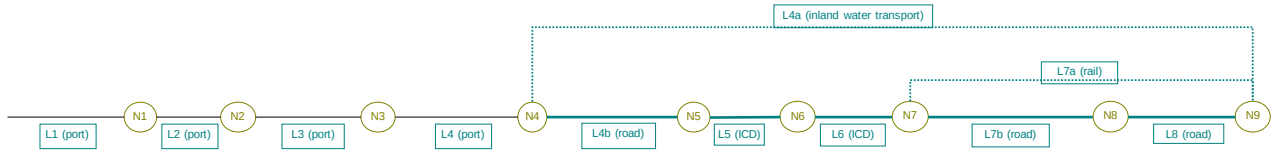
- Within the SADC region, the introduction of dual designations on all routes to international entry points in Mozambique by 2009 and the implementation of 5th Freedom rights by 2010.46
- With the intercontinental sphere, the granting of 5th Freedom rights on routes where there are no existing direct flights under 3rd and 4th Freedom rights. The latter rights are particularly relevant for intercontinental services linking the new Nacala and existing Beira airports to countries in Africa and abroad where no direct flights exist. LAM Mozambique Airlines is currently the only domestic operator the policy allows for entry of additional air services companies, and only if they are registered in Mozambique and use a Mozambican sales distribution system.

[46] Carrying passenger from the state of registration of the aircraft to the territory of another state and onto the territory of a third state where there is an air services agreement with the third state.

# APPENDIX B. TYPICAL TRANSPORT LOGISTICS CHAIN

# Typical Transport Logistics Chain




*Source: Nathan FastPath2*