Ministry of Transport and Public Works

# Malawi National Transport Master Plan

## Rail Sub-Sectoral Plan

ATKINS

WORLD BANK GROUP

EY
Building a better working world

# Contents

**Tables** ..... ii
**Figures** ..... iii
**Acronyms** ..... iv

**Executive Summary** ..... 1
**Introduction** ..... 3
**Commercial** ..... 4
**Recommendations** ..... 6

**1. Introduction** ..... 15
1.1 Introduction to the National Transport Master Plan ..... 17
1.2 Introduction to the rail sub-sector ..... 17
1.3 Objectives of the plan ..... 27

**2. Existing infrastructure** ..... 31
2.1 Common features of the network ..... 33
2.2 Guage ..... 31
2.3 West: Nkaya - Kachaso ..... 33
2.4 East: Nkaya - Nayuchi ..... 36
2.5 South: Nkaya - Limbe - Marka ..... 38
2.6. North: Nkaya - Mchinji and Chipata ..... 41
2.7 Track maintenance and renewal ..... 45
2.8 Stations ..... 46
2.9 Level crossings ..... 49

**3. Existing locomotives and rolling stock** ..... 53
3.1 Locomotive fleet ..... 53
3.2 Wagon fleet ..... 54

**4. Existing services** ..... 61
4.1 Freight services ..... 61
4.2 Passenger services ..... 62

**5. The concession agreement** ..... 77
5.1 1999: Concession agreement and ownership prior to Vale purchase ..... 77
5.2 2011: Malawi Railway Corridor Agreement ..... 77
5.3 2010: Tripartite Nacala Development Corridor Agreement ..... 78
5.4 2013 Concession agreement ..... 78
5.5 2017: Revision to concession agreement ..... 80
5.6 The ownership of CEAR ..... 82
5.7 Railways Act ..... 83

**6. Passenger demand** ..... 87
6.1 Overall demand ..... 87
6.2 Main passenger flows ..... 88
6.3 Passenger profile ..... 88

**7. Freight demand** ..... 97
7.1 Summary of historic traffic levels ..... 97
7.2 Summary of current traffic and forecast traffic ..... 98

**8. Costs and revenues** ..... 111
8.1 Passenger services ..... 111

**9. Financial sustainability of the concession** ..... 117
9.1 Summary ..... 117
9.2 Survey of CEAR's current financial position ..... 117
9.3 Forecast of CEAR's future financial position ..... 121
9.4 Models for managing forecast financial surplus and securing investment funding ..... 122

**10. Identification and appraisal of specific investment projects** ..... 127
10.1 Introduction ..... 127
10.2 Infrastructure proposals ..... 127
10.3 Other interventions ..... 141
10.4 Freight forecasts ..... 142

**11. Railway passenger** ..... 147
11.1 Strengthening the existing offer ..... 147
11.2 Intercity ..... 149
11.3 Urban rail ..... 151
11.4 Enhancement to rural passenger services ..... 152
11.5 Passenger forecasts ..... 152
11.6 Rail tourism ..... 153

**12. Climate change mitigation** ..... 157
12.1 Improving motor efficiency ..... 157
12.2 Increasing axle loads ..... 157
12.3 Alternative fuels ..... 157

**13. Legal and institutional reforms** ..... 161
13.1 Introduction ..... 161
13.2 Legal background ..... 161
13.3 Draft legislation ..... 163
13.4 Institutions ..... 164
13.5 Institutional reform proposals ..... 164
13.6 Proposals for regulating the rail sector ..... 166

**14. Investment Action Plan** ..... 173

**Appendix 1: CEAR actions agreements on Action Plan** ..... 183

# Tables

**Table E.1** List of recommendations ..... 7
**Table 1.1** Rail transport costs, US $ per tonne-km, 2015 ..... 24
**Table 2.1** Operational stations ..... 47
**Table 3.1** CEAR locomotives ..... 53
**Table 3.2** Regularly used locomotives ..... 53
**Table 4.1** Main railway customers on south branch ..... 62
**Table 4.2** Sample of CEAR train plan for 10th- 12th March 2017 ..... 63
**Table 4.3** CEAR published passenger timetable ..... 63
**Table 4.4** Working passenger timetable (Limbe - Balaka) ..... 65
**Table 4.5** Annual passenger train operation (figures provided by CEAR) ..... 70
**Table 4.6** Example passenger fares (Malawi Kwacha) ..... 71
**Table 6.1** Passenger demand estimates ..... 87
**Table 6.2** Averaged Passenger Origin-Destination Matrix ..... 89
**Table 6.3** Rail passenger trip purpose ..... 88
**Table 6.4** Rail passengers' access mode ..... 89
**Table 6.5** Rail passengers' access time ..... 92
**Table 6.6** Rail passengers' wait times ..... 90
**Table 6.7** Rail passenger group size ..... 90
**Table 6.8** Rail passenger trip frequency ..... 90
**Table 6.9** Rail passenger journey times ..... 91
**Table 6.10** Passenger age range ..... 91
**Table 6.11** Gross monthly personal income by mode ..... 92
**Table 7.1** CEAR freight traffic carried, tonnes ..... 97
**Table 7.2** Zambia copper production ..... 101
**Table 7.3** International rail traffic (tonnes) ..... 105
**Table 7.4** Forecast rail traffic through Nacala ..... 105
**Table 7.5** Domestic rail traffic (tonnes) ..... 106
**Table 7.6** Forecast domestic rail traffic (tonnes) ..... 106
**Table 7.7** Forecast transit traffic (tonnes) ..... 106
**Table 8.1** Passenger service operating costs, 2016 ..... 111
**Table 9.1** CEAR accounts rounded to million Kwacha ..... 120
**Table 10.1** Recent projects used for cost estimation ..... 127
**Table 10.2** Summary of key infrastructure proposals ..... 128
**Table 10.3** Do-minimum freight traffic forecasts ..... 142
**Table 10.4** International freight traffic forecasts ..... 143
**Table 11.1** Differences between rail and coach on Lilongwe - Blantyre ..... 150
**Table 11.2** Proposed southern service route and schedule ..... 152
**Table 11.3** Daily rail passenger forecasts, 2036 ..... 153
**Table 11.4** Annual economic benefits of rail passenger services, $M, 2036 ..... 155
**Table 14.1** Investment Plan (US$ Millions) ..... 173
**Table 14.2** Action Plan funding sources ..... 174
**Table 14.3** CEAR Actions and Agreements on Recommendations ..... 175

# Figures

**Figure 1.1** Map showing historic development of the railway network in Malawi ..... 18
**Figure 1.2** CEAR mission statement ..... 22
**Figure 1.3** Railway network in Malawi and Mozambique ..... 22
**Figure 1.4** Imports and exports by seaport ..... 26
**Figure 2.1** New alignment close to Phalula ..... 31
**Figure 2.2** Map of concession areas ..... 32
**Figure 2.3** Map of main traffic flows ..... 33
**Figure 2.4** Map of existing condition of the railway network in Malawi ..... 34
**Figure 2.5** Typical coal locomotive used on the new alignment ..... 35
**Figure 2.6** Rebuilt line at Liwonde ..... 36
**Figure 2.7** Replacement of sleepers and upgrade of the route north to Lunzu ..... 38
**Figure 2.8** Photo of 2016 track rebuild between Limbe and Lirangwe ..... 39
**Figure 2.9** Maleule station track ..... 40
**Figure 2.10** Private freight sidings near Luchenza between Limbe and Makhanga ..... 41
**Figure 2.11** Track under water near Balaka ..... 42
**Figure 2.12** Track quality of north line of near Salima ..... 43
**Figure 2.13** North line near and in Kanengo yard ..... 43
**Figure 2.14** Track condition between Sharpeville and Golomoti ..... 44
**Figure 2.15** Monteagle track machines near Liwonde and a wagon near Nkaya ..... 45
**Figure 2.16** Track renewal work being undertaken in Limbe yard. ..... 46
**Figure 2.17** Balaka station and Chipala station ..... 46
**Figure 2.18** Passenger facilities at Balaka Train Station ..... 48
**Figure 2.19** Passengers waiting on platform at Blantyre ..... 49
**Figure 2.20** Maleule Station - north of Lunzu ..... 49
**Figure 2.21** Early morning at Blantyre station – ..... 49
**Figure 3.1** Locomotive gifted by Republic of China (Taiwan) ..... 53
**Figure 3.2** CDR mainline locomotive being used by CEAR for shunting in Limbe yard. ..... 54
**Figure 3.3** Bogie covered (pallet) wagons in Limbe yard ..... 55
**Figure 3.4** CDN BBW wagons ..... 55
**Figure 3.5** CEAR grain hopper wagons ..... 55
**Figure 3.6** Diesel tank wagons in Blantyre ..... 55
**Figure 3.7** Disused type of tank wagon from Kanengo yard (2016) ..... 55
**Figure 4.1** CEAR container train ..... 61
**Figure 4.2** Historic photo of finger boards and departure clocks in operation ..... 66
**Figure 4.3** CEAR's new build passenger carriage ..... 68
**Figure 4.4** Photos of the interior of CEAR's new carriages – both standard and premium class ..... 69
**Figure 4.5** Photo of typical fares display at stations ..... 71
**Figure 5.1** Condition of the line between Limbe and Sandama at Luchenza ..... 81
**Figure 5.2** Chiromo Shire river washaway ..... 81
**Figure 6.1** Photo of carriage interior passenger service in operation ..... 88
**Figure 7.1** Nacala container train from 2001 ..... 97
**Figure 10.1** Map showing civil infrastructure enhancement options ..... 132
**Figure 10.2** Chipoka terminal ..... 139
**Figure 10.3** Moatize-Macuse proposed railway line ..... 142
**Figure 10.4** Do-minimum freight traffic forecasts ..... 143
**Figure 11.1** Potential site for a station in Lilongwe (Area 25) ..... 149
**Figure 11.2** Steam locomotive from Kanengo yard ..... 153
**Figure 11.3** Steam locomotive from Limbe yard ..... 153
**Figure 13.1** Previously proposed structure for railway sub-sector in Malawi ..... 165
**Figure 13.2** Proposed structure for the Malawi Rail and Maritime Regulator ..... 167

# Acronyms

| | |
|---|---|
| **ADMARC** | Agricultural Development and Marketing Corporation |
| **BBW** | Bogie Ballast Wagon |
| **BOT** | Build-Operate-Transfer |
| **BOOT** | Build, Own, Operate and Transfer |
| **BSAC** | British South Africaa Company |
| **CDN** | Corredor de Desenvolvimento do Norte |
| **CEAR** | Central East African Railways |
| **CFM** | Caminhos de Ferro de Moçambique |
| **CLN** | Corredor Logístico Integrado do Norte |
| **CNCEC** | China National Complete Engineering Corporation |
| **CNG** | Compressed Natural Gas |
| **CODIZA** | Zambezia Development Corridor |
| **DFID** | Department for International Development |
| **DMU** | Diesel Multiple Unit |
| **DPC** | Diesel Power Cars |
| **DRTSS** | Directorate of Road Traffic and Safety Services |
| **GHG** | Greenhouse Gas |
| **GoM** | Government of Malawi |
| **IFI** | International Financial Institution |
| **IRO** | Institute of Railway Operators |
| **JTSR** | Joint Transport Sector Review |
| **LIBOR** | London Interbank Offered Rate |
| **LNG** | Liquefied Natural Gas |
| **MFC** | Malawi Fertilizer Company |
| **MLW** | Montreal Locomotive Works |
| **MoTPW** | Ministry of Transport and Public Works |
| **MRA** | Malawi Revenue Authority |
| **MWK** | Malawi Kwacha |
| **NES** | National Export Strategy |
| **NTMP** | National Transport Master Plan |
| **NTA** | National Transport Authority |
| **PSO** | Public Service Obligation |
| **PPP** | Private Public Partnership |
| **PPPC** | PPP Commission |
| **RDC** | Railroad Development Corporation |
| **RAMRAM** | Rail and Maritime Regulatory Authority of Malawi |
| **SADC** | Southern African Development Community |
| **SDCN** | Sociedade de Desenvolvimento do Corredor do Norte |
| **SHR** | Shire Highlands Railways |
| **TAZARA** | Tanzania Zambia Railway Authority |
| **TSIP** | Transport Sector Investment Programme |
| **TSPMIF** | Transport Sector Performance Monitoring Indicators Framework |
| **VLL** | Vale Logistics Limited |
| **ZRL** | Zambia Railways Limited |


Locomotive used
for coal transport


ATKINS

Malawi National Transport Master Plan

# Executive Summary

Rail Sub-Sectoral Plan

# Executive Summary

## Introduction

Rail offers Malawi the opportunity to overcome the barrier of being a landlocked economy, distant from international ports and international markets owing to the challenge of cost efficiently transporting goods over long distances.

Rail also offers Malawi the opportunity to become a logistics nexus – at the centre of the regional economy for parts of Mozambique and Zambia, and even potentially from as far as South Africa, Zimbabwe and Tanzania, via transit on its rail network.

The assessment of the accounts and forecast freight traffic by this study suggests that CEAR is likely to be financially stable in the short term, profitable in the medium term and capable of helping to support the Malawi economy through enhancements to the Malawi rail network in the long term. The investment by Vale in building the west line from Moatize to Nkaya and the east line from Nkaya to Nacala, and smaller but still significant investments in the south from Nkaya to Limbe and north lines from Nkaya to Mchinji and Chipata, have arrested the historic decline of rail in Malawi. The financial arrangements put in place for the transit of coal should put the railways in Malawi on a sustainable financial footing for the next 15 years as long as CEAR invests the forecast financial surplus in sustaining and enhancing the whole network (particularly the north and the south lines). This needs to be supported by investment from the Government of Malawi to increase traffic levels so that a virtuous cycle of extra traffic, extra revenue, and higher level of financial surplus can be established. This will increase the concession fee to the Government of Malawi but the much bigger and more important contribution that the railway can make to Malawi is in reducing haulage costs and improving freight haulage reliability across the nation.

At the same time CEAR can achieve its historic vision – "to be a benchmark on railway and logistics solutions for southern Africa"[1] and its recently refreshed "vision" – "to provide transportation needs of the region with efficiency and on a competitive basis. To enhance economic productivity in the region. To provide a seamless transport service to the economic needs of the region." [2]

The biggest risks are:

- that the Government of Malawi promotes schemes that do not generate extra revenue and that increase the cost of operating the railway. If the CEAR network grows through over-ambition that reduces the ability of CEAR to afford to maintain and renew the core network from traffic receipts, then the opportunity afforded by Vale's massive investment in coal haulage will be lost,[3] or
- that the owners of CEAR take any financial surplus, spending the minimum possible on the national network in contradiction to the general obligations of the concession agreement and their own vision statements, but in compliance with elements of the existing concession agreement. CEAR should not therefore rely on the coal business only and ignore the long-term potential of the other traffic. The concession agreement is currently being renegotiated and CEAR is being refinanced to ensure that Vale, as the funder of CEAR to date, is repaid. It

*1 See photograph (figure 2-1) of board in CEAR main reception.*

*2 The refreshed vision appears on CEAR's website http://www.cear.mw/services.html. Please note though that the historic "vision" also appears on the same website on a different page: http://www.cear.mw/index.html. The terms "historic" and "refreshed" are the consultant's.*

*3 "Building more isn't always the answer. Political leaders are often under pressure to build what turned out to be white elephants" Henry de Longchamps, World Bank quoted in the Economist magazine 28th February 2015; "African Roads and Rail: All Aboard."*

is vital that, as part of that process, the Government ensures that any financial surplus after debt repayment, beyond that required to reassure the funders of the certainty of the refinancing, is recycled into investment in the network.

International donors will struggle to justify supporting the development of the Malawi rail network if CEAR is generating a significant financial surplus and this surplus is not being used to support the development of the network over which CEAR has monopoly access rights. A mechanism has been proposed in this study. This is the single most urgent task identified in this sub-sector plan. Management of both of these risks (investment over-ambition and CEAR failing to invest a sufficient amount of its forecast financial surplus in network development) will require The Government of Malawi to strike a difficult balance both economically and politically which will require technical skill and commercial acumen.

## Commercial

The CEAR concession agreement warrants that the Government of Malawi will receive no less than US$1 million per year as a concession fee and this is expected to rise to US$1.2 million with the new concession agreement. However, should coal traffic levels rise to the forecast 18 million tonnes per year this figure may rise to closer to US$5 million per year as the Government of Malawi is paid around 5% of CEAR's gross revenue. However, the concession fee revenue stream, welcome though it will be and even though it should help fund improvements in the capacity of the Government of Malawi railway directorate, should not be seen as the main opportunity by the Government of Malawi.

The main opportunity lies in CEAR being able to support and help pay towards the reconstruction and phased upgrade of Malawi's railways. This could ultimately see Malawi benefitting from reliable, higher capacity freight lines to Nacala, Moatize, Beira and via Beira to Zimbabwe and South Africa, and via Chipata to other parts of Zambia and potentially to the Tazara railway.

Within the plan period, sufficient traffic could be generated to allow for financial self-sustainability. Such a network would allow Malawi to export and import goods cost effectively and help position the Malawian economy at the heart of the regional economy as a logistics nexus. Such a network could also afford to support an enhanced passenger services operation. Using this study as a starting point, the Government of Malawi might consider setting out with the Railway Directorate a vision for the network, with phased stages to 2045, the date of the end of the CEAR concession.

CEAR has, to date, been financially unsuccessful but the growth of Vale's coal traffic and the investments made by Vale through CEAR in the north and south lines mean that CEAR now should be able to deliver a consistent financial surplus going forward. The proposed refinancing of CEAR by external backers, at what are expected to be more commercially attractive rates than currently enjoyed by CEAR, would seem to reinforce this optimism. This is also testament to the previous work by the Government of Malawi through/with the Railway Directorate and their negotiation and management of the concession and corridor agreements. Together with Vale, the Government of Malawi has arrested the decline of rail in Malawi.

The CEAR concession is wholly-owned by Vale and its partners. CEAR's main revenue stream is from Vale coal, the haulage of this product is negotiated with other Vale entities and CEAR's main (budgeted) costs (track maintenance) are negotiated also by Vale owned organisations. It is, therefore, vital that the Government of Malawi understands in detail how the various agreements work so they can and maximise the gain to Malawi and forecast CEAR's finances more accurately. The proposed amendment to the concession agreement and the introduction of external finance gives the Government of Malawi the opportunity to do this now. However, if the Government of Malawi is not able to engage with CEAR appropriately at a technical level it risks CEAR concentrating on the coal traffic and delivering the minimum it feels legally obliged to do on the other lines. CEAR are operating a time limited concession – albeit over a long period to allow them to benefit from their investment – and the Government of Malawi needs to ensure that value of that concession is maximised for when it takes over, and more importantly for the benefit of the Malawi economy in the interim.

This may have been difficult previously because Vale needed repaying for its investment in CEAR, but with the refinancing that is no longer the case and the financial strength of CEAR is likely to be such that both the funders of the refinancing can be repaid and help contribute towards a gradual upgrading of the network. A potential approach for this is recommended later in this report.

This report proposes that CEAR and the Government of Malawi develop a joint business plan process whereby the Government of Malawi is engaged at a detailed level in both understanding the commercial and financial results and helps to plan expenditure and investments for the year ahead. Whilst the Government of Malawi will not wish and must not be involved in the operations of the railway, it does need to be involved in the budget and investment decisions as part of a planned and cyclical process. It is vital that CEAR feel that the Government of Malawi have the technical capability to add value during that process and view it as a partnership as otherwise it will simply become a transactional burden to CEAR.

This report suggests two cost effective early options for helping build rail connectivity to Beira – which should be a key objective for the Government of Malawi. This may involve investments in Mozambique (Moatize avoiding line and/or restoration of the line from Mutararara to Marka), and the role of the Government of Malawi will be vital in facilitating the international support, for example, in establishing customs arrangements at Marka so that traffic from Beira for Malawi is not delayed.

## Recommendations

Sixty recommendations have been made in this report. CEAR have indicated that they are planning to implement some of these, or have already started to do so. The study team recognises these actions, and their inclusion in this report will formalise them and allow them to be included within the business planning process to be established between CEAR and the Government of Malawi.

The civil infrastructure scheme proposed for investment as a priority is the rebuilding of the line from Mutarara Junction in Mozambique to the Malawi side of the Malawi-Mozambique border at Marka along with customs cleared dry-port facility. In the medium term, it is recommended that the Sena line is extended to Bangula along with the relocation of the dry-port, that the existing north and south lines are gradually upgraded to 20.5 tonne/axle subject to the growth of general freight traffic and marketing discussions. In the long-term, the objective is for the whole Sena line to be rebuilt and the entire network to be 20.5 tonnes/axle. The key systems scheme proposed for investment is an extension of the train control system, although it is expected that locomotive and wagons numbers will need to grow as traffic volumes increase significantly.

Many of the recommendations in this report require only minimal investment but are expected to improve the finances of the railway in Malawi and the economy of Malawi. One example is the negotiation of customs arrangements with Mozambique so that imports to and exports from Malawi that transit to/from Nacala (and Beira) ports in Mozambique for/from international shipping do not need to be fully customs cleared, along with similar arrangements for transit traffic from/to Zambia.

The recommendations range from detailed operational matters to considerations for future planning of services through to capital intensive infrastructure schemes. However, whilst these recommendations will be of value individually they will be of greater value if implemented through an improved business planning partnership and process between CEAR and the Government of Malawi that if implemented appropriately will generate its own set of short, medium and long term objectives that will supersede those in this report.

Currently the way that CEAR reports on its obligations is cumbersome and in some instances, involves the use of metrics that are no longer required by the Government of Malawi. It is recommended, therefore, that the Government of Malawi and CEAR consider how they could modernise the reporting arrangements to make them more useful and incorporate them with the recommendations that are to be taken forward from this report so that they are built into a joint business planning process. It is important in this process that the Government of Malawi is not simply the beneficiary of actions by CEAR but commits to driving forward those elements of the business plan that it is best placed so to do. This includes encouraging neighbouring governments to develop their rail connections to Malawi, regulatory matters including customs and lobbying international railway and funding bodies as appropriate. It is vital, therefore, that the Government of Malawi do not simply use the concession fee to support general expenditure but recognise that it is needed to support the development of the railway directorate and the railway network. CEAR and the Government of Malawi may need to seek support for institutional capacity building and external assistance where required.

In Table E.1, the recommendations coloured in green are those actions that are required early. Implementation will be a matter for the Government of Malawi in consultation with CEAR and others. Included in the list is a recommendation for the lead owner. It is important to note that this is not the same as the organisation that might lead the activity. For example, it is suggested that the Government of Malawi undertakes financial analysis to test the case for acquiring a further two passenger train sets. The Government of Malawi may ask CEAR to undertake much of this and to produce the raw data in particular. The business case needs to be owned by the Government of Malawi who would then decide whether the political, economic and social gain justifies the financial cost irrespective of any financial analysis by CEAR.

Actions and agreements to date regarding these recommendations are shown in Appendix A.

### Table E.1 List of recommendations

| No | Area | Description | Lead owner – note that others may lead activity | Section in report |
|---|---|---|---|---|
| 1 | Regulation | Establish One Stop Border Post (OSBP) at Nayuchi- Entre-Lagos border. Alternatively, import cargo should be cleared at Nkaya only. Customs should allocate officers to work during weekends to clear exports. | GoM | 2.3 |
| 2 | Regulation | Continue with the move of customs clearance from Liwonde to Nkaya. | GoM | 2.3 |
| 3 | Operations investment | Review potential extension of the east-west route train control system to include Limbe branch. | CEAR | 2.4.1 |
| 4 | Regulation | Type GT26 locomotives to be licenced for this route (Nkaya-Limbe) to improve operational flexibility. | CEAR | 2.4.1 |
| 5 | Operations | Conduct further trials to test the maximum trailing load west and east between Nkaya and Kanengo and Chipata– partly for publicity and partly to plan potential traffic on this route in a way that optimises efficiency. | CEAR | 2.5 |
| 6 | Operations investment | Review potential extension of the east-west route train control system to also include the north branch. | CEAR | 2.5 |
| 7 | Financial | That the Government of Malawi review the level of track (and other) maintenance by CEAR. In addition GoM need to review the level of renewals. | GoM | 2.6 |
| 8 | Operations retail | An annual paint programme for each station. This is in addition to any maintenance plan. Take care to ensure that the station retail front is maintained appropriately. | CEAR | 2.7 |
| 9 | Operations retail | Display station opening times in information where it can be seen by public. | CEAR | 2.7 |
| 10 | Financial | Wagon element of haulage fee be disaggregated so that customers are incentivised to use wagons more productively. | CEAR | 3.2 |
| 11 | Financial | Shunting element of haulage fee to be disaggregated so that customers are incentivised to manage this cost. | CEAR | 3.2 |
| 12 | Operations | Publication of the CEAR freight timetable. | CEAR | 4.1.2 |
| 13 | Operations retail | Production of public timetable with days and times of departure for every station with date of the publication of the next proposed timetable, no more than 12 months ahead. | CEAR | 4.2.1 |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report |
|---|---|---|---|---|
| 14 | Operations retail | Publication of timetable on website – revised whenever there are amendments e.g. because of line closures. Also public the freight timetable on the same site. | CEAR | 4.2.1 |
| 15 | Operations retail | Once a passenger timetable has been produced it should then be displayed each and every station. Most stations already have a notice board for displaying information to passengers so it could easily be added. | CEAR | 4.2.1 |
| 16 | Operations retail | CEAR to develop media plan and liaise with national public radio and other media over publicity regarding scheduled and unscheduled changes to the timetable or its operation. | CEAR | 4.2.1 |
| 17 | Operations retail | Consideration to be given to "next train" signs at all manned stations displaying date, time and day of the next train in each direction. This would require station staff to update the signs once each train has departed. | CEAR | 4.2.1 |
| 18 | Operations | CEAR are in the process of removing a number of temporary and (semi) permanent speed restriction currently in force. These improvements should be factored into a new calculation of the journey time between stations (and the whole working timetable). This would provide passengers with a direct benefit from CEAR's investment in the freight traffic. This process should be repeated – and a new public timetable produced - no less than once per year. | CEAR | 4.2.2 |
| 19 | Operations retail | With the publication of a timetable, and more disciplined approach to operations, CEAR should formalise a reduction in the dwell time at each station to no more than 3 minutes at the smaller halts and 5 minutes at larger stations – less where practical. Note that reduced dwell times may already be included in the working timetable which may explain why it is up to an hour different in end-to-end times than the website timetable, The journey time savings that this generates should be factored directly into the public timetable. | CEAR | 4.2.2 |
| 20 | Regulation | That any revised frequency of the operation is recorded formally as part of the contractual relationship between GoM and CEAR. | GoM | 4.2.4 |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report |
|---|---|---|---|---|
| 21 | Operations retail | Include at least one premium coach per scheduled train. If this recommendation is rejected then the existing premium coaches should be declassified at a minimum and potentially reconfigured as standard coaches, and all reference to premium fares be removed from CEAR publications. | CEAR | 4.2.5 |
| 22 | Passenger marketing | Consider merging the two premium fares – "Premium" and "Business". | CEAR | 4.2.5 |
| 23 | Passenger marketing | Consider the level of fare differentiation between premium and standard and what other services might be offered to premium passengers – perhaps a coffee, tea or soft drink service. Conduct regular usage level surveys – if the premium coach is empty then reduce fare differential and increase level of service. If premium coach is full then increase fare differential. | CEAR | 4.2.5 |
| 24 | Passenger marketing | A review of the fares policy for all fares in the light of current operating conditions, bearing in mind the corporate and social responsibility element of the service, and the need to enhance revenue to help reduce CEAR's operating loss. Once determined, the new fares should be published and displayed at each of the stations on the station notice boards. The fares should also be displayed on the company website. | CEAR | 4.2.5 |
| 25 | Passenger marketing | Simplify and unify the way that the fares are shown at stations. | CEAR | 4.2.5 |
| 26 | Regulation | Agree a revised list of KPI metrics in order to reduce the burden on CEAR and improve their usefulness. Consider whether any or all of these can be made public. | GoM | 5.4 |
| 27 | Regulation | 2017 agreement should cover the treatment of any financial surplus generated by CEAR and how much of this should fund the development of the network before any is taken as profit by the owners of CEAR. | GoM | 5.5 |
| 28 | Regulation | This rail sector report and these recommendations are refreshed once the terms of the proposed 2017 Agreement are made public. | GoM | 5.5 |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report |
|---|---|---|---|---|
| 29 | Operations | A thorough review pf the passenger counting process is undertaken including how that data is used and reported. This then needs to be agreed with GoM. Passenger count data can then be exchanged with the Government on a regular basis to aid with the understanding of the success of the services operated. | CEAR | 6.1 |
| 30 | Strategy | GoM to produce short, medium and long term traffic forecasts on a regular (annual) basis and review on a similarly regular basis any variance from forecast and how the accuracy can be improved. | GoM | 7.2.1 |
| 31 | Regulation | Extend customs pre-clearance to Zambia – Mozambique transit traffic. | GoM | 7.2.2.3 |
| 32 | Freight marketing | That CEAR/CDN should work with the Zambian Railways Limited (ZRL) to agree what they could do to improve the railway service short of increasing the axle load. Additionally, they should agree on a list of target customers to approach to sell this new service, in particular, whether it is worth approaching any of the mining operations in Zambia. | CEAR | 7.2.2.4 |
| 33 | Freight marketing | Include Port of Nacala in workshops on developing rail service offer for Zambia. | CEAR | 7.2.2.4 |
| 34 | Freight marketing | That CEAR/CDN should work with ZRL to agree what they could do to improve the railway service including increasing the axle load to complement potential line extensions within Zambia. As above, additionally, they should agree on a list of target customers to approach to sell this new service and whether it is worth approaching any of the mining operations in Zambia. | CEAR | 7.2.2.4 |
| 35 | Operations | CEAR to consider optimum operating methodology should Chipata line be extended. | CEAR | 7.2.3 |
| 36 | Strategy | GoM to refresh/reconsider the business case for Sena line rebuild options, should Chipata line extension become more certain. | GoM | 7.2.3 |
| 37 | Strategy | Maintain Beira as an option for Zambian traffic forecast to use the proposed extension from Chipata. | GoM/CEAR | 7.2.3 |
| 38 | Strategic | GoM to keep in regular contact with the Government of Zambia and the sponsors of the Serenje extension scheme to support lobbying. | GoM | 10.2 |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report |
|---|---|---|---|---|
| 39 | Strategic | Consult with CEAR/Vale and consider Moatize avoiding line as an alternative (quicker) option to the proposed rebuild of the Sena line. | GoM | 10.2.1 |
| 40 | Strategic | GoM and DFID agree on status of DFID feasibility report into the reconstruction of the Sena line, and publish if practical. | GoM | 10.2.2.1 |
| 41 | Infrastructure investment | Consider adopting southern approach phase 1 for Sena line as the preferred infrastructure option. | GoM | 10.2.2.2 |
| 42 | Infrastructure investment | Consider whether phase 1 and phase 2 of the southern approach for Sena line should be implemented together. | GoM | 10.2.2.2 |
| 43 | Marketing freight | Consult with key clients (particularly Illovo) over "southern" Sena option. | CEAR | 10.2.2.2 |
| 44 | Regulation | Institute customs clearance procedures and a dry port at Marka just within Malawi. | GoM | 10.2.2.2 |
| 45 | Strategic | Consult with the Government of Mozambique over phase 1 of the "southern" Sena option. | GoM | 10.2.2.2 |
| 46 | Operations investment | Government of Malawi and CEAR to consider whether renewal and maintenance standard should be uplifted to 18 or 20.5 tonnes. | GoM /CEAR | 10.2.3 |
| 47 | Marketing freight | Government of Malawi and CEAR to establish a formal rail freight users group. | GoM | 10.2.5 |
| 48 | Infrastructure investment | Liwonde to be considered a potential location for any new intermodal facility between the lake (and the Shire River) and rail for the medium-long term. | GoM | 10.2.6 |
| 49 | Operations investment | Undertake an audit of the operational methodology at all private sidings including an estimate of the cost to CEAR and the investment options for reducing this. It is recognised that CEAR has already undertaken significant work previously but a systematic approach combined with looking at investment options may be worth while. | CEAR | 10.2.7 |
| 50 | Operations investment | Evaluate the cost of extending radio train control system to the south and to the north lines. | CEAR | 10.2.8 |
| 51 | Operations investment | Government of Malawi to seek donor support for above investments. | GoM | 10.2.8 |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report |
|---|---|---|---|---|
| 52 | Capacity building | Consider approach to IRO/Transnet or development of similar distance learning programme. | GoM /CEAR | 10.2.9 |
| 53 | Regulation | Retain any increase in the concession fee to the Railway Directorate to further improve oversight of the concession and planning. | GoM | 10.2.9 |
| 54 | Regulation | Seek donor support for capacity building. | GoM | 10.2.9 |
| 55 | Strategy | Engage with CFM, as project owner, as to the long term possibilities for accessing the port of Macuse by rail | GoM/CEAR | 10.3 |
| 56 | Regulation | GoM to undertake financial analysis with CEAR to test the case for acquiring a further two passenger sets to operate a Mchinji – Kanengo – Salima service. | GoM | 11.4 |
| 57 | Operations | Maximise the use of the existing passenger fleet to create two sets and operate a more ambitious 12 trains/week schedule. | CEAR | 11.5 |
| 58 | Regulation | Create an independent regulator for the rail sub-sector, either as a stand-alone agency or in combination with the regulation of other sub-sectors to secure stronger technical, economic, environmental and safety coordination in line with national and regional goals. | GoM | 13.6 |
| 59 | Regulation | Following separation of the regulatory function from MoTPW, restructure the residual functions of the Department of Railway Services to focus on effective policy making, monitoring and oversight. | GoM | 13.6 |
| 60 | Regulation | Seek parliamentary approval for a new Railways Act (or equivalent legislation) to determine the future sub-sector structure, with provisions for the Minister and rail regulator to make regulations and guidelines as may be required to achieve a safe, efficient, integrated and financially sustainable rail sub-sector over the duration of the NTMP. | GoM | 13.6 |

## Balast Wagons

ATKINS

Malawi National Transport Master Plan

# 1 Introduction

Rail Sub-Sectoral Plan

# 1 Introduction

## 1.1 Introduction to the National Transport Master Plan

The Government of Malawi commissioned WS Atkins in February 2016 to prepare a National Transport Master Plan (NTMP). The primary objective of the study is the development of a plan to guide the sustainable development of an integrated multi modal transport sector over the period 2017 to 2037. The study 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. The NTMP is intended to include a prioritized time bound plan for institutional (organizational, policy and regulatory) reform and capacity building in all sub-sectors. This detailed master plan for the rail transport sub-sector has been developed working with the concerned agencies and organisations, in both the public and private sectors.

## 1.2 Introduction to the rail sub-sector

### 1.2.1 Context

Rail forms only a small part of the overall transportation market within Malawi. It is largely focussed around freight so is only indirectly relevant to the lives of most Malawians. There is a limited passenger service that operates from Limbe, but this carries only a small number of passenger trips per annum. It would be wrong, however, to dismiss rail as irrelevant.

In part because of the low base of current traffic, rail has the greatest potential to grow proportionally, and it also has the greatest potential to grow in absolute terms. Most critically rail has the greatest potential to help Malawi overcome the economic barriers from being a landlocked economy and nation.

Rail forms the main mode to Nacala port and could form the main mode to Beira if the historic railway line (the "Sena" line) could be rebuilt. Rail should be less costly per tonne over long distances – particularly for imports and exports.

Rail already accounts for the largest, single flow of freight traffic within Malawi, although this is transit coal from Moatize in Mozambique to Nacala in Mozambique. It could also become the main mode for transit goods from all or parts of Zambia, to Nacala or Beira, as the rail route to the Indian Ocean is shorter and more direct than the existing export routes from most of Zambia including the Copperbelt.

It is important to note that the existing railway network is geographically (and operationally) limited. It comprises of four branches only that cover parts of the south of Malawi only. The north branch of the railway traverses Malawi east-west between the Zambia border at Mchinji and Salima close to Lake Malawi via Kanengo (for Blantyre), but does not run north of this line in Malawi. This excludes roughly half of Malawi and for this reason it was requested by the Government of Malawi to examine the cost and option of extending the railway network further north towards Mzuzu. South of Salima the railway runs to Nkaya (just south of Balaka) – although there have been occasional short-term closures in the past and recently. From Nkaya there are three (further) branches (1) east to Nayuchi to the east of Malawi on the Mozambique border, (2) west to Mwanza (also on the Mozambique border) and (3) south to Limbe south of Blantyre. The historic railway route to Mozambique (known commonly as the Sena line – via Vila Nova de Frontiera) via Nsanje and Bangula is non-operational as significant sections have been washed away particularly at the Shire River crossing in 1997.

## Figure 1.1 Map showing historic development of the railway network in Malawi


**Legend**

- Built 1909 - 1915
- Built 1922 - 1949
- Completed by 1970
- Built 1982 - 1992
- Built 2012 - 2015
- Opened 1970/2: Occasionally closed
- Tazara Railway 1975

ATKINS

WS Atkins International
Woodcote Grove
Ashley Road
Epsom
Surrey
KT18 5BW

Tel: +44 (0) 1372 726140
Fax: +44 (0) 1372 740055

**Client:**

Government Of Malawi

**Project:**

National Transport Master Plan

Although rail volumes as a percentage of all traffic have grown since 2005, rail as a mode accounted for only 11.7% of exports in 2015 and 5.1% of imports,[4] and an insignificant percentage of domestic traffic. Rail, therefore, is not a vital part of the existing transport mix but it could be a vital element of helping improve the Malawi economy and giving shippers greater modal choice. This point is emphasised in the Malawi National Export Strategy (NES) 2013 – 2018:

*"The top priority for the Ministry of Transport and Public Works (MoTPW) is to supply a multi-modal transport system to reduce the dependence on road transport, particularly for bulk transportation. A key part of this is rail transport, while marine transport is also important, as outline in the Transport Sector Investment Programme (TSIP) and the National Transport Policy of 2004."* [5]

The National Transport Policy of the Government of Malawi (2015) states that:

*"The policy will promote private sector participation in railway operations under concessionary arrangements and ensure that railway companies provide efficient services of a quality that meets demand and are compliant with the required safety standards."*[6]

This potential for rail is doubly important because the Government of Malawi did not seek to negotiate more direct taxes or higher access and concession fees when construction of the railway was being negotiated. This was partly because it was feared that coal might use a different route, partly because of the local benefits the line would bring and partly because of the macro-economic benefit.

The Government of Malawi Ministry of Finance stated "The Government of Malawi also considered present and future economic development along the section where the line has passed, including areas where development has been lagging for a long period the project has rejuvenated the ailing rail sub-sector in Malawi and continues to attract more investors including the rehabilitation of the railway network in the country."[7] At the time the Nacala line was started in an opening ceremony on 6th December 2012, the then president of Malawi Joyce Banda stated: 'transport costs constitute about 60% of the landed cost of goods in Malawi. If we are going to be competitive regionally and internationally we need to bring those costs down.' She expected that Malawi would save more than US$120 million a year in reduced transport costs"[8] (from having an enhanced railway network).

The Government of Malawi is aware of the potential for rail and its importance to the Malawian economy (to the south of the country in particular). The National Transport Strategy (2005) stated:

*"the rail sub-sector played a major role in Malawi over the past years in the movement of international trade. This role declined in the mid 80s due to the closure of the international rail routes in Mozambique in 1985 during the civil war. Both the re-opening of the Nacala route in 1989 and the end of the civil war in Mozambique have, however, now revived the importance of this mode of transport in freight movement and it is hoped that the rail sector will capture back considerable freight traffic."*[9]

Since then the West route has been opened for coal traffic, the East route refurbished to take up to two general goods (and one passenger) train per day, refurbishments undertaken on

4 Source: Malawi Revenue Authority quoted in Malawi National Transport Master Plan: Report on Task A4: Review of Current Transport Costs, December 2016, Table 3-8, page 18.

5 Malawi National Export Strategy ("NES") 2013 – 2018, page 44:

6 National Transport Policy of the Government of Malawi (2005); section 8.2 page 15.

7 Source: http://mwnation.com/government-gives-up-taxes-to-vale/, July 24th 2015.

8 Source: http://www.railwaygazette.com/news/infrastructure/single-view/view/vale-starts-work-on-nacala-corridor.htm

9 EU and World Bank (2010) Malawi Transport Sector Multi-Modal Development & Potential Public Private Partnership Study (section 2.1.2 page 88 and 89); and National Transport Policy of the Government of Malawi (2005); Appendix, section 1.40 page 31.

the North and South routes, and the North route extended to Chipata.

Over the medium to long term rail could capture up to half of all exports to international shipping – and shipping accounts for around half of all exports and imports[10] - general freight traffic (i.e. excluding transit coal) has not yet returned to historic levels despite significant investment by the Central East African Railways ("CEAR") and the Government of Malawi.

It is not yet clear whether Malawi will develop a large-scale mining sector but without rail developing such an industry would be significantly harder. It is possible that the historic poor condition of the railway network in Malawi may be one of the causes of the under-development of the mining sector in Malawi. Only rail can carry the large tonnages typically required by the mining industry efficiently, without destroying local roads. It is not yet clear whether Malawi will import electricity from Mozambique and other neighbours, or will import coal from the Moatize field to feed a new power station in Malawi or will carry coal from Malawi's own coalfields in the south near the Mozambique border to a power station. Having a railway network is probably a requirement for the Government of Malawi to maintain to have these last two choices as options.

### 1.2.2. **History**

The very first railway to be built in Malawi was from Blantyre to Chiromo, on the south bank of the Shire River in 1909. The Shire Highlands Railway Company (SHR) obtained the first concession to build the railway and this was later completed by British South Africa Company (BSAC) in 1909. By 1915 this was extended across the Shire to the Zambezi River at Dona Ana (near Mutarara) in Mozambique. By 1922 the railway from Beira (Mozambique) had reached Via de Sena – a ferry ride across from Dona Ana – and from this point on the line from Malawi via Blantyre via Via de Sena is often referred to as the "Sena" line. In 1935 the bridge over the railway Zambezi was completed, and the line was extended to Moatize (in Mozambique) in 1949. The Malawi railway was extended from Blantyre to Chipoka in 1932 and to Salima in 1935. At this point the only rail access for Malawi products was via the Sena line to and from Beira.

Since Independence the situation changed. There were three main extensions of the network – from Nkaya to Mozambique (and Nacala) in 1969/1970, from Salima to Kanengo (Lilongwe) in 1978 with support between 1974 and 1979 from the Canadian International Development Agency, and from Kanengo to Mchinji in 1981/1982. More recently the line from Mchinji to Chipata (Zambia) was extended first to the border in around 1992,[11] then opened to Chipata in 2012 although, according to CEAR, traffic did not really start significantly until 2015.[12]

Unfortunately, the history of railways in Malawi (and Mozambique) has not always been one of consistent extension and growth. All railways in Mozambique, and therefore all international railways to and from Malawi, were closed in 1983 because of the civil war and most were partly or wholly destroyed. Up until that point most international traffic to/from Malawi was carried by rail.[13] As a result of the civil war, all rail traffic to/from Malawi ceased. Because international traffic accounted for the bulk and most profitable flows on rail in Malawi this undermined the economic operation of rail within Malawi itself. It also underlined the Malawian economy more generally as there was no longer secure and cost efficient port access for bulk imports and/or exports.

In 1989 the Nacala Corridor was opened following some rehabilitation but the Beira corridor (via the Zambezi bridge) has remained closed since the wash-away of the

10 *Source: Malawi Revenue Authority quoted in Malawi National Transport Master Plan: Report on Task A4: Review of Current Transport Costs, December 2016, Table 3-9, page 18.*

11 *Interview with Geoffrey Magwede, 21st March 2017.*

12 *Interview for this commission with Christina Chithila, Director of Finance and Administration, June 2016.*

13 *Malawi: Beneficiary Framework Contract Lot 2 – Transport and Infrastructures: Technical assistance to the Rail Sector Development; Draft Final report by GOPA for EU, May 2009, page 6.*

embankments of the Shire River bridge at Chiromo in 1997. This type of wash-away is not uncommon. In 2003, a wash away destroyed the Rivi-Rivi Bridge near Balaka and was not restored until 2005. The line, south from Blantyre, is only currently open as far as Limbe. As a result, commercial freight traffic collapsed further from 502,482 tonnes in 2000 to 213,959 tonnes in 2008.[14]

However, the development of the Tete/Moatize coalmine has transformed the outlook for Malawi railways. Moatize is in Mozambique's Tete Province on the eastern side of Zambezi River. The coal basin has been estimated to have reserves of 2.5 billion tonnes of coal. Firstly, the line to Beira was re-opened in 2009. The first modern coal from Moatize started to operate to Beira in January 2010.[15] In September 2011 Vale purchased 51% of CEAR as part of a phased take-over that led to Vale owning a controlling of majority of CEAR's stock. This was accompanied by a determined attempt to enhance the professionalism of the railway with new values and a formal investment programme.

The preferred route for the majority of Vale coal traffic was shifted to Nacala where Vale Mining Company (Vale) have built a dedicated, deep water loading facility. In 2012 work started on the Nacala Corridor project. A new 136 km line was built to from Kachaso to Nkaya within Malawi. From Nkaya the 99 km existing railway was fully refurbished to the border at Nayuchi. The first coal trains started operating to Nacala in 2015.[16] Volumes are forecast to grow up to a maximum of 18 million tonnes per year. This volume of coal traffic is higher than originally forecast and the impact will be consequentially greater.[17]

### 1.2.3 Purpose

The railway was originally developed with the purpose of allowing Malawi goods to be exported efficiently and Malawi imports to be imported more easily and cheaply – as the 2005 National Transport Policy states: "to provide Malawi with efficient and competitive outlets to the sea". This remains its primary purpose today along with the movements of materials, goods and products within Malawi. There are other indirect benefits in terms of an increase

14 *Malawi Beneficiary Framework Contract Lot 2 – Transport and Infrastructures; Technical Assistance to Rail Sector Development: Draft Final Report by GOPA (a member of the Cowi consortium) for EU, May 2009, section 1.1 page 7.*

15 *Railway Gazette; http://www.railway gazette.com//news/single-view/view//sen-line-trains-retrun-to-moatize.html also quoted on Wikipedia: Moatize.*

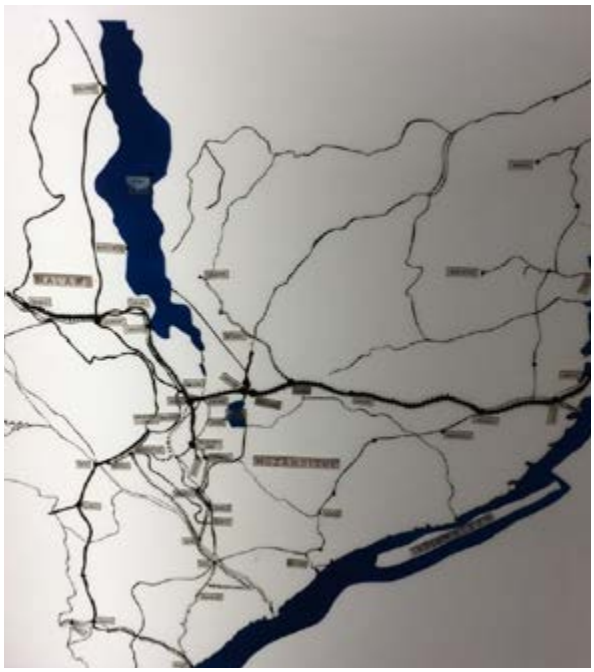
16 *Mozambique's port of Nacala, Mozambique to start exporting coal; http://www.macauhub.com.mo/en/2015/07/20/mozamiques port of Nacala-Mozambique-to-start-exporting-coal/ also quoted on Wikipedia: Moatize.*

17 *The 2010 USAID Nacala Corridor Assessment: Logistics and Supply Chain Efficiency report describes the opportunity for coal traffic to Nacala as "less promising" (page 41). However, it also goes on to say that "5 to 7 million tonnes" … "will have an enormous impact." Small changes to the economics of a particular flow – whether to use Beira or Nacala port for the coal, for example, can have a very significant impact on freight volumes because of the high fixed costs and low variable costs. The fact that 6.6 million tonnes was carried in 2016 and 18 million tonnes per annum is therefore likely to have a commercial impact of more than three times.*

### Figure 1.2 CEAR mission statement


Photograph from reception of CEAR showing Vale's public commitment to running CEAR in accordance with a transparent and aspirational set of values and principles.

### Figure 1.3 Railway network in Malawi and Mozambique



Picture of map showing railway from CEAR reception

in the total transport capacity of Malawi, modal and port flexibility, and the enhanced attractiveness of Malawi as an investment location. Because the railway network in Malawi is located between Zambia and Mozambique and is connected to both it also benefits Zambia and Mozambique just as the railway in those countries benefits Malawi economically when connected as part of a wider network. This economic effect is understood. For example, in describing the potential extension of the line from Chipata to Serenje within Zambia and the potential for increased freight traffic to/from Zambia to run via Serenje and Chipata and through Malawi to/from parts in Mozambique, the Zambian Transport and Communications Minister stated:

*"this project is meant to enhance regional and international trade through the Nacala development corridor with a direct economic stimulus to Zambia, Malawi and Mozambique."*[18]

This role is understood and accepted by CEAR, and is reinforced by their declared corporate mission:

*"to serve as a lever to the economic development for Malawi, north and east of Mozambique and Eastern Zambia at cost effective and efficient manner."* [19]

#### 1.2.3.1 **Tariffs**

Currently Malawi's economy, in part, reflects the logistics of the country. One of the handicaps in developing Malawi's mineral resources has been a lack of a cost-effective means to exporting any product from the country prior to the refurbishment of the Nacala line. Poorer logistics lead to a poorer economy which leads to fewer goods and a poorer logistics offer. However, the reverse is also true, a better logistics offer will help increasing the volume of goods carried and thereby help improving that logistics offer.

This mechanism is explained in more detail in report on Task A4: Review of Current Transport Costs.[20]

Currently rail is not significantly cheaper than road. CEAR do attempt to sell their services as cheaper than road haulage. The CEAR website states that "rail transport is the cheapest mode of transport when compared with other modes of transport."

The concession and the corridor agreements that give CEAR the mandate to operate services allow CEAR to set their own haulage prices and there is no regulatory requirement to price below the prevailing road price. The table below is taken from the Review of Current Transport Costs: Task A4 of Malawi National Transport Master Plan.

The figures shown in the table on the following page are averages. It is important to note that the haulage prices for road and rail vary across seasons, between customers and across routes. For example, rail does not serve Beira and there is very little road traffic to/from Nacala. The table on the following page and more detail on these differences is contained within the report.[21]

It is also important to note that whilst haulage rates are important that other elements can have an impact on the price, particularly storage costs, any extra material handling costs and reliability. Ensuring that rail has customs priority, which is common because of the large volumes typically involved, can increase the end-to-end price differential between rail and road.

Whilst CEAR have a commercial incentive to price just sufficiently below the end-to-end road price to attract a commodity or customer to rail, they do not have an incentive to price significantly below the end-to-end road rate. This will remain the case until there is rail on rail competition. However, the efficiency of rail operation is important and traffic volumes are too low currently to allow two or more rail operators to run on a commercial basis – let alone compete.

18 https://www.lusakatimes.com/2016/12/24/chipata-mchinji-railway-line-not-viable-government-engage-private-sector/

19 *CEAR mission statement taken from CEAR website: http://www.cear.mw/services.html. Note that CEAR's website also includes a mission statement which is for CEAR "to transport passengers and cargo through railway and to execute on-shore and off-shore port operations with safety, quality and efficiency". This though looks closer to a methodology statement and how they will achieve the mission and the visions that they have declared.*

20 *Report on Task A4: Review of Current Transport Costs; Malawi National Transport Plan, December 2016, page 76.*

21 *Malawi National Transport Master Plan: Report on Task A4: Review of Current Transport Costs, page 8 and Chapter 5, pages 19 – 27.*

**Table 1.1 Rail transport costs, US $ per tonne-km, 2015**

| Mode | Import/ export | International | | | | Domestic |
|---|---|---|---|---|---|---|
| | | 20ft | 40ft | Break bulk | Liquid | Break bulk |
| Rail | Import | 0.105 | 0.145 | 0.090 | 0.11 | 0.083 |
| | Export | 0.06 | 0.083 | 0.058 | 0.073 | |
| Road | Import | 0.11 | 0.09 | 0.075-0.12 | 0.13 | 0.082-0.233 |

Whilst some small detail is missing from the data that has been shared with the study team on CEAR's finances, CEAR is currently loss-making (and only survives with financial support from Vale). This is expected to change since it is general traffic operation (i.e. non-coal traffic) that contributes least revenue and is least efficient in terms of operation. Any cash that CEAR currently makes contributes directly to their funding of the gradual refurbishment of the railway network in Malawi. Any reduction in revenue would threaten this.

Without rail as a modal choice it is likely that the road hauliers would be able to raise their prices, for longer distance and for port traffic in particular. The threat of using rail reduces the ability of road hauliers to exploit Malawi's landlocked location. Rail in effect caps road prices and where rail and road compete for traffic, this can act to force road hauliers to improve their efficiency and pricing. It also reduces the opportunity for road hauliers to monopoly price traffic, even informally. This is true in particularly during the rainy season when – in theory at least – rail should be less affected.

#### 1.2.3.2 Port access

Only rail serves Nacala Port, which is further from Malawi than Beira Port. Without a rail connection, it is unlikely that Nacala port could compete as effectively with Beira, as there is very little road traffic from Malawi currently and the road route is not a simple one. Because of the distance Nacala port has very limited road hauled freight traffic to/from Malawi, although it has the capability of handling most commodities by road if required. The competition that exists, therefore, is between rail to/from Nacala port and road to/from other ports, rather than simply between modes.

Beira is the port of choice for the clear majority of freight traffic exported or imported by ship (which accounts for most international traffic). Beira is the nearest main port to Malawi (noting the very recent growth at Quelimane, see foot of the page for more information) and historically the most important. Beira port cannot accommodate the largest of vessels but enjoys incumbency benefit from historic shipping routes and warehousing and other logistics arrangements. For flows to shift between ports (and in this case between modes), shippers have to consider not just the choice between road and rail within Malawi and Mozambique but all the elements of the logistics operation between the port and destination/origin in Malawi. Often the cost of and availability of storage, warehousing and ancillary services can be decisive. There is little point a shipper moving to use rail if in order to do so they need to use larger ships that require more warehousing than the suitable for the flow or is available.

According to CEAR, in 2012 around 47% of all international traffic went through Beira.[22] Figure 1.4 shows the seaport exports and imports between Malawi and these other ports. This broadly agrees with the equivalent figures from the Malawi Revenue Authority (MRA) for 2015. It shows that Beira (road only) accounted for 56% of total imports and exports, Durban for 28%, Nacala for 10% and Dar-es-Salam for 5%. It is clear, that despite CEAR's best efforts, Nacala remains only the third port of choice for Malawi importers/exporters.

22 *Interview with Hendry Chimwaza for this commission on 24th March 2017. Having discussed with CEAR the difference in the figures for Nacala and Durban, CEAR believe that the MRA figures are likely to be a more accurate reflection of the current market that CEAR's historic estimates of around 32% through Nacala, 16% through Durban in South Africa and 5% through Dar-es-Salam in Tanzania.*

The primary position of Beira port reinforces the modal dominance of road, which carried 85% of international traffic in 2012.[23] For exporters and importers to be able to offer rail customers in Malawi greater choice over the ports they use or to offer users of Beira (and Durban) modal choice, a rail connection is required to Beira, and through that ultimately to Durban in South Africa.

This dominance of Beira, and therefore of road to Beira, means that Malawi remains more vulnerable to instability in Mozambique. It has been suggested that the Beira corridor is more unstable than the Nacala route. That is hard to quantify, but in 2016 trucks to/from Beira were attacked, looted and destroyed. Rail lines tend to be easier to secure. However, should a full-scale civil war restart in Mozambique both rail and road routes to both Nacala and Beira would risk being closed again. At this point Malawi would need to export through Tanzania (or use other convoluted routes). These routes are longer and more expensive and currently are not rail connected. Over those long distances road haulage would be highly inefficient and the cost would be destructive to the Malawi economy.

One port that is expected to grow rapidly is Quelimane in Mozambique. This is the closest port to Malawi and there has been a recent (2017) growth in trucks using the routes to Quelimane, largely due to the upgrading of roads in Mozambique. Quelimane has no rail access although there are currently discussions regarding a potential branch line from the proposed line to Macuse.[24]

### 1.2.4 Strategic value

Malawi's geography has formed and shaped the nation. The landlocked location and the size of the country means that distance matters. Malawi can either develop as a transport hub encouraging industry and development through the development of trans-national corridors or will see its position eroded through the development of neighbouring nation's transport infrastructure.

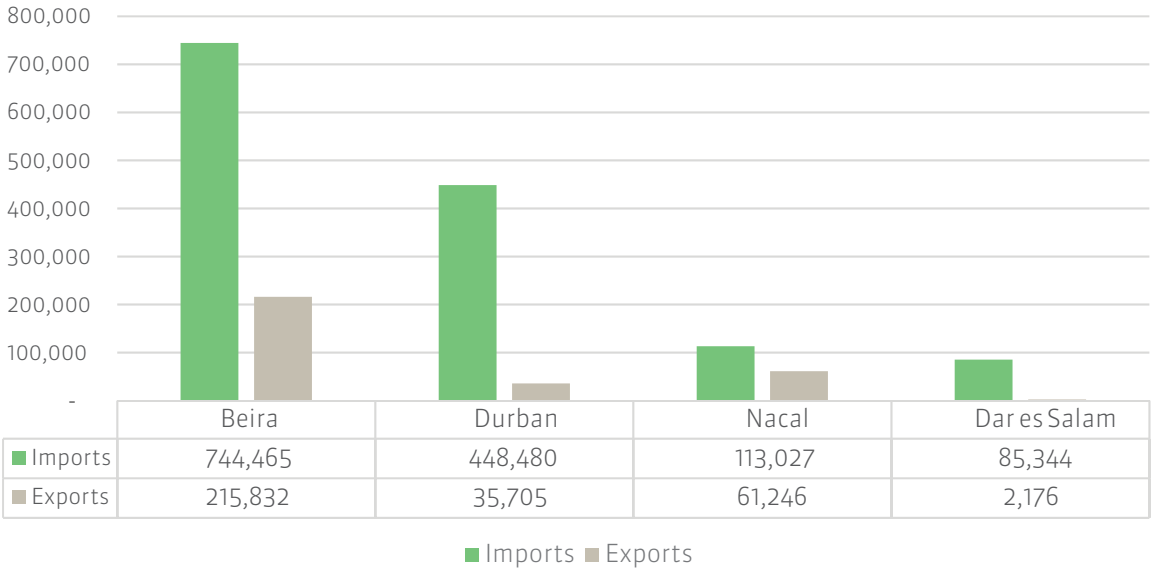
The best example of this is the coal traffic from Moatize. Thanks to a massive investment by Vale of around US$2 billion for the entire corridor, most of this traffic is carried from Moatize to Nacala via Malawi – Mozambique to Malawi to Mozambique. This coal traffic paid for the building of a new line from Moatize/Tete within Mozambique to Kachaso on the Malawi border, to the main marshalling yard in Malawi at the crossroads of the four railway branches in Malawi at Nkaya, and for the refurbishment of the Nkaya – Nayuchi line which can now carry other traffic. Without the coal traffic it is possible that rail services to Nacala would have ceased with insufficient traffic to have paid for the heavy fixed costs of refurbishing and maintaining the railway line in Malawi and Mozambique. However, constant commercial vigilance is required - some coal traffic continues to be carried to Beira. The new west line gives the Government of Malawi the option of importing Moatize coal to feed a new Malawi power station or even to haul Malawi coal from the Malawi field near the Malawi-Mozambique border.

Concession agreements have been signed for the construction of a coal export facility in Macuse, Mozambique, with a connecting rail freight line to the Sena line.[25] This will by-pass Malawi. If Malawi does not develop its railway more traffic and more industrial development will by-pass Malawi, as significant scale industrial development requires efficient access to materials and a means of exporting finished goods and products. This will result in less traffic, meaning that Malawi may struggle to have enough traffic to set against the fixed costs of a railway.

When traffic levels fall too far it becomes unaffordable to maintain the railway resulting in less traffic and a slow commercial death spiral. This is because railway maintenance fixed costs are high and the variable costs relatively less than changes with traffic volumes. Meanwhile neighbours who have invested in rail will attract heavy industries that rely on rail – mainly mining but also agriculture and secondary industries. Currently any diversion of the coal traffic is highly unlikely. Vale have invested in the route.

23 *CEAR Market Overview and business Plan July 2013; "corridors", slide 6.*
24 *https://furtherafrica.com/2016/07/13/construction-of-new-port-and-railway-in-mozambique.*
25 *Concession signed for construction of 525 km coal railway; Railway Gazette 19th December 2013.*

**Figure 1.4 Imports and exports by seaport (tonnes, 2015)**




| | Beira | Durban | Nacal | Dar es Salam |
|---|---|---|---|---|
| Imports | 744,465 | 448,480 | 113,027 | 85,344 |
| Exports | 215,832 | 35,705 | 61,246 | 2,176 |

Vale have also brought in external investors such as Mitsui who require warranties from Vale and new financiers to refinance the railway debt who will require guarantees.

Most importantly, restrictions on vessel size at Beira remain, and it was this that caused Vale to build the purpose built, deep-water loading terminal at Nacala along with the railway to that facility.

Because of the investment involved, the railway in Malawi should be considered a significant potential asset. According to CEAR's accounts for the year ending 31st December 2015 the assets of CEAR were worth MWK94,189 million (around US$130 million at 725 MWK/$) – the vast majority of which was civil infrastructure. This represents an uplift in value of 50% against 2014. Since then CEAR has continued to invest. In total, to date (March 2017) CEAR have invested around US$242 million. This excludes the cost of the new line between Kachaso and Nkaya which, with the refurbishment of Nayuchi – Nkaya, has together been estimated to have cost around US$1.1 billion. It has been estimated that it would cost at least US$3.0 billion to build the entire rail network infrastructure in Malawi from scratch – that is including both the east west link and the much longer north-south links.[26]

This value means that it is worth considering seriously about how best the railway can be best employed for the benefit of the people of Malawi.

## 1.3 Objectives of the plan

The aims and objectives of this plan are to help decide the most appropriate strategic direction for the Government in the management of rail. Rail in Malawi is at a vital cross-roads. Investment by Vale in the East-West line for coal traffic has opened the potential to revive domestic traffic and thereby paying for the maintenance of national system again. The Mozambique civil war and the closure of the international rail services was an expensive shock to Malawi. There is an opportunity now to reverse that.

### 1.3.1 Objectives

Three strategic objectives have been developed to guide the development of the overall National Transport Master Plan:

1. Reduce transport costs and prices across all modes;
2. Improve the safety of transport infrastructure and services; and
3. Enhanced and sustainable passenger and freight transport systems.

*26 Presentation to Joint Transport Sector Review; National Transport Master Plan: Findings and Progress 12th December 2016.*

The achievement of these long-term goals will be guided by the pursuit of a number of operational objectives, the primary ones relating to the rail sub-sector being:

- To facilitate a modal shift from road to rail and inland water transport; and
- To improve intermodal integration.

The aims and objectives of this sub-sectoral plan are to help decide the most appropriate strategic direction for the Government in the management of rail in pursuit of the above objectives. Rail in Malawi is at vital cross-roads. Investment by Vale in the East-West line for coal traffic has opened the potential to revive domestic traffic and thereby paying for the maintenance of national system again. The Mozambique civil war and the closure of the international rail services was an expensive shock to Malawi. There is an opportunity now to reverse that.

### 1.3.2 **Strategy**

The railway system in Malawi provides the greatest potential for reducing transport costs. Even under CEAR's market pricing policy, transport costs per tonne-km by rail are lower than by road. However, the railway's strategic cost advantage is limited by the fact that it only serves Nacala port. Despite investments in port infrastructure for non-coal traffic, the number of shipping lines that call at Nacala are fewer than at other major Indian Ocean ports. The most attractive port to Malawian shippers and transporters is Beira, which is currently served only by road from Malawi.

In order to take advantage of railway's inherent cost advantage, and to promote a shift in cargo transport from road to rail, a dual strategy is proposed:

- Maximising CEAR's advantages through better operational techniques and improving the state of the existing network; and
- Extending the railway network into Malawi from ports other than Nacala, in order to offer choice and increased competition.

Rebuilt line at Liwonde

ATKINS

Malawi National Transport Master Plan

# 2 Existing infrastructure

Rail Sub-Sectoral Plan

# 2 Existing infrastructure

## 2.1 Common features of the network

The infrastructure, asset condition and operation of Malawi's railway varies across the network. The four branches from Nkaya to Kachaso (west), Nayuchi (east), Limbe (south) and Mchinji/Chipata (north+north-west) are described separately below. However, there are significant similarities also. The most important common features of the four routes are:

- Single track with loops;
- "Cape" gauge: 1,067 mm;
- Un-electrified;
- General goods trains are operated within Malawi by CEAR or by a combination of CEAR, CDN and/or the Zambia Railways. The coal traffic is operated by CLN only; and
- Majority use by freight traffic, with some or zero passenger traffic.

## 2.2 Gauge

The African Union (AU) wishes to see a common gauge adopted across Africa, and the favoured gauge at present is standard gauge. Within the plan period, we do not recommended converting to standard gauge in Malawi. At present, whilst there are plans, following the construction of the first Standard Gauge Railway (SGR) in Kenya, to have an SGR in Tanzania via Dodoma to Burundi. These are unfinanced and in part this is driven by the desire to compete with the Kenya SGR. There are no dates for the SGR in Tanzania beyond phase 1, and phase 2 includes to Dodoma. There are no known plans or studies recommending that the existing Tazara line should be made standard gauge. It seems therefore likely that the two almost separate lines in Tanzania will mark a division between standard and Cape gauge.

Malawi is connected currently only to Mozambique (and Chipata, Zambia). There are no plans to convert the railway in Mozambique – not least because Mozambique is connected to Zimbabwe and ultimately to South Africa. The entire network is mainly Cape gauge – so if any single country were to convert they would risk losing the benefit of being part of an international network. When Malawi last lost its international network connection – during the Mozambique civil war – railway volumes collapsed.

If the Tazara line were converted to standard gauge and if a line were built from Tanzania to Malawi then such a connecting line should be standard gauge, However as it stands today any extension into Malawi from the Tazara line should be at Cape Gauge as then it could connect at both ends. There are no plans to convert the Tazara line to standard gauge.

**Figure 2.1 New alignment close to Phalula**

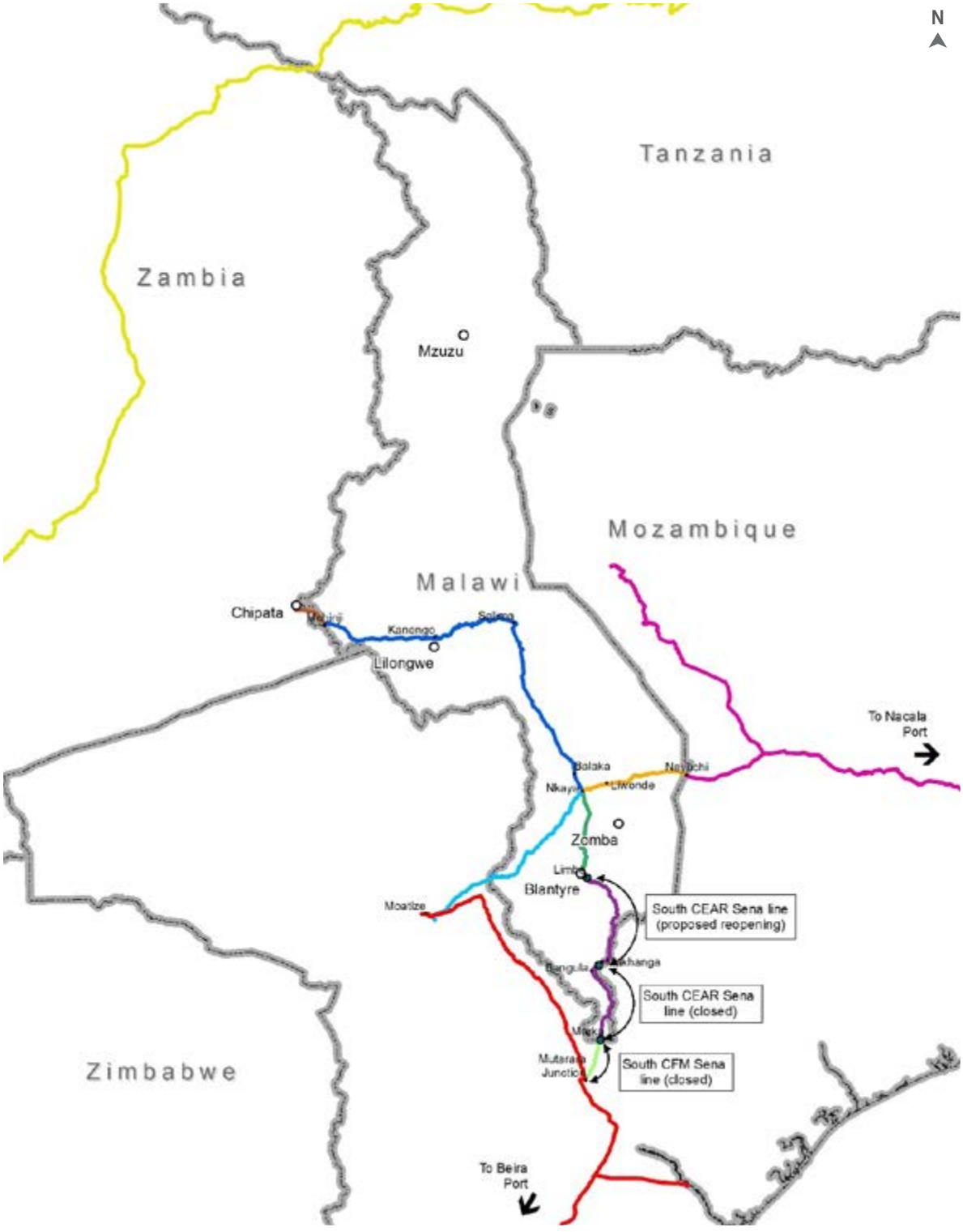
New alignment close to Phalula, showing the high quality of the track bed (with new track, concrete sleepers and Pandrol clips), the new built road bridge and drainage.

## 2.3 West: Nkaya – Kachaso

This railway branch line is 136.5 km long and is newly built. It is not part of the historic legacy included within the 1999 CEAR concession. Railway operations only started in 2015, with volumes building over 2016 when some 6.6 million tonnes of coal traffic were carried. From 2017 traffic volumes on the line are expected to grow further. At its maximum, the line is forecast to carry up to 8 trains per day each way – which equates to about 18 million tonnes per annum of coal traffic.

The concession for this branch is owned by Vale Logistic Limited (VLL), a wholly owned subsidiary of the Vale SA, although ownership will transfer to the Government of Malawi

## Figure 2.2 Map of concession areas




**Legend**

- Mozambique: CDN
- Mozambique: CFM
- North CEAR
- South CEAR Sena line open
- South CEAR Sena line closed
- South CFM Sena Line (closed)
- East CEAR
- Tazara Railway
- West VLL/CLN
- Zambian Railway Ltd.

ATKINS

WS Atkins International
Woodcote Grove
Ashley Road
Epsom
Surrey
KT18 5BW

Tel: +44 (0) 1372 726140
Fax: +44 (0) 1372 740055

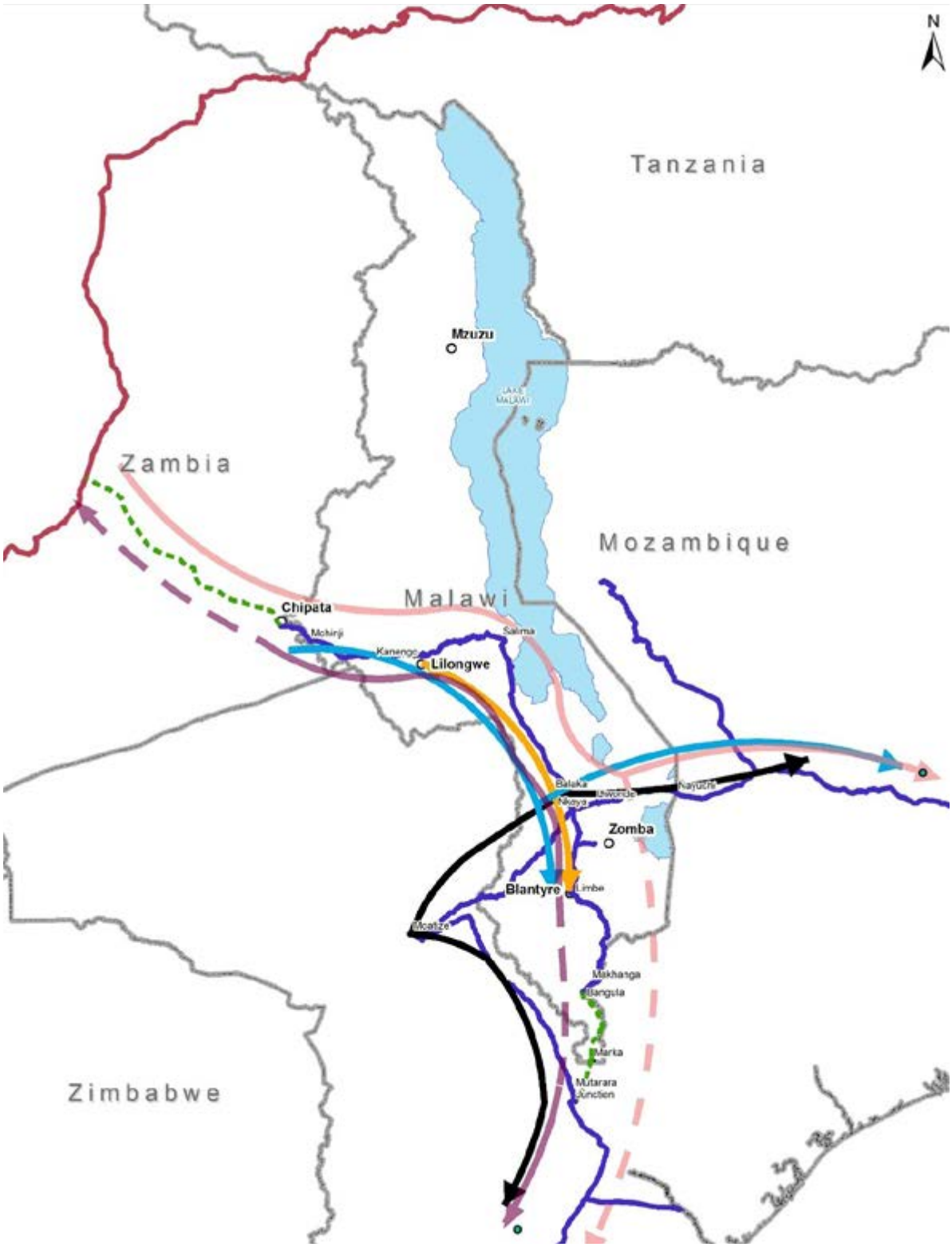
**Client:**

Government Of Malawi

**Project:**

National Transport Master Plan

## Figure 2.3 Map of main traffic flows




**Legend**

**Proposed traffic flows**

- Beira Options
- Beira Traffic
- Copper Belt
- Copper Belt Options

**Main traffic flows**

- Coal
- Domestic
- Imports/exports

ATKINS

WS Atkins International
Woodcote Grove
Ashley Road
Epsom
Surrey
KT18 5BW

Tel: +44 (0) 1372 726140
Fax: +44 (0) 1372 740055

**Client:**

Government
Of Malawi

**Project:**

National Transport Master Plan

## Figure 2.4 Map of existing condition of the railway network in Malawi


**Legend**

- 20.5 Tonnens/Axle
- 18 Tonnens/Axle
- 15 Tonnens/Axle
- 15 Tonnens/Axle proposed for rebuild for 2019
- N/A of fully closed

ATKINS

WS Atkins International
Woodcote Grove
Ashley Road
Epsom
Surrey
KT18 5BW

Tel: +44 (0) 1372 726140
Fax: +44 (0) 1372 740055

**Client:**

Government Of Malawi

**Project:**

National Transport Master Plan

at the end of the Corridor Agreement and the CEAR Concession period (which are co-terminus). All the other railway routes within Malawi are part of the CEAR concession.

The line has been built to handle 20.5 axle loads. It consists of a single track with five passing loops. Each loop is long enough to handle two passing 120 wagon trains plus 4 locomotives plus a small amount of extra length as operational spare land. Authority to proceed between loops is controlled by a satellite system although a recent decision has been made by CEAR to replace/supplement this with a radio-controlled system which is expected to have better reliability and coverage. The exact cost of building this route section in Malawi is not known but from a combination of press reports and conversations with CEAR and the Government of Malawi staff it is assumed to be around US$800-870 million. This represents the bulk of the US$1.1 billion that Vale stated that they would spend in Malawi, excluding the US$200 million spent on Nkaya – Nayuchi and the US$42 million spent on the remaining routes.

The traffic on this route is exclusively operated by Corredor Logístico Integrado do Norte (CLN), a wholly owned subsidiary of Vale. CLN collects the revenue payable for the coal traffic from Vale. CLN pay a fee to VLL for operations over this section (as well as to CEAR and CDN for access and track maintenance over their respective and separate concessions within Malawi and Mozambique). CLN own the wagons and the locomotives required to operate the coal traffic. The commercial and contract arrangements that govern the coal traffic mean that it is effectively outside of the influence of the Government of Malawi – and because the traffic is transit in character, it impacts on Malawi more widely only indirectly. However, the financial benefit that follows to CEAR (and therefore to Malawi) is significant.

No regular traffic, other than transit coal traffic, runs on this route and when the coal traffic hits its forecast maximum of 18 million tonnes per annum that there will be insufficient capacity to allow other trains to operate without further investment. This section has loops on average every 26 km for 16 trains in total per day (both directions). In comparison, the Nkaya – Nayuchi section has 6 loops and is 98.6 km long (has on average a loop every 16.5 kms) which is

**Figure 2.5 Coal locomotive used on the new alignment**


Coal locomotive of the type regularly used on this route on this occasion hauling CEAR civil engineering department wagons.

proportionally greater even though the Nkaya – Nayuchi section carries up to 22 trans per day (both direction 8 loaded coal, 8 coal empties 2 general freight west and 2 east, and 1 return passenger service). It is likely that one or more extra loops would be required for each train per day per direction needing capacity over this section. The exact number depends on the location of the loops, local timetabling and the willingness of VLL and CLN to use the loops as holding locations to allow trains to pass. These loops should be relatively simple to construct but will have a cost particularly as they may not be optimally located on sections where the land is flat and/or relatively easy to build on.

The line speed over this section varies but is typically 70 kmph. The existing coal traffic takes about 2-3 hours to be hauled over this route. The average operational speed is therefore slower than 70 kmph. There is no significant difference in the time it takes to operate trains west or east. From Moatize the coal trains typically take around 12/14 hours to Nkaya and around 27 hours to Nacala in total.[27]

27 *Source: Interview with CEAR (Chimeta Mulamba) for this commission on 28th March 2017.*

## 2.4 East: Nkaya - Nayuchi

This railway line is around 99 km long to the border and is newly rebuilt. It is around 700 km from the border to Nacala. The reported cost of this rebuild is around US$200 million.

This line falls under the CEAR concession even though the dominant traffic carried is transit coal. CLN operate the coal trains over this section and CEAR is paid an access and track maintenance fee for each coal train. East of Nayuchi within Mozambique the concession is operated by CDN, also a subsidiary of Vale and with whom CEAR have a very close management and trading relationship including use of a common pool of staffing and rolling stock resources (with a "wooden dollar" reconciliation system).

The branch line has been rebuilt to handle 20.5 axle loads. It consists of a single track with six passing loops, including the yard in Liwonde. Each loop is long enough to handle two passing 120 wagon trains plus locomotives plus a small amount of extra length as operational spare land. Authority to proceed between loops is controlled by a satellite system although a decision has been made to replace/supplement this with a radio system for better reliability and coverage and to be consistent with the rest of the coal line.

The formation is almost identical to the Nkaya – Kachaso.

Excluding CEAR's own engineering and operational trains services ("light locomotives", engineering trains and wagons for maintenance and repositioning), three types of train traffic run on this corridor:

1. The most important of these is transit coal traffic. This is planned to increase to 8 trains of 120 wagons per day in each direction.
2. Capacity has been reserved for up to two trains per day in each direction for Malawi international traffic – that is traffic exporting goods from Malawi or importing products to Malawi. This definition also includes transit trains to/from Zambia or trains that include part loads of transit traffic to/from Zambia. The general goods trains are typically operated with up to 35-40 bogie wagons but this will increase to 42 wagons from June 2017 and could also in theory be extended to 120 wagon trains if required.

**Figure 2.6 Rebuilt line at Liwonde**

3. There is a weekly locomotive hauled passenger service, although the concession agreement stipulates that there should be sufficient capacity for a daily service (which there is). The passenger train connects communities on the line between Nkaya and Nayuchi with Balaka, Blantyre and Limbe (see below for more detail on the separate section on the passenger service).

There are no major domestic terminals on this route except at Liwonde where adjacent to the yard are two warehouses with the sidings owned by Agricultural Development and Marketing Corporation (ADMARC) and the Malawi Fertilizer Company (MFC).

Coal trains on this route are pre-cleared for customs are not typically required to be checked at Nayuchi, although they do stop at Liwonde for around 15 minutes. However, that is not the case for general goods traffic. Westbound general freight trains from Nacala are currently checked at the border for around 1 hour (mainly to log paperwork). After being logged they are allowed to proceed over the border at Nayuchi. They are typically delayed for a further (approximate) 1 hour for customs clearance at Liwonde. The current plan is that the Liwonde operation will move to Nkaya where the trains typically need to be remarshalled anyhow so this is to be welcomed. Eastbound general freight trains travel to the border directly where they are delayed for approximately 1 hour. They then proceed to Entre Lagos where they are formally cleared for customs into Mozambique. Eventually it is hoped that customs clearance will become unnecessary when pre-clearance is agreed for trains starting at Nacala port. This would offer rail a significant modal advantage over road where obtaining customs clearance can take several hours or days but more significantly would reduce transit times and costs to Malawi.

**Recommendation**
Continue with the move of customs clearance from Liwonde to Nkaya.

**Recommendation**
Establish One Stop Border Post (OSBP) at Nayuchi- Entre-Lagos border. Alternatively, import cargo should be cleared at Nkaya only. Customs should allocate officers to work during weekends to clear exports.

**Recommendation**
Continue to seek customs pre-clearance to remove the need for stops for customs as far as possible.

The line speed over this section varies but is typically a maximum of 70 kmph, although general cargo trains can typically operate at no more than 60 kmph. Whilst the line speed is up to 70 kmph the operational speeds achieved are significantly slower. There is a specific requirement within the concession agreement that coal traffic takes no longer on average on an end to end basis (defined as Nkaya yard and Nacala yard) and a metric to ensure that the average speed of general freight trains is no less than 90% of the coal trains. The existing coal traffic takes about 3 hours to be hauled over this route. The general goods traffic takes around 4.5 hours but this includes time for customs clearance. CEAR have confirmed that there is no significant difference in the time it takes to operate trains west or east.

## 2.5 South: Nkaya – Limbe – Marka

This route section is part of the CEAR concession and forms the historically most important branch line of the Malawi railway network – the "Sena" line. The entire route section to the border is 297 km in length but around 200 km of the route is currently non-operational. Only the section between Nkaya and Limbe is currently in operation for freight and passenger traffic. This section is discussed first in more detail below. The section between Limbe and Marka is discussed also in the next chapter as this section is expected to be brought back into operational use. The reminder of this route between Marka and Mozambique is discussed in the final section below.

### 2.5.1 Nkaya – Limbe

This section is 96 km long. Freight trains from/to Limbe are generally made up of only up to 35 - 40 wagons and two locomotives – though this is expected to increase to 42 wagons from June 2017 with extensions to the loops and other works currently underway.

Having the line at 18 tonnes rather than 20.5 tonnes means that each 2-axle wagon can carry around 5 tonnes less each in terms of payload than on the main east-west, coal route. The payload differential is twice the axle load difference for wagons with 2 axles – although in theory the tare (empty) weight of the wagon may be lighter on a lower axle load railway which could allow marginally more payload to be carried. It also means that some of the more powerful locomotives – the C30s – cannot be used on this railway. The smaller substitute locomotives that must be used – such as the types U20/C and GT26 – and these typically have less tractive effort and can only haul a smaller number of wagons. CEAR do not yet use GT26 type locomotives on this section because they have not been approved for use by the Government of Malawi. For this reason, the trailing load is currently limited (for 2 locomotive trains). Upgrading the axle load of a route would require significantly more expenditure.

**Figure 2.7 Replacement of sleepers and upgrade of the route north to Lunzu[28]**

The line to Limbe is 18 tonne axle load. This was recently raised from 15 tonnes. This was paid for by CEAR with financing from Vale although the debt is a liability on CEAR's accounts.

28 *Photographs of the replacement of sleepers and upgrade of the route north of Lunzu adjacent to the M1 in late 2016 taken by the consultant.*

**Recommendation**
Type GT26 locomotives to be licenced for this route to improve operational flexibility.

The cost of upgrading the axle load per tonne on this route is discussed in more detail later in this report. Currently CEAR would not benefit immediately from any increase in the axle load as the wagon fleet and most of the locomotives that could be used on this branch do not need 20.5 tonnes/axle route capability. However, the economics will change over the medium-long term; should the rest of the Sena line be rebuilt.

The line speed over this section varies from 25 to 50 kmph. The line is currently typically up to 50 kmph north of Namatunu (262km) and up to 40 kmph south to Blantyre. Between Blantyre and Limbe the line is 25 kmph. Transit times between Limbe and Nkaya were typically around 7 hours in the past but in early 2017 they were reduced to around 5 hours. Works are currently underway that will reduce this still further to around 4 hours in 2017.

Currently the Limbe branch operates using a paper system to control train operations but this is under review as CEAR hope to extend the existing satellite or proposed radio system. Having a separate system to the east-west line (Kachaso – Nkaya – Nayuchi) to other lines is not a fundamental problem operationally, however, having a token or paper system can cause difficulties as it means that the capacity of the network is harder to manage on a real-time basis from a central location. Having a central control capability will make it easier to run a more punctual and faster railway. It is also likely to be safer as it reduces local operating autonomy and increases the ability of the central controller to intervene in the event of a line failure (such as track defect) or should there be "two trains in section".

**Figure 2.8 Photo of 2016 track rebuild between Limbe and Lirangwe[29]**

**Recommendation**
Review potential extension of east-west route train control system to include Limbe branch.

It is worth noting that whilst the station facilities are very basic. At most smaller stations, there is no platform and the station building is some distance from the track, but it can be seen from photographs (refer to Figure 2.8) that the line has been mostly refurbished with concrete sleepers and modern track fastenings, and is well ballasted. However, the station at Maleule siding looks in relatively poorer condition and this is thought to explain why the train discharged and loaded passengers on the mainline even though this potential uses capacity.

29 *http://www.mbc.mw/index.php/component/k2/item/2312-rehabilitation-of-limbe-lirangwe-railway-line-to-be-completed-in-july. The same photo can also be found also on CEAR's website.*

## 2.5.2 **Limbe – Makhanga**

This section is 120.6 km long. and is non-operational although the expectation of CEAR and the Railways Division of the MoTPW is that this section as far south as Sandama will be brought back into use in 2019 with the cost being borne by CEAR. It is not clear whether this is an explicit part of the 2017 revision of the concession agreement or a separate commitment by CEAR to the Government of Malawi. Some feasibility work has been completed already and surveys are currently underway to confirm the cost. CEAR (and the Government of Malawi) also intend to extend the refurbishment a little further to Makhanga and surveys are expected to start after the initial phase of work and until these have been completed there is not expected to be any formal and firm commitment from CEAR and/or the Government of Malawi. However, the CEAR website has recently refreshed to include an article titled "Nkaya – Mchinji rehabilitation on the cards."[30] This states:

*"CEAR has embarked on a multi-million Kwacha rehabilitation of Nkaya – Mchinji railway line in an effort to improve its services this part of the line. The 2-year project has started with engineers and contractors inspecting the line before the submission of tenders for the actual work to begin."*

From 2019, it is expected that CEAR will operate a passenger service over this route. There will be some potential freight traffic – mainly sugar, cement, fertilizer, tobacco and general goods. This though this is not thought to be significant currently as most of the large historic freight users of this route are located south of Makhanga and the Chiromo (the Shire River Bridge) washaway, but there will be some additional traffic and this is expected to grow. For this reason, at this point the intention is only to restore the historic line speed and gauge of the route prior to its closure – that is to 15 tonnes axle load only. This however is not a problem for passenger trains which typically do not have heavy axle loads.

30 http://www.cear.mw/index.html. *The web posting goes on to say: "The works will among other things involve replacing of rails in critical areas of the line, putting ballast stone, placing concrete Sleepers and repairing bridges. Once completed, CEAR expects to have more local cargo like tobacco, sugar, cement and general cargo."*

**Figure 2.9 Maleule station track**

Track (top) and siding (bottom)

### 2.5.3 Makhanga – Marka – Mutarara

From Makhanga there is only 77 miles to the border with Mozambique at Marka (Malawi) and Vila Nova de Frontiera (Mozambique) and only around 37.5 km to Mutarara rail junction on the east of the Zambezi where the railway could join the Moatize – Beira line, and subject to its proposed construction to the branch to Macuse also. At Beira there is an opportunity to connect with existing freight services to Durban via Harare, Zimbabwe – from the Republic of South Africa to Mutarara Junction; this is the same route the new passenger carriages were brought to Malawi.

This section includes the bridge at Chiromo near Bangula over the Shire River that was washed away in 1997. Options for this route are discussed in more detail later in this report.

## 2.6 North: Nkaya – Mchinji and Chipata

The north branch between Nkaya and Mchinji and the Zambia border near Chipata is also part of the CEAR concession and is the longest of the four routes. It is 12 km from Chipata to Mchinji and 110 from Mchinji to Kanengo, 105.5 km from Kanengo to Salima and 172 km from Salima to Nkaya. In total that is around 400 km. The concession from the Malawi/ Mozambique border from Nayuchi to Chipata is operated by Zambian railways. The line terminates at Chipata around 389 km from the Tazara line and around 150 km from the Patauke mine in Zambia.

Line speeds vary but even though the track geometry allows trains to operate at 50 kmph (with 15 tonne axles) they typically only run at up to 50 kmph from Nkaya to Salima and at 25 kmph west of Salima. Some track refurbishment is underway but this is not expected to raise line speeds significantly. Typical services take about 20 hours to run between Mchinji and Nkaya and 4 hours between Kanengo and Salima.[31]

31 *Source: CEAR Operations department interviews for this concession 28th March 2017.*

**Figure 2.10 Private freight sidings near Luchenza between Limbe and Makhanga**


The maximum load is 18 tonnes between Chipata and Salima (via Kanengo and Mchinji) and 15 tonnes per axle between Salima and Nkaya. The lower axle lower south of Salima effectively limits the maximum axle load for all trains to/from Nkaya and further. Having the line restricted 15 tonnes axle loads rather than 20.5 tonnes (or 18 tonnes) means that wagons carry around 11 (or 6) tonnes less each in terms of payload than on the main coal route. It also restricts the locomotives that can be used. The lighter weight locomotives – type U20/C that can be used – have a lower tractive effort. They typically can only haul 30 - 35 wagons but a successful test has been completed to operate eastbound with 39 wagons. The constraint on this section is thought to be the trailing weight of the train from the combination of the steep gradients[32] from Salima west towards Kanengo and tight curves on that section rather than the length of the trains.[33] This constraint will not apply to loaded trains running east and south from Chipata (or from further within Zambia), Mchinji or Kanengo so these trains heading towards Nacala (or Beira) could be longer than trains heading from Nacala particularly if the backload was part empty.

This route has suffered significantly from recent wash ways particularly between Balaka and Salima. A photograph of the track under water at Balaka after a short downpour of rain is shown above but the main damage is not caused by surface water but when water running off the railway removes ballast, and in extreme cases the track, in the process. A feasibility study on the Nkaya – Mchinji section was undertaken in June 2016. Significant work has been undertaken to rectify this and upgrade the spots on the route that have suffered from poor maintenance. According the 8th Joint Transport Sector Review (JTSR)

32 *Around 32.5% of the route between Salima and Kanengo is on some gradient with a maximum gradient steepness of 1.663%. The Nkaya – Salima section has a steeper maximum gradient of 1.754% but that is only for what are thought to be very small sections and only 2.2% of the route section has any form of gradient. There are no gradients between Kanengo and the Zambia border. Source: Feasibility for the Rehabilitation of the Mchinji to Nkaya Railway Line in Malawi; Feasibility Report; June 2016 by TEAM Engineering in partnership with D'Appolonia, page 21.*

33 *Much detail on the alignment of the route can be found in the GOPA (COWI Consortium including Atkins) report for the EU: Malawi: Beneficiary Framework Contract Lot 2 – Transport & Infrastructures – technical Assistance to Rail Sector Development. Draft Final Report. May 2009. Page 21.*

**Figure 2.11 Track under water near Balaka**

**Recommendation**
Conduct further trials to test the maximum trailing load west and east between Nkaya and Kanengo and Chipata – partly for publicity and partly to plan potential traffic on this route in a way that optimises efficiency.

Action Plan this work is due to be completed by June 2017. This is a significant task. There are 830 structures between Nkaya and Mchinji[34] Once this remedial work is completed it is recommended that CEAR conduct further trials to test the maximum trailing load between Kanengo and Nkaya and between Nkaya and Chipata for the different types of locomotives that might be used.

The variable quality of the track on this route can be seen in Figure 2.12, west of near Salima. It is clear from these that some sections are in a good condition but other sections are in a much poorer condition.

34 *Feasibility study for the rehabilitation of the Mchinji to Nkaya railway line in Malawi, June 2016, for the Malawian Ministry of Transport and Public Works, page 28.*

**Figure 2.12 Track quality of north line near Salima**

Figure 2.13 shows the north line from near Kanengo and show the variable quality of the track within a small section. The first picture shows the track on the branch into Kanengo yard itself.

**Figure 2.13 Track quality of north line near Salima**

### Figure 2.14 Track condition between Sharpeville and Golomoti


Figure 2.14 shows track condition between Sharpevale and Golomoti. These also show the highly variable quality of the track in relatively small section that is used by the same trains. This would suggest that CEAR is restoring and/or renewing the track as required on a spot renewals basis and it may be worth considering whether these spot works could be more effectively replaced by preventative renewals /maintenance and whether renewing/ maintaining to a higher axle load may be a cost-effective means of progressively upgrading the route. It is possible that some of the track may have been already upgraded as the quality of the track in the bottom left photo of Figure 2.14 near Sharpeville would suggest.

Currently the Nkaya – Mchinji - Chipata branch operates using a paper system, but CEAR have suggested that over the medium-term consideration will be made whether this may be replaced with an extension of the existing satellite or proposed radio system. Having a separate system to the east-west line (Kachaso – Nkaya – Nayuchi) to other lines is not a problem operationally. However, having a token or paper system can cause difficulties. It means that the capacity of the network cannot be managed on a real-time basis from a single, central location. As with the southern route, improving the punctuality and the speed of trains will be easier with a central train control, particularly if the rest of the network is also controlled from the same point. A radio system will be safer as it reduces local operating autonomy and allows central controllers to intervene when required, such as should there be "two trains in section."

**Recommendation**
Review potential extension of east-west route train control system to also include north branch.

The branch to Mchinji and Chipata has not got the same number of historic or existing customers as the branch to Limbe, not least of all because of the frequent breaks in service and the poor rail speeds though also because the area has less industry and the line was not built until much later than the Sena line. However, the line includes Kanengo (the main yard for Lilongwe) and the connection to Zambia. The line only extends into Zambia for a short distance but by doing so it allows exporters and importers to more easily use rail to access the port facilities at Nacala. There is significant traffic potential from Zambia – in particular imports to Zambia and clinker and metals exports from Zambia. This flow is discussed in more detail later in this report.

The very southern section of this route between Bilila and Balaka and Nkaya has a regular passenger service. There is no passenger service north of Bilila to/from Salima, Lilongwe (Kanengo), Mchinji and/or Chipata.

## 2.7 Track maintenance and renewal

CLN/VLL contract all infrastructure maintenance. This avoids CEAR having to run its own separate, complicated and expensive tender process. Currently in Malawi Monteagle is used for most maintenance and renewals work.

Maintenance is then charged to CEAR and the other concessions. The 2016 accounts suggest that CEAR paid around US$400k for track maintenance but this is probably lower than would be the case given that CEAR has been replacing assets rather than maintaining them at key locations. It is not clear that this level of maintenance is sufficient given the cost of the upgrade of the line between Nkaya and Nayuchi (around US$200 million) and works on the remainder of the route (part of US$52 million). It is expected that this figure will increase as the upgraded track ages. Over the whole life of the railway asset this should be sufficient to ensure that the railway is being maintained and renewed.

**Figure 2.15 Monteagle track machines near Liwonde and a wagon near Nkaya**

Whilst the sections of the railway are relatively new and should need less maintenance/ renewal and whilst traffic volumes are still growing including for the coal traffic, it is to be expected that CEAR maintenance/renewal costs will be low but the Government of Malawi need to ensure that these rise appropriately to be certain that the infrastructure is being kept in good condition. Most freight railways fail commercially when maintenance/renewal is not undertaken and thus traffic levels fall to a point where such work can no longer be afforded. The appropriate forecast cost for track maintenance is discussed in the financial chapter in this report in more detail.

**Recommendation**
That the Government of Malawi review the level of track (and other) maintenance by CEAR. In addition, the Government of Malawi need to review the level of renewals.

## 2.8 Stations

A full list of operational stations, taken from the Working Timetable supplied by CEAR, is shown in Table 2.1. This includes the type of station, and whether it is busy or not, according to the CEAR's descriptions. All the stations between Makhanga and Limbe are not currently operational so are not shown.

Visits were made to several major stations (categorised as large or medium in the list above) to examine the facilities available. These stations included Balaka, Liwonde, Blantyre and Limbe. All the stations were reasonably well maintained, with improvement projects in evidence at Blantyre and Liwonde (although it wasn't clear if these were for track works or for the station environment).

All the large and medium stations visited were staffed with a station master. All stations comprised a covered waiting area, either through the provision of an inside waiting room, or on the porch underneath a veranda. Office facilities were in evidence at all stations, including ticket windows, and a notice board was available with general notices and fare tariffs. Toilet facilities were also available at the stations visited on request but it was not clear that the toilets would be open for most passengers.

**Figure 2.16 Track renewal work being undertaken in Limbe yard**

**Figure 2.17 Balaka station and Chipala station**

Top: Photo of Chipala station (disused) west of Salima

Bottom: Passengers waiting at Balaka station for a delayed train (later cancelled)

### Table 2.1 Operational stations

| Station name | Type | Busy/not busy |
|---|---|---|
| Limbe | Large | Busy |
| Blantyre | Large | Busy |
| South Lunzu | Halt | |
| Maleule | Small | Not busy |
| Lirangwe | Small | Not busy |
| Namatunu | Small | Not busy |
| Gwaza | Halt | |
| Shire North | Small | Not busy |
| Njerenje | Halt | |
| Utale | Small | Not busy |
| Nkaya | Small | Relatively busy |
| Bazale | Halt | |
| Rivirivi | Halt | |
| Balaka | Medium | Relatively busy |
| Khwiza | Halt | |
| Faringdone | Halt | |
| Bilila | Small | |
| Mululu | Small | Not busy |
| Mitengwe | Halt | |
| Liwonde | Large | Busy |
| Chinyama | Small | Not busy |
| Molipa | Small | Not busy |
| Lambulila | Small | Not busy |
| Mbanila | Halt | |
| Namanja | Small | Not busy |
| Mphonde | Halt | |
| Likhonyowa | Halt | |
| Nayuchi | Medium | Busy |

In addition, a number of smaller stations and halts were visited. At the smaller stations, there is often a small station building but no facilities, with no buildings at the halts. In these cases, passengers boarding/alighting the train do so directly onto the trackside. Station staff were not seen.

Figure 2.18 show one of the large stations at Balaka.

It is recommended that an inventory is carried out at each of the stations to check that the facilities are well maintained, and any improvements carried out that are required.

In line with the earlier recommendations space should also be made for displaying timetables, fares and for the provision of the 'Next Train' sign in each direction. Whilst this will be straightforward at most of the medium and large stations information should also be provided at the smaller stations and the halts.

The photographs of the station in this section show the station at Balaka, during a short, but heavy downpour. Even with this short storm

the station was soon inundated, with the ground, including the track, covered in about 6 inches of water. Given that the station at this location is on the same level as the track it was very difficult to access the station. In the instance where a train arrives this would have resulted in all of the passengers getting very wet to access the train. It is therefore recommended that during any inventory consideration is given to drainage at each of the station areas, and improvements made where necessary.

Finally, given the fact that the station is effectively the retail front for the railway, the general environment of the stations should be improved to ensure an excellent passenger experience. On the site visit to ride on the train at Blantyre on Wednesday 29th March, works were underway at Blantyre station around the station entrance, and the main station entrance was taped off. This is shown in the photograph below at which time the station was open for passengers.

This meant that passengers had to enter through a side gate, through mud and then cross a building site to access the station. This presented a very poor impression to passengers and operational measures should be put in place to avoid this situation occurring on the days that passenger services are in operation. At the very least an annual paint programme should be established for each and every station. The stations and the station boundaries should be painted in the brand colours of CEAR.

CEAR also need to decide whether the stations are open or closed to the public. If information is published for passengers and the stations are closed to the public, then any information – including station opening hours – need to be displayed where passengers can see them.

**Figure 2.18 Passenger facilities at Balaka train station**


**Recommendation**
Annual paint programme for each station. This is in addition to any maintenance plan. Take care to ensure that the station retail front is maintained appropriately.

**Recommendation**
Display station opening times in information where it can be seen by public.

**Figure 2.19 Passengers waiting on platform at Blantyre Station**

**Figure 2.20 Maleule Station - north of Lunzu**

**Figure 2.21 Early morning at Blantyre Station**

Open for passengers but not welcoming

## 2.9 Level crossings

Safety at road and rail crossings needs to be improved. A risk assessment needs to be conducted at level crossings to ensure that road authorities and network operators identify technical and operational hazards to users and manage any identified risks to people, property and the environment, including with a clear understanding of stakeholder roles and responsibilities. The standard criteria for grade separated crossings is where Average Daily Traffic (ADT) of motorised vehicles multiplied by the trains per day is greater than 50,000 within the space of a few years. Very few, if any, crossings meet this criterion in Malawi, but grade separation is nevertheless recommended in the following cases:

- New railways
- New roads
- Road rehabilitation projects, upon review of a road safety audit

In the context of at grade railway crossings the criteria for safety interventions is calculated as follows: Train Vehicle Units (TVU) = Daily traffic (motorised and non-motorised) x Trains per day. Where the TVU is less than 6,000 an unmanned level crossing with warning signs is required. Where TVU is more than 6,000 but less than 10,000 an unmanned crossing can be erected and manned on priority basis, and where the TVU is greater than 10,000 a manned level crossing is ideal.

Maleule station track

ATKINS

Malawi National Transport Master Plan

# 3 Existing locomotives and rolling stock

Rail Sub-Sectoral Plan

# 3 Existing locomotives and rolling stock

## 3.1 Locomotive fleet

The track maintenance figure above is still more than the cost of locomotive maintenance of around US$100,000.

CEAR currently have five main types of locomotive (including 2 on loan from CDN and excluding 2 locomotives that are no longer operational). They are shown in Table 3.1.

The investment in the fleet is significant. CEAR invested US$7.2 million buying 6 U20/C locomotives at $US1.2 million each (this includes 2 trains "lost" – assumed damaged beyond repair in a derailment from a river bridge). In addition, CEAR spent around US$300,000 refurbishing each of the MLW locomotives which are mainly used for general cargo.

In total CEAR have 10 mainline locomotives and 2 shunt locomotives. This is a significant enhancement on the fleet that CEAR had to operate in the past. This included four locomotives sent by Taiwan in 2006 which seem to have only been capable of being used for shunting or not all. The remnants of the fleet seem to be non-operational.

**Figure 3.1 Locomotive gifted by Republic of China (Taiwan)**


Now thought to be non-operational

CEAR operate a separate fleet but there is clear synergy with the CDN fleet. For example, at the moment CEAR are borrowing 2 U20/Cs. CDN also operate C30s and GT26s, as well as U20/C and MLW locomotives. The locomotives shown in Table 3.2 are used regularly within the CEAR concession area.

**Table 3.1 CEAR locomotives**

| | Horsepower | Axle load | Weight | Axles | Number |
|---|---|---|---|---|---|
| U20/C | 1,500 | 15 tonnes | 91 tonnes | 6 | 4 (used to be 6 but 2 "lost" in derailment) |
| Montreal Locomotive Works ("MLW") | 1,500 | 15 tonnes | 90 tonnes | 6 | 6 |
| Others: Shunt locos | | | | 2 | |

**Table 3.2 Regularly used locomotives**

| | Horsepower | Axle load | Weight | Axles |
|---|---|---|---|---|
| C30 | 3,000 | 20 tonnes | 120 tonnes | 6 |
| GT26 | 2,600 | 18 tonnes | 108 tonnes | 6 |

The arrangement for borrowing and loaning wagons between CDN and CEAR works well. In addition to locomotives CEAR and CDN borrow/lend staff, wagons and other resources. A record is kept. In theory, any shortfall is reconciled, however, because normally over a year the trade is roughly even, to avoid excessive bureaucracy and because both entities are owned by Vale a "wooden dollar" process has to date proved sufficient. Currently CEAR is understood to be slightly in debt to CDN but this is reported by CEAR as to be not significant.[35]

## 3.2 Wagon fleet

CEAR operate a large and diverse wagon fleet. They also own nearly all the wagons although a minority are leased. Excluding the coal traffic where the ownership is complicated by Vale's dual role as parent of CEAR and as the end customer, and which are not used by CEAR, there are no significant number of privately owned wagons being used for general traffic.

CEAR operates around 798 wagons (excluding CLN's Moatize coal fleet and CDN's fleet). Nearly all of which have been acquired new or have been refurbished. CEAR also regularly lend or borrow wagons with CDN on a wooden dollar arrangement to ensure that between the two concessions that the two fleets are managed optimally.

The key CEAR sub-fleets include:

- Around 246 covered bogie (pallet) wagons with a tare weight of 19 tonnes and a payload of approximately 36.5 tonnes (which is low given the potential axel load of the routes would allow up to 53 tonnes).
- Around 289 container wagons ("cc"s) – consisting of low sided bogies and container flats – used for container and other traffic including around 125 for clinker traffic from Zambia.
- 84 plus ballast bogie wagons used for engineering trains and fertilizer which will include 44 refurbished high sided and 58 low side border wagons with an upgraded braking system.

**Figure 3.2 CDN mainline locomotive being used by CEAR for shunting in Limbe yard**

- 60/61 covered, refurbished wheat wagons leased by CEAR from CDN (Bogie Ballast Wagons: "BBW"s) – with a tare weight of 18 and a payload of 39 tonnes. These are due to be returned. Figure 3.4 shows these wagons.
- 100 new, hopper bogie wheat wagons – from Transnet with a tare weight of 19.5 tonnes and a payload of 54.5 tonnes. A picture of these green wagons being shunted in Limbe yard is shown above. The full fleet has been deployed since March 2017, and will replace the fleet on loan from CDN. This is a good example of CEAR investing in the capacity of the system. It is important to note that in early 2016 there was a significant possibility that Malawi might have to import significant quantities of grain to overcome the "hunger" caused by a poor rainy season. Only rail has the capacity to shift the large quantities required quickly and this investment would allow that to happen if required again. It is worth noting that these wagons were conveyed to Malawi from Durban by rail through Zimbabwe and via Beira and Moatize in Mozambique helping prove the potential viability of that route.
- Around 61 Tank wagons ("FT"s) used for diesel with a tare weight of 19 tonnes and a payload of between 38 and 43 tonnes. Some wagons have been recently damaged in a derailment and are temporarily stored in Limbe yard.

35 *Source: Interview with the Financial Controller of CEAR for this commission held on 28th March 2017.*

Figure 3.3 Bogie covered (pallet) wagons in Limbe yard

Figure 3.4 CDN BBW wagons


Figure 3.5 CEAR grain hopper wagons

Figure 3.6 Diesel tank wagons in Blantyre


Figure 3.7 Disused type of tank wagon from Kanengo yard (2016)

In addition, to manage the expected traffic from Zambia, Zambia Railways has fleet of around 49 flats and low box wagons and around 20 high sided box wagons.

It is worth noting that the loaded wagon of most CEAR fleet is 15 tonnes per axle or less – for example the bogie diesel cars normally weigh around 60 tonnes – which is 15 tonnes per axle. However, in order to operate block trains as efficiently as possible it may be necessary on routes that permit higher axle loads to use wagons with bigger payloads – in particular should CEAR carry regular mining traffic from Zambia or a new mine in Malawi.

Because CEAR have been actively refurbishing the existing fleet and leasing/buying new wagons, as well as losing some wagons to accidents and sending others back, the exact size of the fleet is not fixed and is still growing. This refurbishment programme is not yet fully complete. CEAR have, for example, replaced the vacuum brakes on the over 80% of their fleet with air brakes (March 2017) but vacuum braked trains still operate and may continue to do so until May 2017 or later. However, over the last two years CEAR have invested in a large and diverse fleet that should be sufficient for any gradual increase in general traffic for the next few years, particularly if CEAR can persuade their customers to improve their operational efficiency.

One of the key issues for CEAR is wagon efficiency and utilization. This is made more pressing by the significant investment in acquiring new and refurbishing old wagons. At the moment, the cost of wagons is not disaggregated in customers' bills but is included in the haulage price. This means that customers and other agents are not commercially incentivised to utilize the wagon fleet efficiently. This might be acceptable if CEAR can enforce a strict timetable with its customers that ensures the efficient loading and discharge of its wagons – via commercial incentives. However, even on the best managed flows the actual transit time only accounts for half or less of each wagon cycle. For most customers, the percentage of transit time is even less. This matters because it is only whilst traffic is in transit that CEAR can charge freight customers.

CEAR understands this issue. They have undertaken an analysis of their key customers and the main terminals including Nacala Port to assess what takes so long to load and discharge each wagon set. For example, at Bakhresa's facility in Limbe, the discharge of the grain wagons is slow because of conveyor system that can only unload one wagon per hour, shunting difficulties because of a lack of space which adds to the cost for CEAR as they undertake the shunting and the favouring of trucks over rail. Other customers tie up rail wagons by using them as mobile or static storage.[36]

### 3.2.1 Use of private wagons

Currently no customers of CEAR lease their own wagons – except the coal fleet. Wagon provision is seen effectively as a "free good" without any cost by most customers in the interviews held with them. For this reason, it is recommended that existing and new customers' bills are disaggregated so that the wagon charge is explicit. Calculating this will be easiest for customers who have or could have a dedicated wagon fleet but this accounts for a small minority of CEAR's customers. This should be sufficient to generate a discussion between CEAR and its customers as to how they can get this reduced. It is recommended that a formula be developed to underpin the wagon charge and that this reflects the utilization level of the wagons in part – so that customers can see that if they half the turnaround times what the commercial gain is for them. Customers should be incentivised to discharge and load wagons quicker – and consider leasing their own wagons. This though will be a gradual process. It is important to note that this is not a recommendation that haulage rates are increased as CEAR already sets these at market rates, merely that the wagon element is disaggregated.

**Recommendation**
That wagon element of haulage fee be disaggregated so that customers are incentivised to use wagons more productively.

36 *CEAR/CDN presentation and report on Nacala Logistics Corridor: Getting ready for the future.*

### 3.2.2 Private siding shunting

Because some customers see shunting as a "free good" without any cost to them, they do not seek to minimise the cost to CEAR. Therefore, to prevent customers improving their wagon turn-around times by increasing the shunting workload on CEAR, it is recommended that in addition where CEAR undertakes local shunting that this cost is also disaggregated so that customers who work with CEAR to reduce the cost and complexity of shunting at their sidings will see a fall in the bills. Whilst CEAR might need to minimise any shunting on the mainline shunting within customers' own facilities might be undertaken by their own shunt locos or other technology such as "mules", cables or converted road vehicles. It is important to note that this is not a recommendation that haulage rates are increased as CEAR already sets these at market rates, merely that the shunting element is disaggregated.

**Recommendation**
That shunting element of haulage fee be disaggregated so that customers are incentivised to use locomotives and rolling stock more efficiently.

### 3.2.3 Other assets

Non-operational assets such as housing are not the subject of this plan.

ATKINS

Malawi National Transport Master Plan

# 4 Existing services

Rail Sub-Sectoral Plan

# 4 Existing services

## 4.1 Freight services

In order to describe the method of operation of freight services they have been divided into three categories: Transit, (Malawi) International and (Malawi) Domestic freight traffic, each of which are operated differently.

Freight volumes are discussed in this report in more detail later in this report.

### 4.1.1 Transit freight traffic

Transit trains account for the majority of traffic on Malawi's railway network.

CLN are moving increasing volumes of coal traffic, which is expected to grow to up to 8 trains per day each. Each coal train consists of 120 wagons and 4 locomotives. Each train is operated as a single block train. This is the most efficient way of operating freight trains and is consistent with international best practise.

In addition, there has been some transit traffic between Chipata and Nacala. At the moment though this traffic is highly irregular and is typically combined with Malawi wagons to/ from Nacala. If a block train is run it will be formed of around 30-35 wagons, although a trial has been conducted with 39 wagons. It is unclear if any test train has been run to ascertain the maximum trailing load westbound (towards Mchinji). At the moment, the operational practice for these trains is that

**Recommendation**
Undertake a trailing load test westbound upon completion of current track restoration work. Use this test and previous test to determine the maximum load with existing axle load. This will be useful if the line from Chipata is extended prior to any extension of the Chipata branch line to further within Zambia.

Figure 4.1 CEAR container train[37]

Zambian Railways will haul the traffic between Kanengo and Chipata, CEAR haul the traffic between Kanengo and Entre Lagos, and CDN haul the trains between Entre Lagos and Nacala.

### 4.1.2 (Malawi) International freight traffic

These trains are typically formed of traffic to/from the Limbe (south) route although there is more irregular traffic to/from the Nkaya – Chipata (north) line also. Most Limbe line international trains are composed of up to 42 wagons, though often smaller, with 2 locomotives. The trailing load of trains from Kanengo/Mchinji/Chipata is typically 30-35 bogies although a successful (eastbound) test train has been operated with 39 bogie wagons. Block movements directly from the customer sidings in Limbe or Blantyre (or Chipata/Mchinji/ Kanengo) to the Nkaya yard are now run wherever practical. This is a change. CEAR used to effectively operate a mixed traffic train on a daily (or near daily) basis. CEAR now attempt to plan on the basis on block movements and a weekly train plan, although they typically have to actually re-write that plan day to day (except over the weekend) to accommodate customer demands. Conversations with CEAR's planning department suggest that they have been broadly successful in persuading a significant part of their customers to move to a block train

37 http://www.cear.mw/press.html

arrangement rather than have to make up trains in Limbe and Blantyre from wagonload traffic, and that they are slowly succeeding in reducing the number of unplanned train movements. The least consistent traffic are fuel and fertilizer.

Trains from Nacala stop at Liwonde to be cleared by customs. This typically takes around 1 hour. This is in addition to a further 1 hour required at the border itself to confirm the train manifest is consistent with the actual trains seeking to cross. Westbound trains have a similar arrangement with CDN using Entre Lagos instead of Liwonde. CEAR are currently working with the Governments of Malawi and Mozambique to move the customs clearance to Nkaya which will save one hour.

CEAR's website suggest that customers should expect an average transit time from points within Malawi to Nacala of 34 hours.[38] However this contradicted with what both Illovo and CEAR suggested in their interviews has been historically and typically achieved, although recent improvements mean that this target time should now be very much more deliverable.

One of the key problems for CEAR clients from their direct feedback is that they do not know how long journeys are likely to take. This is disappointing given the effort that CEAR is undertaking to persuade their customers to move to more regular and planned movements. If CEAR wants its clients to move towards a regular timetable because it promotes efficiency it is not unreasonable of them to expect CEAR to publish that timetable.

Most of the historic and existing (freight) customers by volume currently using rail can be found on the south branch of the network.

On the right is a copy of a sample daily train plan from CEAR. It can be seen from this how most traffic on that day typically is being carried between the south branch and Nayuchi for Nacala. The only traffic shown to other destinations are engineering trains or passengers services.

**Recommendation**
Publication of CEAR freight timetable.

38 http://www.cear.mw/general-freight.html

**Table 4.1 Main railway customers on South branch**

| Customer | Principal traffic commodity carried |
|---|---|
| Illovo | Sugar |
| Bakhresa | Wheat |
| LaFarge | Cement |
| Total + Puma | Fuel – mainly diesel |
| ADMARC, Optichem + Farmers World | Fertilizer |
| CCTL + GSM | Containers |

### 4.1.3 Domestic

Domestic services are relatively less common. There is some cement traffic and fertilizer traffic to/from Kanengo. These wagons are generally carried along with other block movements to/from Nkaya.

## 4.2 Passenger services

### 4.2.1 Timetables

The passenger service currently typically operates as a weekly service. It currently only operates from Limbe via Blantyre to Bilila, and then back to Balaka and then from Balaka to Nayuchi, and back to Limbe via Balaka. The passenger service is effectively a local service only centred in the south and east of the country. In part this is because of the history of the railway with the line to Lilongwe being closed north of Balaka between 2003 and 2005 and because the service is relatively slow with a large number of local stops.

Until very recently, CEAR published a timetable on their website, as shown in Table 4.3.

This on-line timetable included the following note also: Train from Limbe to Balaka arrives Balaka 14:53 and proceeds to Bilila, then back to Balaka at 17:35. Train from Balaka to Limbe leaves Balaka at 6:00 to Bilila and back to Balaka where it leaves at 9:40**.** Figure 4.2 shows the extent of the passenger service run by CEAR.

## Table 4.2 Sample of CEAR train plan for 10th- 12th March 2017

| 10-Mar-17 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D-3 | | Origin | Destination | Wagons | | Crew arrival | Schedule | Status | REAL | Prev | Arrival | TRAFFIC | OBS |
| P621 | 504/520 | Nayuchi | Balaka | 10 | | | | Ran | 0:22 | | | Passenger | |
| C620 | 114/111 | Blantyre | Nkaya | 30 | | 2:00 | 3:00 | Ran | 4:20 | | | 2 CBEs, 13 hoppers, 6 FTEs, 9 CCEs | Locos out of shed 02:55 (refuelling), 03:00-04:15 b/testing |
| V621 | 520 | Balaka | km325/Balaka | 1 | | | 7:00 | Ran | 9:40 | | | 1 Machine | late arrival of loco ex P521 in Balaka 06:10 |
| P623 | 504 | Balaka | Limbe | 10 | | 6:00 | 8:40 | Ran | 8:40 | | | Passenger | |
| C621 | 526/117 | Nkaya | Blantyre | 29 | | | | Ran | 17:00 | | | 17 Generals, 12 wheat | |
| C622 | 9153/9151 | Nkaya | Nayuchi | | | | 1:00 | Ran | 19:00 | | | 13 Ftes, 9CCes, 6 Ftes, 2Cbes | Late arrival of Traffic ex C620 |
| C623 | 114/111 | Nkaya | Limbe | 25 | | | 12:00 | Ran | 19:15 | | | 25 Wheat | locos to arrive late ex C620 |
| C601 | 303/9152 | Nayuchi | Nkaya | 37 | | | 13:00 | Ran | 12:20 | | | 33 general, escort | |

| 11-Mar-17 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D-2 | | Origin | Destination | Wagons | | Crew arrival | Schedule | Status | REAL | Prev | Arrival | TRAFFIC | OBS |
| s720 | 508 | Limbe | Balaka | | | 2:00 | 3:00 | Ran | 6:30 | | | BDC 2 Crane, material, van | Change of plan by Recovery Team |
| P720 | 512/504 | Limbe | Balaka | 10 | | 4:00 | 5:00 | Ran | 5:25 | | | Passenger | W721 in section - clearing Blantyre station congestion |
| W721 | 520 | Balaka | Nkaya/Balaka | | | 7:00 | 8:00 | Ran | 7:30 | | | 7 Generals | |
| C501 | 301 | Nayuchi | Nkaya | 20 | | | 8:00 | Delayed | | | | 19 Wheat, escort | Late arrivalof train EX – Cuamba |
| V721 | 520 | Balaka | Lirangwe | 2 | | 12:00 | 13:00 | Ran | 15:10 | | | 1 Machine, 1 CCE | Late of W721 |
| C720 | 526/117 | Blantyre | Nkaya | 28 | | 18:30 | 21:00 | Ran | 23:40 | | | 15 CCEs, 13 sugar, | Crews arrived 21:00hrs, late shunting (21:25 to 22:40), brake testing (22:40 – 23:20) |

| 12-Mar-17 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D-1 | | Origin | Destination | Wagons | | Crew arrival | Schedule | Status | REAL | Prev | Arrival | TRAFFIC | OBS |
| C501 | 301 | Nayuch | Nkaya | 20 | | | | Ran | 1:35 | | | 19 Wheat, escort | |
| C121 | 526/117 | Mkaya | Blantyre | 20 | | | 4:00 | Ran | 5:30 | | | 25 Generals | Late arrival of train EX - C720 |
| C603 | 205/9158 | Nayuchi | Nkaya | 31 | | | 6:00 | Ran | 14:32 | | | 30 Wheat, escort | Late arrival of train EX - Cuamba |
| P120 | 504/303 | Balaka | Nayuchi | 10 | | | 6:00 | Ran | 7:30 | | | Passenger | Loco failure (DE 512), change of crews |
| C120 | 301/9152 | Nkaya | Nayuchi | 21 | | | 8:00 | Ran | 16:20 | | | 13 CCEs, 7 sugar, escort | Change of locomotive - initial loco used on passenger AC 303 |

## Figure 4.2 Extent of the passenger service run by CEAR


Section where passenger service operate

## Table 4.3 CEAR published passenger timetable

| Route | Departure time | Arrival time |
|---|---|---|
| Limbe – Balaka (Wednesday) | 07:00 | 17:35 |
| Balaka – Nayuchi (Thursday) | 06:00 | 11:40 |
| Nayuchi – Balaka (Thursday) | 13:30 | 19:20 |
| Balaka – Limbe (Friday) | 06:00 | 17:37 |
| Limbe – Makhanga (Saturday) | 09:00 | 17:15 |
| Makhanga – Limbe (Sunday) | 07:00 | 16:45 |

Critically, this published timetable does not match the timetable that CEAR use for the planning or the operation of their services. This inaccuracy matters despite the suspected low number of website visitors because, as detailed below, CEAR do not publish anywhere else any public information on the passenger timetable so this has been only place where potential passengers and the organisations could get the times of trains other than in person at stations which is also often inaccurate.

Please note that whilst the CEAR website, as shown on the table above, states that there is a regular passenger service that operates to Makhanga, that this is not correct. At the time this report is being written (April 2017), the railway south of Limbe is no longer operational, having been washed away in 2014.

It is understood that surveys are currently being undertaken to examine the cost of restoring the line to the south, initially to Sandama, with the aim of bringing the line back into operation by 2019. In addition, subsequent studies will be undertaken to then examine the additional cost to restore services all the way to Makhanga. The line will be reconstructed in its previous form as a 15 tonne axle load line, but this is sufficient to operate the passenger services.

However, no trains are currently running. If the published timetable cannot be relied upon to show when the service is no longer operational on this route it will not be trusted when services are restored on the same route.

The inaccurate passenger timetable has been removed but not replaced recently from CEAR's website. The reference to services running to Makhanga has also not been removed.[39]

At the time of writing this report the services from Limbe – Balaka – Nayuchi – Balaka – Limbe are running in a 4-day cycle, as inferred from the website, once per week. Services were suspended for one of the weeks at the time of the last site visit in March 2017 due to engineering works on the line, but then resumed in the second week. It is probably not surprising to note that during the closure of line due to a washaway in March and April 2017 no mention of this was made on the website either and uninformed customers would have assumed that the service was running as advertised.

39 *CEAR operates a regular passenger train service with standard Class Coaches among Limbe-Balaka-Liwonde-Nayuchi and southwards from Limbe to Makhanga.*

### Example of inconsistency of train times

**One specific but representative example is that the departure time given on the website for Limbe is not correct. This does not seem to be a simple error as it was hard to discover the actual departure time. The website suggests the train is scheduled to depart at 07:00 hours. During discussions with officials from the Ministry they suggested that they thought that the service was due to leave at 06:00 hours. CEAR HQ officials stated that service was due to leave at 05:00 hours. CEAR station staff at Limbe were non-committal when questioned the day before. This is an issue at other locations also. For example, the actual time of departure of the same train further up the line at Blantyre was at around 06:40 – despite having been told by some station staff variously that the train would leave at 06:00, at 07:00 and the previous afternoon. This matters particularly when train services are infrequent as they are in Malawi. It is important to note that there were no posters or other timetable information on the station. Passengers started arriving at Blantyre station at 05:30 for the train and were still arriving immediately prior to departure just over an hour later. Similar problems relating to the absence of timetable information were found at Balaka and Liwonde. It was however usually possible to find at least one member of staff member at most of the larger stations who was able to give indicative times of arrival, usually within an hour to two-hour range. The staff at Liwonde were generally informed and accurate, and enthusiastic, and were praised by fellow passengers interviewed for this commission as helpful and informative.**

Whilst the website publishes the start and end times of services each day, which are open to question as discussed above, there is no information available on the time that the train arrives and departs from the intermediate stations. Visits to a sample of the minor stations confirmed that no timetable or train running information was posted. Less surprisingly, station staff could not always be found at most of the smaller halts visited on the railway.

A number of staff mentioned that Malawi National Radio is informed and broadcasts information regularly, particularly when the train is running late or is cancelled. Despite Atkins local staff listening over a few sample days no such information was heard. CEAR seemed to suggest that they informed the Government of Malawi who would inform National Public Radio but Atkins could not find any evidence that any such process seems to have been agreed with the Government of Malawi.

At a meeting with CEAR officials on Tuesday 28th March a Working Timetable for passenger services was produced for Limbe to Balaka, showing approximate timings of services from each of the stations. This shows that a detailed passenger timetable exists but is just not publicised outside of CEAR. This was dated December 2015, with figures for the section from Limbe to Balaka and Bilila as shown in Table 4.4 below:

**Table 4.4 Working passenger timetable (Limbe - Balaka)**

| Station | In | Departure | Time at station | Running time |
|---|---|---|---|---|
| Limbe | | 05:00 | | |
| Blantyre | 05:30 | 05:40 | 00:10 | 00:30 |
| South Lunzu | 06:00 | 06:05 | 00:05 | 00:20 |
| Maleule | 06:40 | 06:45 | 00:05 | 00:35 |
| Lirangwe | 07:35 | 07:40 | 00:05 | 00:50 |
| Namatunu | 08:20 | 08:25 | 00:05 | 00:40 |
| Gwaza | 08:40 | 08:45 | 00:05 | 00:20 |
| Shire North | 09:25 | 09:35 | 00:10 | 00:35 |
| Njerenje | 10:05 | 10:10 | 00:05 | 00:30 |
| Utale | 10:15 | 10:20 | 00:05 | 00:05 |
| Nkaya | 10:45 | 10:50 | 00:05 | 00:25 |
| Bazale | 11:15 | 11:18 | 00:03 | 00:25 |
| Balaka | 11:48 | 12:03 | 00:15 | 00:30 |
| Khwisa | 12:31 | 12:36 | 00:05 | 00:28 |
| Faringdon | 12:56 | 13:01 | 00:05 | 00:20 |
| Bilila | 13:16 | 13:30 | 00:14 | 00:15 |
| Balaka | 14:30 | STABLE | | 01:00 |
| | | Transit - time | Train stop time | Running time |
| | | 08:30 | 01:42 | 06:48 |

This timetable suggests that the timetable service should leave Blantyre at 05:40. A trip on the passenger train was undertaken on Wednesday 29th March 2017 as part of a site visit to gain a better understanding of railway passenger services. The train was boarded at Blantyre. On that occasion the train did not arrive from Limbe until 0640 hours. Although it was quick boarding, by the time the train left Blantyre it was already over an hour late leaving only the second station on the journey. It is also worth noting that neither the working timetable scheduled departure time or the actual time of departure matched the times on CEAR's website, or any of the times given to the study team by CEAR staff or by the Government of Malawi.

It is recognised that timings may vary because of long boarding and alighting times – with officials at CEAR suggesting that trains can be held at each station for up to 15 minutes, although this was not observed on the consultants site visits and seems excessive particularly at smaller stations.

**Recommendation**
Production of a public timetable with days and times of departure for every station with date of the publication of the next proposed timetable, no more than 12 months ahead.

**Recommendation**
Publication of timetable on website – revised whenever there are amendments e.g. because of line closures. Also publish the freight timetable on the same site.

**Recommendation**
Once a passenger timetable has been produced it should then be displayed at each and every station. Most stations already have a notice board for displaying information to passengers so it could easily be added.

**Recommendation**
Furthermore, consideration should be given to 'Next Train' signs, displaying the day, date and time of the next train in each direction. This would require the station staff to update the signs once each train has departed. The stations visited were relatively clean and well maintained (with some security) so these signs should be easy to keep up to date.

**Figure 4.2 Historic photo of finger boards and departure clocks in operation**

The image above shows clocks with the time of the next train and finger boards with stopping patterns. Historically even at small stations, painted signs were produced for each train which stated the station stops and the time would be simple to do in Malawi given the train frequency. These were reviewed along with the new timetable once or twice per year.

**Recommendation**
CEAR to develop media plan and liaise with national public radio and other media over publicity regarding scheduled and unscheduled changes to the timetable or its operation.

In addition to building passenger confidence, which will in turn increase demand, the production of such a timetable will result in better operator discipline. It is not unreasonable though for citizens of Malawi to know when a train should run, how long it will take and whether it is expected to run on time. The consequence of Malawi passengers not having this information is not just a loss of revenue to CEAR but economic inefficiency as passengers have to wait longer for trains or are forced to use other modes.

### 4.2.2 Timings

The scheduled arrival and departure times from the website and Working Timetable, show just how slow the services are, even noting for the fact that these may not be strictly accurate.

The distance by rail from Limbe to Balaka is approximately 112 km, with the website suggesting that the service takes 7 hours 53 minutes (departing Limbe at 07:00 hours and arriving at Balaka at 14:53 hours). The December 2015 Working Timetable has a departure from Limbe at 05:00 hours and an arrival at Balaka at 11:48 hours, thus suggesting a total journey time of 6 hours 48 minutes. These figures give an average speed in the range of approximately 14 kmph to 16.5 kmph.

The distance by rail from Balaka to Nayuchi is approximately 106 km, with the website suggesting that the service takes 5 hours 40 minutes (departing Balaka at 06:00 hours and arriving at Nayuchi at 11:40 hours). The December 2015 Working Timetable suggests that the service takes 5 hours 37 minutes from Balaka to Nayuchi, which coincides with the website timings. This gives an average speed of approximately 19 kmph.

Currently timings include station dwell time of up to 15 minutes (subject to demand), so the times actual run speeds on both lines will be greater, but these will still be relatively low. However, sit visits to a limited stations revealed that no station stop took significantly longer than five minutes.

The average and forecast run speed for freight trains, particularly since the recent track improvements, and the performance of some passenger trains suggest that the passenger service can and often does run faster than 16.5 and 19 kmph, particularly on the section of line to Nayuchi, which was recently renovated.

In the short to medium term it is recommended that CEAR look to improve the operating speeds on the passenger services. This will have the impact of improving the attractiveness of rail as a mode, particularly in comparison with alternative public transport modes. Furthermore, a reduction in journey time should result in operational efficiencies, and thus cost savings. It will also make it possible to operate passenger services further (and potentially more frequently).

There are two ways in which journey time improvements can be made: reduction of dwell times and in taking advantage of the lifting of speed restrictions.

**Recommendation**
With the publication of a timetable, and more disciplined approach to operations, CEAR should formalise a reduction in the dwell time at each station to no more than 3 minutes at the smaller halts and 5 minutes at larger stations – less where practical. Note that reduced dwell times may already be included in the Working Timetable, which may explain why it is up to an hour different in end to end times than the website timetable. The journey time savings that this generates should be factored directly into the public timetable.

To cover the section from Limbe to Nkaya freight trains have traditionally taken around 7 hours. In early 2017, however, because of ongoing enhancing works, the journey time was reduced to approximately 5 hours, and this time is expected to decrease further to approximately 4 hours in 2017. Whilst, the passenger train will by necessity be slower since it must accelerate and decelerate on the approach to stations, in addition to the dwell time, it should be possible to improve the current journey times significantly by re-casting the timetable to reflect the new operating realities. Smaller passenger journey time reductions should also be possible between Nkaya and Nayuchi to capitalise on the refurbishment of this route. Running relatively slower passenger trains than freight trains will reduce capacity. Running slower trains than the line can easily permit slack train operations and poor punctuality as staff will be aware that there is spare time in the system.

**Recommendation**
CEAR are in the process of removing a number of temporary and (semi) permanent speed restrictions currently in force and these improvements should be factored in to a new calculation of the journey time between stations (and of the whole working timetable). This would provide passengers with a direct benefit from CEAR's investment in the freight traffic. This process should be repeated – and a new public timetable produced - no less than once per year.

### 4.2.3 Passenger coaches

The passenger services are comprised of passenger coaches hauled by a locomotive, with additional coaches for luggage. A total of 15 new coaches operated by CEAR are all new-build coaches from South Africa, and have been brought into service in the past 12 months.

**Figure 4.3 CEAR's new build passenger carriage**

Passenger carriage (top); passenger train north of Lunzu (bottom)

Two types of coaches have been introduced into service: executive class carriages; and standard class carriages. The executive class carriages consist of 14 rows of 2+2 seating (so 56 seats), with air conditioning, two table areas, upholstered seats and seat-back tables. The standard class carriages consist of 18 rows of 3+2 seating (which gives a total of 88 seats as two of the rows have 2+2 seating to allow space for the door to open), with air conditioning, hard plastic seats. Both types of carriage have spacious luggage racks above the seats, with toilets and water fountains in the vestibule areas.

The layouts of the two carriages are shown in the photographs below.

**Figure 4.4 Photos of the interior of CEAR's new carriages – both standard (left) and premium (right) class**

These new coaches represent a considerable upgrade on the old coaches previously used on the route. It is understood that the old coaches have been retired from service. They are currently visible in the yard at Limbe.

In the concession agreement, each passenger train is expected to consist of at least three passenger coaches and up to 3 coaches for luggage. Anecdotal evidence suggests that the passenger services are currently being operated with 6 passenger coaches, in addition to the 3 luggage coaches. The reason for this was stated as passenger demand. It is also understood that the operator is predominantly running the standard coaches, rather than standard and executive coaches, at this time. It wasn't clear on the exact reasons for this operational discussion, but it appears that it is due to lack of demand for the executive coaches, with passenger preferring the standard class. This is not surprising as the new standard class coaches represent a considerable upgrade from the old coaching stock, so the passengers are already benefitting without having to pay the additional fare required for executive class.

### 4.2.4 Frequency of operation

Where the service is operating once per week, as it appears, then this is a variation against the concession agreement. Information provided by CEAR on the number of passenger trains operated by year, shown in Table 4.5, also back up the findings regarding the lack of train frequency from the site visit.

**Table 4.5 Annual passenger train operation (figures provided by CEAR)**

| Number of trains (assumed round trip) | 2011 | 2012 | 2013 | 2014 | 2015 to Sept' | 2015 pro rata |
|---|---|---|---|---|---|---|
| Limbe – Balaka – Nayuchi: total | 52 | 42 | 52 | 50 | 31 | 41 |
| Limbe – Makhanga: total | 56 | 22 | 32 | 32 | 0 | 0 |

Even allowing for different ways in which trains services can be counted, this table suggests that CEAR are generally operating only one train per week, with some weeks missing, which would back up the experience on site, with no train running in the week containing Wednesday 22nd March, but services resumed in the week containing Wednesday 29th March 2017.

In the concession agreement, the passenger service is supposed to operate three days per week Limbe – Makhanga, twice per week between Balaka and Nayuchi and Bilila. Both the Government of Malawi and CEAR are aware that the concession agreement is not being complied with exactly but this non-compliance is being actively managed of wider discussions and is expected to be subsumed with the 2017 revised concession agreement negotiations. Even if a particular route section has been closed reasonable efforts could have been made to use the spare rolling stock and staffing resource to run an improved frequency on the remainder of the passenger route, but this does not happen.

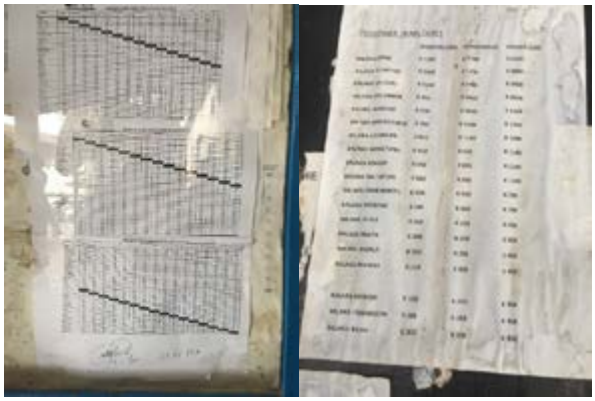
**Recommendation**
That any revised frequency of the operation is recorded formally as part of the contractual relationship between the Government of Malawi and CEAR.

### 4.2.5 **Fares**

The concession agreement is silent on the fares regime for the passenger traffic. Unlike the timetable, detailed passenger fares were displayed on the notice board at all the stations visited.

The posters at the stations suggest that there are three fare rates in existence: Premium, Business and Standard. Fares for some key movements are given in the table below. The travellers employed to test the passenger service for this commission were not offered the opportunity to buy non-standard fares even when they asked.

**Figure 4.5 Photo of typical fares display at stations**



Layout on photograph on right preferred.

**Table 4.6 Example fares (in Malawi Kwacha)**

| Origin station | Destination station | Premium | Business | Standard |
|---|---|---|---|---|
| Limbe | Blantyre | 300 | 250 | 150 |
| Limbe | Shire North | 1400 | 1100 | 850 |
| Limbe | Balaka | 2100 | 1700 | 1300 |
| Balaka | Liwonde | 750 | 600 | 300 |
| Balaka | Nayuchi | 2100 | 1700 | 1100 |
| Liwonde | Nayuchi | 1400 | 1200 | 850 |

It is not possible to be precise in determining the fares per kilometre as the fares vary by the two lines and the stations involved. Brief analysis of the data, however, analysis of the data available suggests that for end to end journeys the fare rates are of the following order:

- Premium Class - 18 Kwacha/kilometre;
- Business Class - 15 Kwacha/kilometre; and
- Standard Class - 11 Kwacha/kilometre.

For intermediate journeys the rates appear to be slightly higher.

It is not clear how the fares relate to the current operations given that CEAR is now typically operating standard class coaches only. It is likely that the posters at the stations, with three fare categories, relate to the situation before the new coaching stock was introduced. A failure to have differentiated fares means that CEAR must rely on the standard fare only with which it is harder to maximise revenue.

It is noted that the CEAR website states "CEAR also operates first class coaches with full air conditioned, bedding and catering facilities serving light meals and refreshments. These are available for special hiring arrangements".[40] However after talking with CEAR staff it is unclear whether such "special hiring(s)" occur sufficiently often to justify having a separate fleet.

It is worth noting additionally that no-one at any of CEAR's stations, when asked, was able to explain the difference between business and premium fares in terms of the passenger experience. Given that there is a lack of clarity over the difference in how the product is sold, it is likely that potential customers are also confused.

It was unclear to the station staff why the premium coaches did not operate. It is possible that having another coach might cause the train to be greater than the length limit on the route or heavier than the tractive capability of the locomotive, but this is thought unlikely.

*40 http://www.cear.mw/services.html*

From the information available the standard fares appear to be very low. In interviews with potential users of the railway the low fares were cited as the main reason for the popularity of the railway. In an interview for this commission, it was suggested that CEAR understand that current fares are low, and that they may need to be raised. Any potential upwards revision of fares will need to be considered carefully. It appears that passengers using the train do so now either because the fares are low, they have no alternative mode available, or because they have large amounts of luggage. In the case of the former group of passengers, raising the fares too much may have the effect of removing the social case for the service which would be unacceptable to the Government of Malawi. That said CEAR also needs to maximise fare income as the passenger service is currently loss making.

**Recommendation**
Include at least one premium coach per scheduled train. If this recommendation is rejected then the existing premium coaches should be declassified at a minimum and potentially reconfigured as standard coaches, and all reference to premium fares be removed from CEAR publications.

**Recommendation**
Consider merging the two premium fares Premium and Business class.

**Recommendation**
Consider the level of fare differentiation and what other services might be offered to premium passengers – perhaps a coffee, tea or soft drink service. Conduct regular usage level surveys – if the premium coach is empty then reduce fare differential and increase level of service. If premium coach is full then increase fare differential.

**Recommendation**
A review of the fares policy for all fares is undertaken in the light of current operating conditions, bearing in mind the corporate and social responsibility element of the service, and the need to enhance revenue to help reduce CEAR's operating loss. Once determined the new fares should be published and displayed at each of the stations on the station notice boards. The fares should also be displayed on the company website.

**Recommendation**
Simplify and unify the way that the fares are shown at stations.


Luchenza station

ATKINS

Malawi National Transport Master Plan

# 5 The concession agreement

Rail Sub-Sectoral Plan

# 5 The concession agreement

## 5.1 1999: Concession agreement and ownership prior to Vale purchase

CEAR operate the railway concession in Malawi. The first concession agreement was signed by CEAR and the Government of Malawi on 15th November 1999 with the start of operation from 1st December 1999. This was one of the first genuine private concession agreements (for rail) in Africa and in this Malawi set a path that other countries have since followed. The new owners were the consortium Corredor de Desenvolvimento do Norte ("CDN") included RDC (Railroad Development Corporation – lead), ERL (Bermuda), MANICA (Mozambique), Mozambican private investors and CFM (Mozambique's Port and Railway Administration). CDN formed the concessionaire company Central East African Railways ("CEAR") and began operations on December 1, 1999. The concession to Mozambique's Nacala Port and Railway was awarded to the same consortium in January 2005. On September 12, 2008 RDC and ERL sold their interests in CDN to Mozambican investor group INSITEC. At that point the Nacala Corridor which includes CEAR was managed and operated entirely by Mozambican investors.[41]

Unfortunately, traffic did not grow as forecast. As a result, the owners sold the concession to Vale Logistics Limited ("VLL") who saw the potential for transit coal traffic. VLL took ownership of CEAR (and CDN) in phases, the key one being that in September 2011 Vale exercised an option to buy a 51% stake.[42]

It is understood that passenger rail services were operated as part of a Public Service Obligation ("PSO") agreement within the 1999 concession, with services subsidised by the State. Anecdotal evidence suggests that the PSO for passenger services was re-negotiated following an initial 5 years of operation, with a sum of 9 times the initial subsidy agreed upon. The passenger service operation was therefore heavily loss-making, with the costs passed directly to the Malawian Government

41 Source: http://www.rrdc.com/op_malawi_cear.html

42 Source: http://www.railwaysafrica.com/news/vale-cfm-to-jointly-operate-north-corridor

## 5.2 2011: Malawi Railway Corridor Agreement

On 22nd December 2011, the Government of Malawi made the Malawi Railway Corridor Agreement with VLL. The agreement will run for 30 years from the start of traffic until 2045 with a right to extend by an additional 20 years. In particular, the Corridor Agreement gave Vale the powers to build the new railway from Kachaso (on the Mozambique border) to Nkaya and a requirement to upgrade the rest of the railway as specified in particular the route from Nkaya to Nayuchi. In return for which the Government of Malawi would provide land, assistance and assurances over tax. One key requirement of the corridor agreement is that CEAR should be wholly owned by Vale commercial entities:

- Capacity should be reserved on "the Nacala Corridor in order to guarantee access (on the Nacala – Nkaya route for) transportation services comprising two trains in each direction per day of up to 120 wagons per train for Malawi general freight and one (passenger train) per day".
- CEAR should have "no obligation to allow other trains to operate over the (entire) Railway (of Malawi)." This clause gives Vale exclusive rights over this rail route for coal traffic from Moatize.

The corridor agreement was concerned with the new line. It was however designed to fit with the existing concession agreement. The new agreement wrapped within it and superseded large elements of the previous concession agreement. One key elements of the revised concession agreement was that it now included an explicit stipulation that a concession fee should be paid.

## 5.3 2010: Tripartite Nacala Development Corridor Agreement

On 27th August 2010, the Governments of Malawi, Zambia and Mozambique signed the Tripartite Railway Transport Agreement on the Nacala Development Corridor to "cultivate active cooperation" in particular with regard to customs and immigration matters to allowed traffic to run unimpeded.

In theory, the 2010 agreement allowed CEAR to operate the then proposed (now open) line to Chipata (Zambia), however, in reality Zambian Railways have insisted on using their own locomotives. However, in 2010 Zambian Railways limited were granted the right to run passenger and freight services into Malawi, although they have not exercised this right so far. No reciprocal arrangements exist for CEAR to operate over Zambian Railways should the line be extended beyond Chipata. CEAR suggested that they believe that they will be able to secure running rights should traffic levels increase to justify an application by them.

## 5.4 2013 Concession agreement

The Concession agreement was amended on 30th September 2013.[43]

The concession period was originally 20 years to 2031, but was automatically extended to 30 years from the start of the services between Kachaso and Nkaya (which was 2015), so therefore to 2045. This automatic extension also grants the concessionaire the right to renew the concession agreement for a further 20 years but the terms of that renewal are to be agreed within vaguely defined parameters. If the concessionaire and the Government of Malawi cannot agree the terms of the renewal the renewal period is reduced to 5 years only - to 2050.[44] Critically the 2013 extension of the concession agreement triggers the requirement of the concessionaire to operate the "Mandatory freight service".

This mandatory freight service consists of at least one train per day running at no slower than 90% of the average speed of the coal trains between Nkaya and Nacala, and once the lines have been refurbished connecting through services from both Limbe and Mchinji (frequency unspecified). The operator is obliged to ensure that the coal traffic leaves sufficient capacity for up to two trains per day between Nkaya and Nacala of 240 wagons in total.[45] However the Concessionaire only has to use "its reasonable efforts to develop the use of commercially viable freight services" and this is undefined. Critically this agreement is silent on whether CEAR have to use any financial surplus to enhance the network to make such a service "commercially viable".

As part of the 2013 Concession Agreement the Malawian Government removed the need to provide passenger services as part of a PSO requirement. Instead the concessionaire is obliged to provide a passenger service as part of their Corporate and Social Responsibility requirement, thus removing the funding requirement from the Government.

The Concession Agreement lists a series of payments to be made by the concessionaire – the most important of which is the annual Concession Fee which is specified as no less than US$1 million once the coal traffic starts but is calculated as a percentage (5%) of revenues less allowable charges plus some historic fees. This fee will become significant should the coal tonnage hit its forecast maximum of 18 million tonnes.

The Concession Agreement (section 28 and appendix 9) obliges CEAR and the Government of Malawi to rehabilitate the railway network in different phases. These obligations flow through from the Nacala Corridor Agreement. In particular, CEAR was obliged to rehabilitate the lines to Nayuchi and maintain the line to Limbe. The obligation to rebuild the north and south line sections between Nkaya and Mchinji and Nkaya and Marka (the Mozambique border falls to the Government of Malawi. The agreement is an explicit statement that the upgrading of these lines is not a financial obligation of CEAR.

43 *Amended and Restated: Concession Agreement between the Republic of Malawi and Central East African Railways; Dated 1st December 1999 (as amended and restated on September 30th 2013).*

44 *Restated concession Agreement (2013) sections 9+10.*

45 *Restated Concession Agreement (2013) section 26.*

However, this was not included to prevent CEAR from funding the rehabilitation of these lines but to protect CEAR from the Government of Malawi requiring this as even now the cost would be significant. The total cost of rebuilding the Sena line and upgrading the north and south branches is estimated in this report to be around US$922 million. However, the main beneficiary from the extra revenue generated by any rebuild of the north and south lines would be CEAR.

The concession agreement places a number of reporting obligations on CEAR which are set out mainly in section 59 of the Agreement. These require the concessionaire to provide data on a monthly, quarterly and an annual basis. Information is required to be provided on the tonnage and tonne kilometres of freight by category, the number of passengers and financial information including gross revenues and costs that "shall separately state the expenses the Concessionaire has incurred to International Financial Reporting Standards." Some other information is required such the average speed of the general freight trains as a percentage of the coal trains.

Some railway statistics are made publicly available. In particular, the Ministry of Transport and Public Works, Department of Transport Planning, with historic support of the European Union publishes a Transport Sector Performance Monitoring Indicators Framework ("TSPMIF") on an annual basis, historically as part of the JTSR held in December. The 7th Review was held on 9th December 2015 and included data on 2014/2015 on:

- The construction of the new line;
- The km of existing rail infrastructure rehabilitated or upgraded;
- Expenditure on rail infrastructure maintenance;
- Number of speed restrictions;
- The percentage of railway infrastructure in a "good or fair" condition;
- Total freight traffic;
- Total passenger traffic; and
- Total number of accidents.

The public data is useful for providing trend data, however, some of the measures used are unclear or might be seen as redundant – that is despite the useful commentary added at the 8th Joint Sector Review held on 12th December 2016 to present on the Transport Sector Performance Monitoring Indicators Framework. For example, the new line was by then complete. For example, the rehabilitation and upgrading of the existing rail infrastructure is expressed as a percentage attainment against an uncontracted target so in 2015/2016 a 235% progress against target was achieved for 47 km of refurbishment whereas in the previous year a 100% actual to target was achieved for 61 km. The 235% actual to target becomes more strange when it considered that there was a budget of 450 million Kwacha and only 248 was spent and in the previous year only 76 million Kwacha was spent of 450 Million budgeted. For example, in the same period the number of speed restrictions fell from 41 to 17 which may be significant but it is worth noting that the target was for no more than 70 speed restrictions and this fell from 73 even though the actual in the previous year was 41. The text makes it clear that this reduction was achieved by "spot" repairs and there is a danger that whilst the number of speed restrictions has fallen that their combined impact has not. The most misleading figure is for the total traffic carried by rail, which includes transit coal. This is forecast to be up to 18 million tonnes per annum[46] and therefore hides the growth or fall in any other traffic, as would any significant uplift in transit traffic from Zambia. Whilst the coal traffic persuaded Vale to build the line from Kachaso to Nkaya and for the refurbishment from Nkaya to Nayuchi, its contribution to the Malawi economy is indirect. Of more direct relevance is the tonnage of goods carried within Malawi, exported from Malawi and imported to Malawi by rail.

Whilst it will be important to continue to monitor most of the metrics above in order to show trends new metrics may need to be devised to match the changes in the concession. Because of the amount of data that CEAR is required to produce as part of the concession agreement and in order to operate the train service there is unlikely to be any significant extra administrative burden on CEAR.

*46 CEAR Limited Business Plan July 2013, section 3.2.2, page 6.*

New metrics could also be fashioned that relate more closely to the experience of customers and the commercial incentives on CEAR.

They might include:

- Limbe – Mchinji average journey time – to see the impact of the speed restrictions rather than just their quantity;

CEAR and the Government of Malawi recognise that the management of the concession metrics could be improved. On 13th and 14th November 2015 a two-day workshop was held to look at ways of improving the KPIs and making the reporting process more efficient. Follow up sessions were held on the 14th and 20th January 2016. The proposed list of "database generated reports" that resulted from that meeting is sufficient to give the Government of Malawi comprehensive oversight of the operational railway. No extra measure was included for commercial or financial metrics. It is not clear yet whether the obligation of CEAR to produce any of the existing metrics has been removed.

**Recommendation**
Agree a revised list of kpi metrics in order to reduce the burden on CEAR and improve their usefulness. Consider whether any or all of these can be made public.

## 5.5 2017: Revision to concession agreement

Atkins understands from informal conversations with Vale, CEAR and with the Railway Division of the MoTPW on 12th December 2016 at the JTSR that detailed negotiations are nearly complete to revise and update the concession agreement.

Atkins understands that Heads of Terms have been negotiated but that the new agreement has yet to be authorised by the parties. Atkins has not been formally briefed on the terms of the agreement but understands that key elements include:

- A dove-tailing of the terms and conditions across the various agreements (the corridor Agreement and the CEAR and CDN concession Agreements in particular).
- CEAR will accept the obligation to fund the restoration and the ongoing maintenance of the Sena line between Limbe and Makhanga, and then Sandama. No services have been run on this line since 2014 due to problems with some of the sections of line being washed away. Recent site visits suggest that whilst the track is still largely in place the line is now extremely overgrown, and the stations locked up. This is a significant obligation and will help clarify the cost of restoring this section to full use by freight traffic as part of the proposed restoration of the Sena line to/ from Beira via Mutarara Junction.

This will still leave the restoration of the track to Marka (Malawi) via the Chiromo crossing of the Shire River unfunded and the cost of this will be significant as large sections of the track are known to have washed away. The photo below shows where one part of the bridge is still standing.

Also included within the proposed concession agreement is the potential rehabilitation of the line from Nkaya – to Mchinji on the Zambian border although this will not include any uplift of the axle load of this route. Some of this work may have started already in anticipation of the agreement. This was costed by the June 2012 Feasibility Study for the Rehabilitation of the Mchinji to Nkaya Railway Line by Team engineering and D'Appolonia to be US$145 million.

**Figure 5.1 Condition of the line between Limbe and Sandama at Luchenza**


**Figure 5.2 Chiromo Shire river washaway**

Potential extensions to passenger service operation to include a service between Blantyre/Limbe and Makhanga and Sandama although the frequency is not known.

Increased annual minimum concession fee by 20% (to US$1.2 million per annum) – without any change to the maximum permitted which is 5% of CEAR revenue.

Financial comfort for international lenders to Vale rail entities by the Governments of Malawi and Mozambique allowing for a refinancing of the rail investments by Vale on the Nacala corridor (Moatize – Nacala). It is important to note that whilst Vale are refinancing the debt that they incurred from the construction of CEAR's railway that Mitsui and Vale retain around US$60 million (one third of the debt to be refinanced) and will continue to fund this directly. Part of this is funded through equity.

This refinancing is the primary driver for the agreement by Vale. Vale had hoped to secure external financing for the rail investments in the Nacala corridor prior to its re-construction. That did not prove possible though although this possibility was explicitly catered for in the corridor agreement. The agreement required Vale to finance the investment (with borrowing at LIBOR plus 7%) instead.

The refinancing effectively pays Vale back for the investment that they made in CEAR. Once Vale is repaid it is important that the 2017 revised concession agreement does not generate excess profits for the owners of CEAR or the financiers. CEAR is likely to be financially stable in the short-term and potentially significantly profitable in the medium term (see finances chapter). It is important, therefore, that the 2017 revision to the concession agreement that allows Vale to be repaid also ensures that any "excess" surplus is reinvested in the network and not taken out of the company. This is important and urgent.

International funders are unlikely to support the development of the railway in Malawi, at the same time, that the owners of CEAR are perceived to be taking "excessive" money from CEAR from any financial surplus rather than investing that money in the network over which CEAR enjoys a traffic monopoly, whether that perception is fair or not.

It is important to note that this agreement is a tripartite agreement and that the Government of Mozambique has also been asked to sign a letter of comfort.

Because Atkins have not been formally briefed on the draft 2017 agreement and because discussions were ongoing at the time of the writing of this report, it is possible that the terms will change.

**Recommendation**
The 2017 agreement should cover the treatment of any financial surplus generated by CEAR and how much of this should fund the development of the network before any is taken as profit by the owners of CEAR.

**Recommendation**
This rail sector report and these recommendations are refreshed once the terms of the proposed 2017 Agreement are made public.

## 5.6 The ownership of CEAR

It is important to note that in the negotiations above that CEAR were not a free agent. CEAR is controlled by Vale. CEAR has two shareholders. Sociedade de Desenvolvimento do Corredor do Norte ("SDCN") own 51% and CFM (Caminhos de Ferro de Moçambique) own 49%. SDCN is currently 85% owned by Vale but they are in the process of selling 50% of their shareholding to Matsui. The remaining 15% of SDCN are owned by smaller shareholders – mainly from Mozambique. Caminhos de Ferro de Moçambique ("CFM") remains wholly owned by Vale. During an interview for this commission, Christina Chithila mentioned that SDCN and CFM are "forming a share leasing agreement" which will allow greater cooperation between the major shareholders. Following the sale to Matsui, Vale will own just under 71% of CEAR, Matsui will own just under 22% and small shareholders the remainder.

For this reason, CEAR are strongly motivated by the needs of Vale their biggest customer (albeit indirectly via CLN) to ensure that the coal traffic is not impeded.

## 5.7 **Railways Act**

The concession agreement is in theory governed by the Railways Act. The previous act dated from 1907 with various amendments added during the 1920s. It is deemed by the MoTPW Railway Department to be unfit for purpose.[47] For this reason a draft Railway Bill has been prepared. The JTSR 7th Action Plan for the MoTPW set a target date for this to be approved by Parliament by September 2016 and the associated regulations to be approved by the Minister by December 2016.[48]

The bill sets out the legal basis for the separation of rail infrastructure and services. It also establishes and defines the functions of a new Rail Regulator as recommended by the 2009 GOPA report (albeit who may also regulate other modes).

Within the new industry structure, there is also an opportunity to create a Rail Infrastructure Manager (sometimes called the Infraco) to own, maintain and operate the rail infrastructure. This may be state owned but is planned to run commercial lines. To do this, it has been proposed to "reactivate" Malawi railways which were created by Articles of Association in 1994.

However, given that nearly all the various lines are owned or let out on a concession basis until 2045 there is little for any Rail Infrastructure Manager to do. This type of structure is usually promoted where the infrastructure serves more when the operator and the Government wishes to promote competition. That is not practical given the monopoly rights given to CEAR and VLL. Therefore, whilst the separation of track from operations is in line with best practise[49] it may not be the most pressing priority for Malawi at this time.

47 *Interview by Jonathan Spear with Mr Justice Ntande representing the Department of Rail Services; 15/0316.*

48 *7th JTSR Action Plan for the MOTW – January – December 2016.*

49 *The SADC commissioned a useful technical report into the various commission arrangements across the region. This gives some useful indications on perceived best practice. Technical Report: SADC Railways Revitalization Policy Dialogue, by Aecom (Larry Phipps) for USAID, August 2011 – USAID Contract no. 674-C-00-10-00075-00.*

Standard class passenger service operated by CEAR

ATKINS

Malawi National Transport Master Plan

# 6 Passenger demand

Rail Sub-Sectoral Plan

# 6 Passenger demand

## 6.1 Overall demand

The number of passengers carried by year has been supplied by officials at CEAR, and is shown in Table 6.1.

At first glance it appears that significantly more passengers were carried in 2012 and 2013 than either before or after this time. Taking into account the number of trains purported to have been run in these two years, this would equate to implausibly high load factors on individual trains. Discussions with CEAR officials have revealed that a different system of passenger counting was operated for 2012 and 2013, and they concede that the numbers are incorrect. From 2014, CEAR reverted to the system of counting passengers that existed prior to 2012, and the company is confident in these more recent numbers. The numbers quoted in the table for 2012 and 2013 will therefore be excluded from the discussion in the remainder of this section. However, it was not clear how even the 2012 and 2014 – 2015 passenger counts were undertaken and reconciled; whilst counts were seen being undertaken on rail services it was less clear how they were aggregated.

**Recommendation**
A thorough review of the passenger counting process is undertaken including how that data is used and reported. This then needs to be agreed with the Government of Malawi. Passenger count data can then be exchanged with the Government on a regular basis to aid with the understanding of the success of the services operated.

Understanding the usage of the passenger rail services is a key aspect of judging the success of the system, and making provision for future service deployment and enhancements.

If the figures for 2012 and 2013 are excluded, then 2011 is the only year where passenger services were operated on the Limbe – Balaka – Nayuchi and the Limbe – Makhanga sections of line. The figures for 2014 represent services for Limbe – Makhanga for a part year only. The 2011 figures show that the Limbe – Makhanga section was well utilised, with passenger numbers at 84% of those on the longer Limbe – Balaka – Nayuchi section. This suggests that the rail passenger services provide an important transport mode south of Limbe, and that services should be re-instated once the line is rehabilitated. Site visits to this area suggest that many of the stations are not that accessible by road so the railway provides vital access to otherwise inaccessible areas. It is accepted that alternative modes will have attempted to step into the gap left by the lack of rail services but that rail should still have an advantage once services are restored.

The figures for the Limbe – Balaka – Nayuchi section, excluding 2012 and 2013, suggest that numbers of rail passengers have dropped from 147,043 in 2011 to a total of 122,875 trips in 2014 with a further drop to 94,531 trips in 2015, effectively a low point. Encouragingly, however, there has been significant growth in passenger numbers in 2016, with the highest number of passengers recorded at 156,908 trips. This represents a growth of 66% in passengers in a year.

**Table 6.1 Passenger demand estimates**

| Passengers (assumed single trips with ticket) | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|
| Limbe – Balaka – Nayuchi | 147,043 | 507,924 | 570,694 | 122,875 | 94,531 | 156,908 |
| Limbe – Makhanga | 123,995 | 275,916 | 165,992 | 56,014 | 0 | 0 |
| Total | 271,038 | 783,840 | 736,686 | 178,889 | 94,531 | 156,908 |

This growth coincides with the introduction of the new passenger coaches on the service, and represents a positive passenger response to the new product. This growth in numbers accords with the statement from CEAR officials on a tour of the yard at Limbe, that 6-car sets are now being run to cope with the amount of passenger demand.

The recent rise in passenger numbers represents a success story with regard to passenger rail operations, with a growing demand for services. The 2016 figures are the highest in the last 5 years that we have evidence for, and suggests that with the correct investment rail passenger services in Malawi can thrive.

Anecdotal evidence from CEAR who explained that there now must operate 6+3 carriage passenger trains because of the high-level demand. It was observed during the course of the study that typical loadings were at approximately 80% plus in the standard class, as shown in Figure 6.1.

## 6.2 Main passenger flows

Table 6.2 on the next page shows the origins and destinations of passengers observed on the whole passenger service. 90% of all passengers have origins or destinations at one of Balaka, Bilila, Blantyre, Limbe, Liwonde, Nayuchi or Nselenje.

## 6.3 Passenger profile

Recent surveys (2016) undertaken for the Malawi National Transport Plan have included interviews with existing rail passengers. These interviews, predominantly to determine passenger origin-destinations and values of time, also included profile questions which allowed a picture to be built up of rail passengers. These are discussed in the sections below.

### NTMP – origin-destination surveys

As part of the Origin-Destination survey exercise undertaken for the NTMP, some 866 interviews were carried out with rail passengers. The interviews were undertaken to determine the origin and destination of passengers, but did include a profile question on trip purpose. The results of the trip purpose question are shown in Table 6.3.

**Figure 6.1 Interior of passenger coach**

**Table 6.3 Rail passenger trip purpose**

| Trip purpose | Number | Percentage (%) |
|---|---|---|
| Work | 16 | 1.8 |
| Education | 31 | 3.6 |
| Business | 329 | 38.0 |
| Leisure | 11 | 1.3 |
| Tourism | 26 | 3.0 |
| Shopping | 8 | 1.0 |
| Personal business | 41 | 4.7 |
| Visiting friends | 404 | 46.7 |
| **Total** | **866** | **100.0** |

The survey results show that the most popular trip purpose is visiting friends with 46.7% of the total respondents. Trips on business are also popular, with some 38.0% of interviews undertaken. There are a number of other reasons given, but these are all relatively minor.

### NTMP stated preference

As part of the Stated Preference exercise undertaken for the NTMP, some 254 interviews were carried out with rail passengers. Whilst the interview mainly involved a 'game play' scenario to determine passengers' Values of Time, background profile information on rail passengers was collected. This data can be used to build up a profile of rail passengers.

## Table 6.2 Averaged Passenger Origin-Destination matrix

| | Balaka | Bilila | Blantyre | Chingale | Gwaze | Limbe | Lirangwe | Livilivi | Liwonde | Machinga | Machuka | Madziamchere | Matoponi | Mlulu | Mitengwe | Mulipa | Mululu | Namatunu | Nayuchi | Njelenje | Nkaya | Nselenje | Ntcheu | Shire North | Utale | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Balaka** | | 3 | 6 | | | | | | 89 | | 3 | 6 | | | 6 | | | | 83 | | | | 3 | | 14 | **213** |
| **Banda** | 1 | 5 | | | | | | | | | | | | | | | | | | | | | 2 | | | **8** |
| **Bazale** | | | | | | | | | 10 | | | | | | | | | | 1 | | | | | | | **11** |
| **Bilila** | 1 | 1 | 63 | | | | | | | | | | | | | | | | | | | | | | | **65** |
| **Blantyre** | | 26 | | | | | | 2 | | | | | | | | | | | | 2 | 11 | | 2 | 12 | | **55** |
| **Chinyama** | | | | | | | | | | | | | | | | | | | 1 | | | | | | | **1** |
| **Chirimba** | | | | | | | | | | | | | | | | | | | | | | | | | 3 | **3** |
| **Flangton** | 1 | | | | | 19 | | | | | | | | | | | | | | | | | | | | **20** |
| **Gwaza** | 1 | | | | | | | | | | | | | | | | | | | | | | | | | **1** |
| **Khwisa** | 1 | 1 | | | | | | | | | | | | | | | | | | | | | 1 | | | **3** |
| **Kwale** | | | | | 1 | | | | | | | | | | | | | | | | | | | | | **1** |
| **Lambulila** | | | | | | | | | | | | | | | | | | | 2 | | | | | | | **2** |
| **Likhonyowa** | 1 | | | | | | | | | | | | | | | 1 | | | | | | | | | | **2** |
| **Limbe** | 1 | 55 | | 2 | 2 | | | 2 | | | | | | | | | | 2 | 1 | 2 | | 3 | 6 | 7 | | **83** |
| **Lirangwe** | | | | | | | | | | | | | 2 | | | | | | | | | | 5 | | 11 | **18** |
| **Liwonde** | 5 | | | | | | | | | 4 | | | | 2 | | | 4 | | 3 | | 38 | | | | | **56** |
| **Matoponi** | | | 2 | | | | 17 | | | | | | | | | | | | | | 10 | | 2 | | | **31** |
| **Mbanira** | 1 | | | | | | | | | | | | | | | | | | 1 | | | | | | | **2** |
| **Mphonde** | 1 | | | | | | | | | | | | | | | | | | 1 | | | | | | | **2** |
| **Mulipa** | 1 | | | | | | | | | | | | | | | | | | 1 | | | | | | | **2** |
| **Mululu** | | | | | | | | | | | | | | | | | | | 2 | | | | | | | **2** |
| **Namatunu** | | | | | | | | | | | | | | | | | | | | | | | 2 | | | **2** |
| **Nayuchi** | 72 | | | | | | | | | 3 | | | | | | | | | | | | | | | | **75** |
| **Njerenje** | | | | | | | | | | | | | | | | | | | | | | | 2 | | | **2** |
| **Nkaya** | 1 | 6 | | | | | | | 12 | | | | | | | | | | 2 | | | | 2 | | | **23** |
| **Nkwisa** | | 1 | | | | | | | | | | | | | | | | | | | | | | | | **1** |
| **Nlkaya** | 4 | | | | | | | | | | | | | | | | | | | | | | | | | **4** |
| **Nsamala** | 1 | | | | | | | | | | | | | | | | | | | | | | | | | **1** |
| **Nsanama** | 11 | | | | | | | | | | | | | | | | | | | | | | | | | **11** |
| **Nselenje** | 1 | | 2 | | | 19 | | | | | | | | | | | | | | | | | | | | **28** |
| **Ntcheu** | | 1 | | | | | | | | | | | | | | | | | | | | | | | | **1** |
| **Shire North** | 1 | 6 | | | | | | | | | | | | | | | | | | | | | 6 | | | **13** |
| **Sosolozi** | | 1 | | | | | | | | | | | | | | | | | | | | | | | | **1** |
| **South Lunzu** | | | | | | | | | | | | | | | | | | | | | | | 2 | | | **2** |
| **Utale** | | | 3 | | | | | | | | | | | | | | | | | | | | 11 | | | **14** |
| **Zomba** | | 1 | | | | | | | | | | | | | | | | | | | | | | | | **1** |
| **Total** | **106** | **107** | **76** | **2** | **3** | **38** | **17** | **4** | **111** | **7** | **3** | **6** | **2** | **2** | **6** | **1** | **4** | **2** | **98** | **4** | **65** | **3** | **46** | **19** | **28** | **760** |

The main mode of access to rail is shown in Table 6.4.

## Table 6.4 Rail passengers' access mode

| Mode of access | Percentage (%) |
|---|---|
| Walk | 56 |
| Cycle | 16 |
| Minibus | 13 |
| Taxi | 10 |
| Car | 3 |
| Train | 2 |
| **Total** | **100** |

The data shows that over half of the passengers (56%) walk to access the railway, with a further 16% cycling, giving a total of 72% using non-motorised modes to access the railway. This suggests that the majority of passengers that use the train originate in the area reasonably local to the station, rather than the railway drawing people in from a wider area. This is to be expected given the slow journey times of the railway it would be quicker, and easier, for people from a wider area to use another mode to access their destination directly.

Access times to public transport were also examined as part of the survey. The results of this question are given in Table 6.5.

### Table 6.5 Rail passengers' access time

| Access time | Percentage of passengers (%) |
|---|---|
| Less than 10 minutes | 16 |
| 10 – 19 minutes | 16 |
| 20 – 29 minutes | 7 |
| 30 – 44 minutes | 20 |
| 45 – 59 minutes | 4 |
| 1 – 2 hours | 24 |
| 2+ hours | 12 |

This suggests that the majority of rail passengers (66%) access rail in less than one hour. Given that the majority of passengers are also known to walk then this suggests that the majority of passengers are likely to live within 5 kilometres of the station that they access (assuming a 5 kmph walk speed). Interestingly 34% of passengers take over an hour to access the railway, which seems high, but the figures take no account of the egress times; it may be that a large access time is worth it if there is a short egress at the destination.

The distribution of wait times for rail were also determined from the survey, and are shown in Table 6.6

### Table 6.6 Rail passengers' wait times

| Wait time | Percentage of passengers (%) |
|---|---|
| Less than 10 minutes | 21 |
| 10 – 19 minutes | 17 |
| 20 – 29 minutes | 9 |
| 30 – 44 minutes | 25 |
| 45 – 59 minutes | 3 |
| 1 – 2 hours | 17 |
| 2+ hours | 8 |

The average wait times for rail services is 48 minutes, with more than 50% of passengers having to wait over 30 minutes. This is quite a long time to wait for a train, but is not surprising given the lack of a fixed timetable for the services. On site visits to a number of stations as part of the study, the response to a question on what time the next train arrives has generally resulted in the time being given as an hour block, so between 2pm and 3pm for example. In this case, it is not surprising therefore that the wait times are relatively long.

The response to the question on group size is given in Table 6.7.

### Table 6.7 Rail passenger group size

| Group size | Percentage of passengers (%) |
|---|---|
| Alone | 77 |
| 1 other adult | 9 |
| 2 or more other adults | 2 |
| 1 child aged 5 or under | 4 |
| 2+ children aged 5 or under | 2 |
| 1 child aged 6 – 17 | 11 |
| 2+ children aged 6 - 17 | 3 |

This shows that most of the rail passengers surveyed travel alone. Interestingly, when this is examined against the surveys for the other public transport modes the results are very similar.

The frequency of trip by rail is shown in Table 6.8.

### Table 6.8 Rail passenger trip frequency

| Frequency of trip | Percentage of passengers (%) |
|---|---|
| 5 or more times per week | 0 |
| 3 - 4 times per week | 1 |
| 1 – 2 times per week | 19 |
| 1 – 3 times per month | 24 |
| Less than once per month | 44 |
| First Time | 12 |

The frequency of trip responses suggest that the passenger rail services cater for infrequent users, with 56% of the interviewees travelling less than once per month or for the first time. Only 20% of the users travel on the train every week.

The distribution of rail passengers by journey time is shown in Table 6.9.

### Table 6.9 Rail passenger journey times

| Journey time | Percentage of passengers (%) |
|---|---|
| Up to 1 hour | 1 |
| 1 to 2 hours | 11 |
| 2 to 3 hours | 22 |
| 3 to 4 hours | 15 |
| 4 to 5 hours | 15 |
| 5 to 6 hours | 9 |
| 6 to 7 hours | 13 |
| 7 to 8 hours | 7 |
| Over 8 hours | 7 |

The figures from the journey time question suggest that the journeys of rail passengers are relatively long in terms of time. This is unsurprising given the relative slowness of the mode as discussed in the earlier chapter. The modal journey time is between 2 to 3 hours in duration. Analysis of the data suggests a mean journey time of 4 hours 7 minutes.

In addition to the questions asked about the journey undertaken some further profile questions were asked about the sex of the respondents, their age, employment status and income. The Stated Preference question was asked targeted at private vehicle, inter-urban bus, and air travellers in addition to rail passengers. The results of these questions in the tables below show the rail passengers response in relation to those of other modes. The gender question showed a reasonable response by both male (53%) and female (47%) travellers, shown in Table 6.10.

The response to the age question suggests that the rail passengers tend to be much younger than those using the other main inter-urban modes. A total of 30% of respondents are between the ages of 15 and 24, far higher than the next mode (inter-urban bus with 21%) and compared to only 1% of private vehicle respondents. A total of 66% of respondents are between the age of 15 and 34.

On the question on employment status, 59% of the total sample was employed (and of these 47% were full-time employed and 12% part-time employed). When broken down by mode, the data reveals that private vehicle (59%) and air travellers (66%) were most likely to be employed and rail passengers least likely (39%).

Table 6-11 shows that rail passengers have far less personal income per month than passengers using other modes. 28% of the total passengers have a personal income of less than 20,000 Kwacha per month, with a further 12% having a personal income of between 20,000 and 50,000 Kwachas, giving a total of 40% of passengers with a personal income of less than 50,000 Kwacha per month. If the passengers that responded with 'Don't Know' or refused to answer are excluded from the sample, then the figure for respondents with a personal income of less than 50,000 Kwacha per month rises to 67%.

The findings of the income question are what would be expected given what we know of the rail mode. The rail services are slow and cheap, certainly in comparison to the other main inter-urban modes.

### Table 6.10 Passenger age range

| Age range | Private vehicle | Bus | Rail | Air |
|---|---|---|---|---|
| 15 – 24 | 1 | 21 | 30 | 16 |
| 25 – 34 | 13 | 33 | 36 | 42 |
| 35 – 44 | 41 | 26 | 13 | 27 |
| 45 – 54 | 33 | 14 | 13 | 11 |
| 55 – 64 | 8 | 3 | 6 | 3 |
| 65 – 74 | 4 | 2 | 2 | 0 |
| 75 + | 1 | 1 | 1 | 0 |

**Table 6.11 Gross monthly personal income by mode**

| Gross monthly personal income (MWK) | Private vehicle | Bus | Rail | Air |
|---|---|---|---|---|
| Under 20,000 | 0 | 18 | 28 | 1 |
| 20,000 – 50,000 | 0 | 18 | 12 | |
| 50,000 – 70,000 | 5 | 16 | 5 | |
| 70,000 – 100,000 | 8 | 8 | 4 | |
| More than 100,000 | 55 | 14 | 11 | 62 |
| Don't know | 25 | 24 | 29 | 14 |
| Refusal | 8 | 2 | 11 | 22 |

### 6.3.1 Summary of passenger profile

The findings of the Stated Preference profile questions suggest that rail passengers are younger, are much less likely to be in employment, have lower incomes, and have less pressure on time given the longer journey times, than those using the other main inter-urban modes. From these findings, one would expect the rail passengers to have much lower values of time than those using the other main inter-urban modes of transport.

The findings are in line with what is expected given the provision of the passenger railway services. The passenger rail services are operated by CEAR as part of their Corporate and Social Responsibility obligations under the concession agreement. The principal justification given for the operation of the service in face to face discussions with CEAR and officials from the railway ministry has been to serve communities that cannot be reached because of the lack of road based alternatives for areas where there are few minibuses because of the poor condition of local roads. This is thought to be a particular issue between Liwonde and Nayuchi and between Limbe and Makhanga. It should be noted, however, that passenger services have not been operated between Limbe and Makhanga since 2013 so it is likely that alternative means of transport are now in place filling the gap that the lack of passenger operations have provided. Site investigations were made to stations south of Limbe, with the stations at Luchenza and Nansad reached relatively easily by road vehicle, and a thriving minibus scene is in existence at Luchenza.

It is accepted, however, that these stations are relatively accessible by vehicle and that this isn't the case with all of the stations on this route.

The rail passenger service is also aimed in particular at passengers carrying goods to and from local markets which explains the high number of coaches for goods. This is also evident in the high passenger flows to Nayuchi where passengers travel to trade at the border with Mozambique. This would be harder on very crowded minibus services. The service is much slower than local mini-buses where they operate.

Typical freight carriages being used


ATKINS

Malawi National Transport Master Plan

# 7 Freight demand

Rail Sub-Sectoral Plan

# 7 Freight demand

## 7.1 Summary of historic traffic levels

### 7.1.1 Coal

6.6 million tonnes of coal were carried in 2016. Coal traffic accounted for around 96% of all traffic by tonnage, and will account for even more in 2017. This makes coal the most important traffic in Malawi.

The coal traffic earned CEAR US$35.6 million in revenue in 2016. That is more than 10 times general freight revenue at US$3.2 million and nearly 10 times CEAR total non-coal revenue which was US$3.6 million and includes general freight revenue, passenger revenue and other financial and commercial revenue.

### 7.1.2 General cargo

Coal traffic is not carried by CEAR and contributes to the Malawi economy only indirectly –even through it effectively financially underpins CEAR and the restoration of the network to enable Malawi local traffic, imports and exports (and those of Zambia also) to be carried more reliably and efficiently. The coal traffic does not operate over most of the Malawi network but is restricted to the east and west branches only. The coal traffic has, is and will help provide CEAR with revenue which can be used to build Malawi a reliable railway network that can help Malawi (and Zambia) import and export goods efficiently but is not driven by the industrial or consumer base that Malawi needs to grow its economy.

Table 7.1 shows a summary of the general freight traffic carried to date by year on rail in Malawi – excluding coal transit traffic.

**Figure 7.1 Photo of Nacala container train from 2001**


By way of a comparison in 2008 CEAR carried 220,000 tonnes of freight traffic. The core traffic carried were described as "Maize, Containers, Fuels, Fertilizer, Cement, Tobacco and Sugar" – that is the same as currently. That was the last year that RDC had an interest in CEAR which they sold to Mozambique investors in that year.[50] Below is a photograph of a Nacala container train from 2001.

Over the last five years, it can be seen then the total of non-coal traffic has increased only slowly if at all. However, growth has been hampered by frequent line washaways and other closures. In 2016 and early 2017 CEAR has made significant improvements to the line in terms of journey times and axle load improvements, set out in Chapter 2. This is expected to have a significant impact going forward.

50 http://www.rrdc.com/op_malawi_cear.html

**Table 7.1 CEAR freight traffic carried, tonnes**

| Year | Export | Import | Local | Transit | Other | Total |
|---|---|---|---|---|---|---|
| 2011 | 82,074 | 116,367 | 7,813 | 0 | 0 | 206,254 |
| 2012 | 81,448 | 94,637 | 10,103 | 0 | 0 | 186,188 |
| 2013 | 61,848 | 137,416 | 18,099 | 0 | 0 | 228,082 |
| 2014 | 100,640 | 171,001 | 19,084 | 1,218 | 0 | 292,167 |
| 2015 | 86,080 | 102,085 | 22,483 | 10,739 | 1,862 | 223,089 |
| 2016 | 42,453 | 166,156 | 23,224 | 8,077 | 22,485 | 262,485 |

There are three types of freight carried Transit (which can be divided between Mozambique – mainly coal and Zambia – non-coal including clinker, inter-modal, maize and break bulk), International (export and import) and Local/ Domestic (where the journey is wholly within Malawi).

Each is examined in in the following section below.

## 7.2 Summary of current traffic and forecast traffic

### 7.2.1 Forecasting methodology

Freight forecasts are often inaccurate. This is because it is relatively hard for forecasting to extrapolate existing trends. It is even harder in Malawi where there is significant latent, even suppressed, demand that should respond to changes in the reliability of the rail offer. This is borne out in the interviews conducted for this study. Kennedy Kwerani of CEAR stated: "demand is always higher than the capacity we have….". Geoffrey Magwede of the Railway Directorate stated that if the railway "create the straw first… and (traffic) will always flow through". Similarly, he stated: "Create a conduit and the cargo will generate itself". He is correct. However, in 2016 non-coal freight revenue was less than half what had been forecast for the year.[51] In large part this can be explained by fact that CEAR had not yet had the chance to complete the line speed and other improvements in 2016 and were still suffering from line closures.

A detailed modelling has been carried out in this study. However, it is difficult for any model to accurately calculate how much traffic will be carried by rail because so much is variable. Traditionally such models rely heavily on the differential between haulage rates but in Malawi CEAR uses market pricing as already noted. Line closures and route reliability are very important (particularly in the wet season). The biggest problem is that because rail is starting with such a low base changes to the assumed speed of modal shift and GDP can have a large impact in terms of traffic volumes forecast over the medium term.

In forecasting the tonnages, we have used the results from the modelling, and these are provided with caveats where appropriate. We have based these forecasts on assumptions regarding the economy of Malawi, although this must be tempered by the rapidly changing railway environment, CEAR's investments and difficulties of data collection. It is possible that forecasts produced for this study are conservative since they focus on infrastructure interventions, rather than operational improvements. Nevertheless, we trust that they will be significantly more accurate than CEAR's own forecast which for 2016 were so inaccurate – although CEAR is more concerned with short-term volumes and this study with the medium-long term. The only way that the forecasts can improve is if the process of producing them and reviewing them is improved.

The Government of Malawi needs to produce short, medium and long term traffic forecasts on a regular (annual) basis and review on a similarly regular basis any variance from forecast and how the accuracy can be improved. This is vital if the financials of CEAR are to be also accurately forecast as traffic volumes underpin CEAR's revenues. It is also vital if the Government of Malawi are to produce reliable investment cases for enhancements to the network.

**Recommendation**
The Government of Malawi to produce short, medium and long term traffic forecasts on a regular (annual) basis and review on a similarly regular basis any variance from forecast and how the accuracy can be improved.

51 *In 2016 CEAR earned US$3.2 million against a budget of US$7.5 million for "freight revenue". This excluded US$21k of "Zambia Railways" revenue against a budget of US$650k. Even the coal traffic was lower than forecast and in this case Vale controls the production: actuals US$35.7 million against a budget of US$41.7 million.*

## 7.2.2 Transit traffic

The transit traffic can be divided between Mozambique (coal traffic) and Zambia (general freight).

### 7.2.2.1 Current Mozambique coal traffic

The most important transit traffic in Malawi is Moatize coal for export. In 2016 this accounted for around 96% of the total freight carried by tonnage.

In 2016 6.6 million tonnes of coal were carried from Moatize to Nacala via the east and west branches of the Malawi railway network. The coal traffic started in 2015 and levels are reported by CEAR to be increasing towards the forecast maximum albeit that the forecast is slightly behind budget. The coal traffic in November (when 734k tonnes was carried) and then December 2016 (when 948k tonnes was carried) each in turn accounted for record monthly tonnages moved. These are the last months for which the consultant has accurate tonnage figures. If the average of these two months had been carried from the start of the year, then CEAR would have carried just over 10 million tonnes. In 2017 CEAR can expect to carry and has forecast between 10 million and 18 million tonnes per year.

### 7.2.2.2 Forecast Mozambique coal traffic

The eventual forecast is up to 18 million tonnes per annum will be carried. It is not clear how much of the 18 million tonnes per annum forecast is made up of Vale's own traffic only or whether this relies on capturing coal traffic from other users and/or the abstraction of existing flows to Beira, but Vale are the largest operators at Moatize.

It should be noted that a new branch from Sena line to Macuze has been proposed and designed.[52] This has the potential to offer extra competition to Nacala.

It is understood that this line is being promoted by a different coal producer in Tete/Moatize for their own coal and other traffic they can attract to help spread their infrastructure cost. Given the investment made by Vale, the historic performance and capacity issues on the Sena line which in part caused Vale to invest in the Nacala route, the deep-sea berth at Nacala and the growing reliability of the Nacala route, it is unlikely that Vale will seek to switch their traffic – but the Government of Malawi should recognise that Vale have a potential alternative.

Each coal train to Nacala has a payload of about 7,560 tonnes (gross load of 9,840). Each train is assumed to be fully loaded to the maximum capacity of the trains given the modern loading apparatus at Moatize and the age of the wagons. To carry the full forecast tonnage will take on average just under the line capacity reserved for coal trains of 8 trains per day in each direction (7.9 trains assuming 300 days of operation per year).

It is important to note that CEAR gets a "fee (revenue) for access" (proportional to the length of the journey spent on the CEAR network) and "a fee for maintenance".[53] The haulage fee from the coal producer for this traffic is paid in its entirety to CLN to simply the commercial arrangements however this makes them less clear in the CEAR accounts. It is understood that a minimum traffic level (of coal) has been agreed by Vale to underpin the investment by Mitsui and others in part to support the re-financing of CEAR.

### 7.2.2.3 Current Zambia port traffic

The fastest growing city in Zambia is Chipata and this is only connected to the CEAR network. Whilst most of the rest of Zambia can reach the Indian Ocean via road and via the Tazara Railway, and might in theory be able to reach the Atlantic via railway links to the DRC, the nearest rail connected port is Nacala or Beira via Malawi, including for Lusaka – albeit the rail connection is only for part or all of the journey in Malawi and Mozambique as Chipata is not connected by rail to other parts of Zambia. It is 1045.5 km from Chipata to Beira and around 1,140 from Chipata to Nacala.[54] This is less than to ports in Tanzania, Dar-es-Salam in particular.

52 *Railway Gazette Concession signed for construction of 525 km coal railway 19th December 2013.*

53 *Source CEAR Company Limited Business Plan (July 2013), section 3.3.2.5.1 page 16.*

54 *Source distances from World Rail Atlas and historical summary, Volume 7, North, Central and East Africa by Neil Robinson, December 2009 ISBN-13: 978-954-92184-3-5 – sections 66-69. Note that the distances do not exactly match CEAR documents with Malawi but are typically less than 1 km in difference. CEAR distances used within Malawi by Rail Atlas used for Mozambique.*

Chipata was connected by rail in 2012. The first traffic only started to run in August and September of 2014. Regular traffic started in July 2015. During 2016 and 2017 regular washaways on the line between Nkaya and Zambia means that traffic has had to be suspended.

Up to December 2015, CEAR was typically hauling between 1,373 tonnes and 3,460 tonnes per month of maize, fertilizer and other products. In 2016 only 877 tonnes of "Zambia traffic" was carried by CEAR, because of the regular closures of sections of the route.

In Chipata there is an intermodal terminal. Some interviewees suggested that historic and recent traffic levels might be low because, in addition to recent line closures, there was no regular reach-stacker or crane to (un)load the train and that other facilities may be required, but this has now been rectified and a crane hired has been brought on site. The terminal is operated by Zambian Railways, who can charge for the use of the crane and other facilities and are thus motivated to secure traffic despite the small distance the train operates within Zambia. Zambian Railways (as well as CEAR and CDN) receive traffic income in proportion to the distance the traffic is carried on their concession with a reconciliation for common resources (locomotives, staff, wagons etc. used). In addition, the Government of Malawi has agreed that Zambian Railways can haul trains as far as Kanengo which will help incentivise them and improve efficiency. In interviews with the Government of Malawi staff it has been stressed that Malawi will seek reciprocal rights for CEAR trains to operate within Zambian should imports from Nacala or other traffic from Malawi, Mozambique or South Africa justify it. The customs arrangements are unclear but it seems at the moment that trains between Chipata and Nacala are not customs pre-cleared and operate on a similar basis to Malawi – Nacala traffic.

**Recommendation**
Extend customs pre-clearance to Zambia – Mozambique transit traffic.

#### 7.2.2.4 Forecast Zambian port traffic

Should the line become more reliable demand will increase. There are few other alternatives that work as well for Chipata, and also for other parts of Zambia. The Tazara railway is no longer hauling significant volumes of Zambian general commercial (i.e. non-mining) traffic despite historically having done so[55]. The rail route via the DRC is closed currently and will need rebuilding. The road alternative is expensive and lengthy. Therefore, any route for freight that is reliable and (marginally) less expensive will be attractive to shippers in the Chipata region mostly but also for much of the rest of Zambia.

However, the historic levels of traffic significantly under-represents the market potential should CEAR be able to work with Zambian Railways to offer a more competitive product. The maximum monthly volume to date still represents only a relatively small volume of the total local traffic and Chipata has the capacity to attract traffic from further within Zambia.

The largest potential is for mining traffic from the copper belt, from Patauke or new mines in Zambia particularly where those mines are not connected to the existing railway network and/or where some road haulage is required. Given the significant tonnages being extracted in Zambia it should be possible for the CEAR and the Nacala route to secure at least some traffic, and even a relatively small percentage could help lift the economic viability of the Chipata – Nkaya section significantly.

Copper production in Zambiahas fallen in recent years from historically high levels but is forecast to grow slightly by the Zambian Government. Table 7.2 sets out actual and forecast production from 2014 to 2018.

55 *In 2016 the Tazara railway only carried a combined total of between 88,000 (https://en.wikipedia.org/wiki/TAZARA_Railway#Growth_in_traffic) and 90,000 tonnes (source: consultant) – from Tanzania and Zambia against a design capacity of 5 million tonnes). This represents a fall from 630,000 tonnes in 2005.*

**Table 7.2 Zambia copper production**

| Year | Production (tonnes) |
|---|---|
| 2014 | 708,529 |
| 2015 | 710,560 |
| 2016 | 746,000 |
| 2017 | 700,000* |
| 2018 | 1,000,000* |

** Estimate*

In 2017 the Tazara Railway had forecast that it would carry about 165,000 tonnes of copper. The rest is expected to be carried by road. Most of the forecast rail traffic to be carried is from a single mine complex (Konkola) that was persuaded to reuse rail in 2013. Konkola Copper Mine produced 115,000 tonnes in 2015[56]. Therefore, the Chipata line be extended into the copper belt (see below), because so much traffic is already being trucked on road, it should be possible to divert some of those trucks to a railhead for forward delivery to Nacala.

Zambian international traffic has historically been forecasted using macro-economic models that assume that rail will maintain or grow the existing percentage of total traffic and that the key driver is economic growth. For example, the June 2016 Feasibility Study for the Rehabilitation of the Mchinji to Nkaya Railway line in Malawi for the Malawian Ministry of Transport and Public Works suggests that even if the Malawi economy grows slowly, but the Zambian economy grows faster (which is their "most likely scenario") the volume of rail traffic between Chipata and Nkaya would be 9% of all traffic on the corridor (271,298 tonnes) in 2015 and 19% of all traffic (2.84 million tonnes) in 2031.[57] It is important to note that this forecast tonnage is not only for Zambian traffic but also any traffic within Malawi on the Nkaya – Mchinji corridor – although the report states "the majority of this traffic is for transit flows and concerns Nacala trades through the Nacala corridor." The report estimates this will generate around US$87 million in revenue for CEAR which would make it as important as the coal traffic at forecast maximum volumes. However, care needs to be taken in these reports to recognise that such massive uplifts in volume are based on macro-economic forecasts that extrapolate over an extended period, and that what will impact on rail even more is whether it can offer a competitive product or not. Even though the report was published in 2016 rail only carried a portion of the forecast tonnage in 2015. In 2016 CEAR only moved 262,485 tonnes of traffic in total including 22,485 tonnes of rail engineering traffic. In 2015 CEAR moved only 223,009 tonnes in total.

Given the long distances involved from Chipata and other parts of Zambia, rail should be able to offer a significantly better service in terms of speed, reliability, customer service and price – and providing other monopoly operators do not adjust their price or service offering to negate this and, in particular, providing that Nacala is competitive as a port with Beira - then rail should be able to grow significantly. Without a connection beyond Chipata, it is suggested that it would not be unreasonable to target the maximum monthly figure on an annual basis and assume that this will grow significantly. It is therefore reasonable to expect that, even without an upgrade of the route, that CEAR should, as a minimum, attract up to around 40,000 tonnes per year (that is 12 x 3,460 tonnes) of Zambian traffic, and that this should double over 16 years with forecast growth in Zambian and Malawian economies to around 80,000 tonnes per year.

The key to securing more traffic is for CEAR and its partners to offer a better product. These relatively small improvements could secure large volume increases as shippers are interested in the marginal difference between modes.

56 *Ministry of Mines, Zambia*

57 *Total traffic (i.e. rail plus other modes) per year is forecast on the Chipata – Nkaya corridor to grow to 3,484,829 tonne kms per day (scenario 2) by 2031. This is equivalent to 3.02 million tonnes in 2015 and 15.11 million tonnes in 2031. The same study then forecasts that rail should carry around 9% of this traffic (271,298 tonnes) in 2015 and 19% (2.84 million tonnes) in 2031. It is important to note that this forecast tonnage is not only for Zambian traffic but also any traffic within Malawi on the Nkaya – Mchinji corridor – although the report states "the majority of this traffic is for transit flows and concerns Nacala trades through the Nacala corridor." This the study states will "guarantee a total annual revenue of US$87 million to the rail operators." If that is the case, the revenue from Zambian and Malawi traffic on the Chipata – Nkaya branch would be roughly equal to the revenue of the Coal traffic at its forecast maximum tonnage. Page 25 of Feasibility Study for the Rehabilitation of the Mchinji to Nkaya Railway line in Malawi for the Malawian Ministry of Transport and Public Works by Team Engineering and D'Appolonia, funded by the EU, June 2016*

Much of the work required has already been undertaken by CEAR as they have restored the route after washaways. Initially these improvements should be based on taking advantage of the improved transit times, running longer trains (taking advantage of the recent operational trial) higher service frequency and reductions in the haulage rate to secure volumes.

It is noted that CEAR originally forecast carry around 300,000 tonnes of traffic to/from Zambia in 2016. That only represents around 10% of total traffic on the Chipata- Nkaya corridor (albeit including Malawi traffic). That proved an impossible target with the washaways in 2016 but is a reasonable target for traffic for the year after the line is fully operationally restored. Carrying 600,000 in subsequent years is not unreasonable given that it only represents rail securing 20% of total traffic. To achieve 300,000 or 600,000 tonnes per annum will require active promotion by Zambian Railways and shippers being persuaded to use Nacala port and these will not happen without concerted effort – see below.

The railways of Malawi, Mozambique and Zambia rely on each other to secure traffic originating in the home nation of each. Therefore, the volume of traffic from Chipata relies on Zambian Railways and from Nacala from CDN. At the moment, the service currently on offer is not clear. Any approach to Zambian customers should be supported by Zambian economic ministries as it will offer Zambian industry a shorter and potentially cheaper means of reaching the Indian Ocean. It may be opposed by some who will not wish to see a competitor and by their supporters in the relevant transport ministries.

**Recommendation**
That CEAR/CDN should work with Zambian Railways to agree what they could do to improve the railway service short of increasing the axle load. Additionally, they should agree on a list of target customers to approach to sell this new service, in particular, whether it is worth approaching any of the mining operations in Zambia.

Because rail only serves Nacala any shift to rail by Zambian importers/exporters will require them to move their operations from the ports that they currently use. To persuade miners to shift their logistics approach can be difficult as they will also need to change their warehousing, shipping and other arrangements – and it is the total price and route reliability that matters. This underlines the importance of offering such shippers or industrial producers a complete product that they can rely on. It will not help CEAR if they upgrade the rail offer only for the shipping arrangements at Nacala for customers to be unsatisfactory.

**Recommendation**
Include Port of Nacala in workshops on developing rail service offer for Zambia.

At the moment, the axle load of the route is less of an issue because of the loaded weight of the existing wagon fleet (mainly up to 15 tonnes/axle). However, in order to attract high volume mining traffic which will normally be loaded to their maximum to improve efficiency, there may be a need for higher axle load wagon and a route upgrade. Whilst the steepest gradient is typically downhill east from Chipata (near Salima) – i.e. leaving Chipata loaded - so will not limit the trailing weight of the train. However, the trailing weight will be an issue if Zambian shippers can be persuaded to import through Nacala and it is likely that any significant increase in mineral traffic would require higher specification locomotives that could take advantage of the higher axle load and be more efficient.

**Recommendation**
That CEAR/CDN should work with Zambian Railways to agree what they could do to improve the railway service including increasing the axle load to complement potential line extensions within Zambia. As above, additionally, they should agree on a list of target customers to approach to sell this new service.

### 7.2.3 Extension of Chipata line within Zambia, including to the TAZARA line

Future connections through extensions of the railway in Zambia have been suggested. The Tazara railway and the CEAR/CDN network were built with the same gauge so can be connected easily. Zambian Railways has promoted a potential 398 km extension from Chipata to Serenje in Zambia on the Tazara line.[58] This extension is similar to historic proposals to extend the line to Mpika on the Tazara line.[59] This would allow traffic from the copper belt to be exported via a short section of the Tazara line, the new line and via the CEAR network to Nacala. This would become the shortest route. It would also give Malawi an option to import/export via Dar-es-Salam (which may be significant in the event of a resurrection of any disorder in Mozambique). It is worth noting that the route is sufficiently long to act as an incentive to Zambian Railways although the attitude of recent Chinese investors in unknown. It has also been suggested that the Chipata line may be extended to Patauke first where there is a mining operation and/or that the line may be expanded direct to Lusaka.

This potential extension within Zambian has the same scale of transformative potential as any rebuild of the Sena line. This is because, as Mr. Brian Mushimba, Zambian Minister of Transport and Communication, said: "once the Chipata-Petauke-Serenje railway line was completed it would provide the shortest route of 1,500 km to the sea"[60] which means, given the distances involved, that rail via the CEAR network should become the primary mode and route for most of Zambia, subject to CEAR, Zambian Railways and CDN offering a coordinated, competitive and reliable service.

There are different views on whether this extension will proceed. Mr Brian Mushimba has been quoted in April 2017 as saying "The contract to construct the 388 km of railway has been signed with the China Railway Construction Corporation Limited."[61] However, other rail projects have also been announced such as Kalumbila - Solwezi – Chingola, there is some political opposition[62].

However, given the enormous potential it is important that Malawi does not do anything that builds that scepticism but helps facilitate any extension.

Zambian Railways have already been granted the rights to run trains direct to Nacala (albeit with payment of an appropriate access fee to CEAR) although CEAR have yet to seek reciprocal rights.

Before the CEAR network is connected to the Tazara line, Patauke and/or Lusaka, CEAR will need to maximise the trailing load of trains from Chipata between Salima and Nkaya. Whilst some trials have been conducted CEAR will need to consider upgrading the axle load to 20.5 tonnes as the extra traffic will justify the investment and is unlikely to be available without such an enhancement. It is important that Zambian Railways, CEAR and CDN/CFN agree to a tripartite train operations methodology that will deliver the forecast tonnage reliably and cost effectively, and profitably for all three companies.

58 http://www.railwaysafrica.com/news/linking-chipata-to-tazara. https://www.lusakatimes.com/2015/07/07/mchinji-railway-line-to-soon-be-joined-to-the-tazara-line-president-lungu/. *"Republican President Edgar Lungu has said the Mchinji Chipata Railway line will soon be joined to the Tanzania Zambia Railway Line. The President disclosed this on Monday evening at Sanjika palace the official state house of the Blantyre during the State Banquet which was hosted in his honour said the Mchinji Chipata Railway Line would be joined to the Tazara. "My government has made strides in joining the Mchinji Chipata Railway Line to Tazara and will make this a reality soon," he said. President Lungu who was accompanied by First Lady Esther said the contractor assigned to work on the project would soon move on the site to embark on this project. He said the Mchinji Chipata Railway and the Zambezi Water way were the two channels through which Zambia and Malawi could facilitate trade between the two countries in the region."*

59 http://www.railwaysafrica.com/2010/06/chipata-railway-2/

60 https://www.lusakatimes.com/2017/04/25/government-completes-assessment-construction-serenje-petauke-chipata-green-field-railway-line/

61 https://www.lusakatimes.com/2016/11/03/government-signs-a-2-3-billion-deal-with-a-chinese-firm-to-construct-a-chipata-serenje-railway-line/ and https://www.lusakatimes.com/2017/04/25/government-completes-assessment-construction-serenje-petauke-chipata-green-field-railway-line/

62 https://www.lusakatimes.com/2016/12/24/chipata-mchinji-railway-line-not-viable-government-engage-private-sector/

Whilst currently it is assumed that trains from Zambia will want to use Nacala Port, Beira Port is likely to be as attractive for Zambian traffic as it already handles significant volumes of road hauled exports and imports. It is important that the Government of Malawi reconsider the business case for the rebuild options for the Sena line should any rail extension beyond Chipata become more certain. It is also important that the Government of Malawi do nothing that precludes the Beira option – ideally giving shippers the choice. Having competition between Beira and Nacala would help ensure that neither port seeks to monopoly price any new traffic from/to central Zambia.

**Recommendation**
The Government of Malawi to sponsor freight forecasts for Malawi should Chipata line be extended.

**Recommendation**
CEAR to consider optimum operating methodology should Chipata line be extended.

**Recommendation**
The Government of Malawi to refresh/ reconsider the business case for Sena line rebuild options should Chipata line extension become more certain.

**Recommendation**
Maintain Beira as an option for Zambian traffic forecast to use the proposed extension from Chipata.

### 7.2.4 International traffic

International traffic is defined as traffic that either starts or ends its journey within Malawi AND originates or is destined for another country. For the clear majority of the traffic on the CEAR network this means traffic imported via Nacala for Malawi or exported from Malawi via Nacala, however the Chipata link allows rail traffic to be imported or exported to Malawi from Zambia also.

#### 7.2.4.1 Current Zambia – Malawi traffic

Currently there is understood to be little Zambian International traffic (that is traffic to/from Malawi rather than through traffic to Nacala) currently running, though both CEAR and Zambia Railways believe that there is a significant chance of clinker traffic being imported from Zambia. Malawi used to produce its own clinker near Zomba and this was the one of the main purposes of the branch line to the Changalume Cement works. Some container traffic could run between Chipata and Kanengo or Blantyre/Limbe but little does.

#### 7.2.4.2 Forecast Zambia – Malawi traffic

It is unlikely that rail traffic levels between Zambia and Malawi will ever be relatively large in comparison with between Zambia and Chipata/Beira. This is because much of their economy is similar. They have similar agricultural sectors. The best short-term opportunity is the movement of the clinker to Malawi and the movement of cement and bagged fertilizer to Zambia (where Malawi receives material in bulk and re-exports the product that has been packaged). In the long-term there is the potential that the Malawi and Zambia economies will become more integrated – that Zambia may import Malawi coal and Malawi process Zambian minerals but that is not thought to be the case at the moment.

Therefore, over the medium term, it is unlikely that Zambia – Malawi traffic will exceed 50,000 tonnes per annum.

**Table 7.3 International traffic (tonnes)**

| Year | Exports | Imports | Total |
|---|---|---|---|
| 2011 | 82,074 | 116,376 | 198,441 |
| 2012 | 81,448 | 94,637 | 176,085 |
| 2013 | 72,567 | 137,416 | 209,983 |
| 2014 | 100,064 | 171,001 | 271,065 |
| 2015 | 102,085 | 86,080 | 188,165 |
| 2016 | 166,156 | 42,453 | 208,609 |

### 7.2.4.3 Current Nacala- Malawi traffic

Table 7.3 above sets out some of the tonnage carried between Nacala and Malawi for different years. It is worth noting that tonnage is not always an accurate proxy for traffic volume or worth for the railway. One key flow is in empty containers which weight little but still command a haulage rate roughly equal to full containers. Other traffic bulks out before it weighs out, where the product is light, and this traffic is often commercially attracted to rail where volume is less of an issue particularly in low axle load railways.

In 2011 198,441 tonnes of International traffic was carried. This consisted of 82,074 tonnes of exports and 116,376 tonnes of imports. Of these sugar was the most important export, followed by beans and peas. Together these commodities almost accounted for at least half the total traffic carried. Sugar hit a high of 7,000 tonnes exported in December and a one month low of 624 in April which may have more to do with railway capacity as beans and peas hit their high of 2,161 tonnes in that month but were zero in November and December. Of the imports wheat grain was the most important, just above "general" goods, followed by fertilizer and then fuel. Fuel traffic strangely stopped in June 2011.

### 7.2.4.4 Forecast Nacala – Malawi traffic

Forecast rail traffic to and from Malawi from and to Nacala is shown in Table 7.4

**Table 7.4 Forecast rail traffic through Nacala**

| Year | Tonnes |
|---|---|
| 2016 | 208,600 |
| 2021 | 264,600 |
| 2026 | 305,400 |
| 2031 | 377,400 |
| 2036 | 468,600 |

**Table 7.5 Domestic traffic (tonnes)**

| Year | Commodities | Engineering materials | Total |
|---|---|---|---|
| 2011 | 7,813 | | 7,813 |
| 2012 | 10,103 | | 10,103 |
| 2013 | 18,099 | | 18,099 |
| 2014 | 19,884 | | 19,884 |
| 2015 | 22,483 | 1,862 | 24,245 |
| 2016 | 23,224 | 22,485 | 45,709 |

## 7.2.5 Domestic

### 7.2.5.1 Current traffic

The haulage of rail traffic within Malawi has slowly grown every year from 2011 to 2016 albeit from a very low base. In 2011 the key commodities were salt and tobacco. More recently the key commodities are cement and fertilizer. The key movements are to/from Kanengo.

### 7.2.5.2 Forecast domestic traffic

This trend is expected to continue. Whilst domestic traffic is always likely to be less than international traffic or transit traffic because rail competes with road most effectively over longer distances, it is still significant. Recent improvements to transit times in Malawi and the restoration of the line after local washaways will have a disproportionate benefit on Malawi customers as the benefit to local transit times will be greater proportionally than customers sending/receiving traffic over longer distances to/from Nacala and/or Chipata. On that basis, having interviewed key customers and looking at the CEAR forecast for 2016 more generally, it is expected domestic traffic to grow to between 50,000 and 100,000 tonnes plus in the medium term should CEAR offer a reliable service and keep tariffs at current or lower levels as volume grows.

**Table 7.6 Forecast domestic rail traffic (tonnes)**

| Year | Tonnes |
|---|---|
| 2016 | 23,224 |
| 2021 | 26,400 |
| 2026 | 29,900 |
| 2031 | 34,000 |
| 2036 | 38,600 |

## 7.2.6. Transit

Transit traffic depends mainly on Zambia, and the efficiency and attractiveness of the railhead at Chipata. Zambia Railways expect transit volumes to grow from a potential 150,000 tonnes per year to 300,000 tonnes, with the construction of a dry port at Chipata. This would be a significant jump from the current low base, but conceivable. Our forecast is shown in Table 7.7.

**Table 7.7 Forecast transit traffic (tonnes)**

| Year | Tonnes |
|---|---|
| 2016 | 8,000 |
| 2021 | 25,000 |
| 2026 | 150,000 |
| 2031 | 185,000 |
| 2036 | 230,000 |

Grade separated crossing between road and rail

ATKINS

Malawi National Transport Master Plan

# 8 Costs and revenues

Rail Sub-Sectoral Plan

# 8 Costs and revenue

## 8.1 Passenger services

Following a meeting with CEAR officials on Tuesday 29th March 2017, a Statement of Comprehensive Income and Expenditure for the railway operation, for the full year of 2016 was made available. The sheet is for the entire railway operation, both passenger and freight services, with only a few line items distinguishing between the two types of operation. An attempt to determine the operating subsidy for the passenger operation is detailed in the section below.

### 8.1.1 Revenue

Revenue for passenger rail services is distinguishable in the Statement of Comprehensive Income and Expenditure as a separate line item. The Passenger Revenue for 2016 is quoted as US$148,094.

It is possible to sense-check this number against the number of passengers travelling. In the earlier section of this report, it was determined from the Stated Preference profile questions that the average journey time was 4 hours and 7 minutes. Furthermore, high level analysis of the fare levels suggested an average fare of 11 Malawian Kwacha per kilometre. If the journey from Limbe to Balaka is examined this is a total journey time of 6 hours 48 minutes (from the Working Timetable) to cover a distance of 112 kilometres. If the average journey time is pro-rated and applied to the distance figure this would give an average distance travelled of 68 kilometres. Applying the average fare of 11 Malawian Kwacha to the distance travelled results in an average fare paid of 748 Malawian Kwacha. The passenger numbers quoted by CEAR for 2016 is 156,908 passengers.

Multiplying the number of passengers by the calculated average fare gives a total revenue of 117m Malawian Kwacha. In this report, we have assumed that the conversion rate is US$1 = MWK725, which results in a total passenger revenue of US$161,000. Given the vagaries of the conversion rate and the approximate nature of the calculation this suggests that the numbers quoted are relatively consistent.

### 8.1.2 Costs

A detailed cost breakdown for the passenger services does not exist as separate line items in the Statement of Comprehensive Income and Expenditure. The only item quoting passenger services directly is the one for 'Locomotive Fuel Costs: Passenger'. In 2016 this line item was US$163,416. This number alone is higher than the entire passenger revenue for the year, which immediately confirms that the passenger operation is running at a loss. This is not unsurprising given that the Government was previously paying a large subsidy for passenger services to be operated as part of a Public Service Operation.

There are obviously other costs associated with running a passenger services operation including spares and maintenance for rolling stock and locomotives, and staffing and other administration costs. None of these items are distinguishable in the Statement of Comprehensive Income and Expenditure. There is a line item, however, for 'Locomotive Fuel Costs: Freight'. This is quoted as US$1,503,585 for 2016. Given that the locomotive fuel costs are effectively a proxy for the amount of services operated it is proposed to use the ratio of passenger to freight fuel costs to determine the remainder of the passenger operating costs. Table 8.1 gives an estimate of the other costs associated with running passenger services.

**Table 8.1 Passenger service operating costs, 2016**

| Item | Total (US$) | Passenger (US$) |
|---|---|---|
| Spares and maintenance – rolling stock | 448,296 | 48,721 |
| Spares and maintenance – locomotives | 108,286 | 11,769 |
| Administration costs | 743,461 | 80,799 |
| **Total** | **1,300,043** | **141,289** |

If the fuel costs for the passenger locomotives is then added to the figures above, then a total cost for operating passenger services is around US$304,705 per year.

In calculating the costs of operating passenger services the costs of rolling stock and some form of track access charge should be considered. It is understood that CEAR purchased the new passenger coaches outright, so the coaches are effectively a 'free' good as they have already been paid for. For track usage CEAR do not operate a regime of track access charging, other than for the coal traffic. Instead the track and structures maintenance costs are included as a single pot of money. Given that the damage caused by passenger services, because of the lower axle loads, is much less than that caused by freight trains, and the number of passenger trains operated is far smaller than the number of freight trains, then the track maintenance costs attributable to passenger services are at best incremental, bordering on insignificant. They have therefore not been taken into account in calculating the cost of operating passenger services.

### 8.1.3 **Profitability**

The calculations above suggest that the passenger services are effectively subsidised by the freight services operated by CEAR. The passenger revenues do not cover the locomotive fuel costs for operating the passenger services, far less the wider costs.

The passenger revenues in 2016 were US$148,094 compared to an estimated cost of US$304,705, meaning that passenger services are subsidised to the amount of US$156,611.

The latest figures suggest that passenger revenue is growing significantly following the introduction of the new coaching stock. Given the issues identified with regard to the passenger operations identified earlier in this report, which can be fixed relatively easily, which should result in even higher demand, and thus revenue, then it is hoped that the gap between operating cost and revenue should be capable of being reduced significantly in the next few years.


Passenger and freight service operated by CEAR

Malawi National Transport Master Plan

# 9 Financial sustainability of the concession

Rail Sub-Sectoral Plan

# 9 Financial sustainability of the concession

## 9.1 Summary

Prior to the intervention of Vale, the financial position of the concession was unsustainable. At a particular low point, just prior to the sale of the concession to CEAR, some CEAR road vehicles were seized by the Malawi Revenue Authority for an outstanding debt of 100 million Kwacha and some staff went unpaid. It is in large part only because of the professional loyalty of many of the CEAR staff who suffered personal financial hardship that the operation was maintained. It was clear though by 2012 that this was insufficient, and had Vale not intervened then it is most probable that the business would have declined further and failed.

This is a common trend with underperforming railways where the lack of passenger revenue decreases the spend available for track and rolling stock which reduces customer service, which reduces demand and revenue in a vicious, downward spiral. The key problem is that railways have very high fixed costs – mainly for track and civil infrastructure but also for rolling stock. The upside is that once breakeven is achieved the high fixed costs mean that the incremental operating costs are low.

However, an assessment of the accounts and forecast freight traffic suggests that this railway is likely to be financially stable in the short term, profitable in the medium term and able to help support the Malawi economy in the long term. The biggest contribution that the railway can make to Malawi is in reducing haulage costs and improving freight haulage reliability. The biggest risk is that this potential contribution is diluted through over-ambition that reduces the ability of CEAR to afford to restore and maintain the core network or that the owners of CEAR seek to recoup any financial surplus rather than invest in the capacity of network in effect relying on the coal business only and ignoring the long-term potential of the other traffic.

## 9.2 Survey of CEAR's current financial position

The franchise concession requires that CEAR provide the Government of Malawi with detailed accounts, completed to international standards and separated from other Vale entities. CEAR has confirmed that these accounts are produced and shared with the Government of Malawi. Atkins has been given copies of the Annual Financial Statements for CEAR for the years ending 31st December 2012, 2013, 2014 and draft Annual Financial Statement for CEAR for the year ending 31st December 2015, and a more detailed Statement of Comprehensive Income (and Expenditure) for 2016.

The 2015 draft accounts state that CEAR made a loss of MWk49,863 mn (that is US$69 Million US at 725 Malawi Kwacha/$US). Of this the net operating loss (without financing) was MWK3,360 mn (US$4.6 million). This loss resulted from CEAR generating only MWk2,521 mn from "revenue" and MWk369 mn from other sales for other sales. The cost of sales and administrative expenses (which are understood to include fuel, staffing and rolling stock) were MWK838 mn and 5,411 mn respectively.

MWk46,510 mn of the total loss in 2015 was made up of financing costs. This a very significant rise on 2014. It is understood that these financing costs include not only the interest on the debt but also the debt itself. In 2015 CEAR paid MWk2,872 mn interest which is greater than revenue and nearly as great as revenue plus other income. In 2015 CEAR is shown as having total borrowings of MWK177,778 mn (approximately US$245 million), nearly all of which is more than one year old. That is an increase by of MWK81,472 mn. This loan – mainly from Vale – "attracts an interest rate of LIBOR plus 7%" – according to the 2015 accounts. This borrowing is denominated in US dollars. The rate is expected to change with the proposed 2017 amendments to the concession agreement when CEAR is refinanced. This cost is due because Vale financed the upgrade of the line between Nkaya and Nayuchi and other works at a total cost to end of 2016 of US$242 million, and has also had to finance operating losses from CEAR.

The financial results for 2016 suggest that CEAR made a loss of US$19,169,186. Had it not been for a US$20 million loss in "Other Comprehensive Income", CEAR would have (just) broken even. This included the payment of US$19 million in "financing costs" – which seems to equate exactly with the declared interest rate of LIBOR +7%.

In an interview given for this commission in 2016, Christina Chithila, the Financial Controller of CEAR stated that the financial performance of CEAR was "on course" – specifically that CEAR was expecting to enjoy US$67.1 million in revenues and US$69.3 million in expenditure – a shortfall of only US$2.2 million although it is not sure exactly over which period and this compares with a budget forecast of US$50 million revenue, US$56 million in costs (including financing) for the 12 months to end of December 2016. The improving emerging results over time bear out that optimism (Table 9.1).

**Table 9.1 CEAR accounts rounded to million Kwacha**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|
| Revenue | 497 | 938 | 1,430 | 1,927 | 2,521 | |
| Other income | 91 | 45 | 47 | 2,744 | 369 | |
| Total income | 587 | 983 | 1,477 | 4,671 | 2,890 | 54,166 |
| Cost of sales | (207) | (394) | (796) | (1,177) | (840) | |
| Other operating costs | (699) | (1,479) | (2,219) | (2,705) | (5,412) | |
| Other | | 1 | 5 | 6 | 8 | |
| Total costs exc financing | (906) | (1872) | (3010) | (3,876) | (6,244) | 39,246 |
| Profit/(loss) exc financing | (319) | (890) | (1533) | 800 | (3,353) | 14,920 |
| Finance costs | (259) | (3,493) | (7,086) | (15,971) | (46,510) | (27,800) |
| Profit/(Loss) | (537) | (4,392) | (8,259) | (15,177) | (49,863) | (13,898) |

Note that revenue disaggregation and attribution in 2011 based on Atkins judgement as accounts formatted differently. In 2016 a Profit and Loss account used to generate figures for comparison. Note that figures are rounded so they do not reconcile exactly.

*63 This figure includes (US$19,175,889) for financing, US$1,404 for tax and (US$20,574,196) for "other comprehensive income". This "other comprehensive income" was unbudgeted but may relate to currency financing and is assumed to be a one-off charge in this assessment of CEAR's accounts.*

There is no explanatory note in the accounts that explain in detail the origin of the debt or disaggregate that debt, though the debt is understood to be for the investment in rebuilding parts and refurbishing other parts of CEAR network and is repayable to Vale. That is consistent with the July 2013 CEAR Business Plan which stated that until external funding could be found Vale was obliged to provide funding. It is also consistent with interviews with CEAR. The rise in debt corresponds with the upgrade of the east branch line and upgrades to both the south and north lines. In addition, there has been a significant investment in rolling stock. CEAR have suggested that the total investment in the CEAR concession to 2016 has been around US$242 million – and that of this around US$200 million has been spent on the Nkaya – Nayuchi line and $US42 million on the north and south branches, rolling stock and other items. The debt is also thought to include losses incurred by CEAR that Vale has had to support.

How that debt is financed and how this accounted for within those parts of CEAR's accounts that have been shared is unclear. The 2016 accounts include a US$20,574,196 debit described as "other comprehensive income" in addition to a debit of US$19,175,889 for "net financing costs" that seems to equate to the interest due on Vale's loan at LIBOR+7%. In 2015 there are financing costs quoted of 46,510 million Kwacha which is around 9 times CEAR total income. A more detailed explanation or breakdown of these costs would help the Government of Malawi understand the net financial position of CEAR more clearly.

The key question this debt raises is whether CEAR will be able to turn around the business sufficiently quickly to generate enough to repay the debt from Vale faster than it grows and in sufficient time that the coal traffic is relatively certain. It is a primary concern. However, from the accounts received and a reconciliation of these with the traffic moved, subject to the missing data, Atkins believes that the CEAR concession is likely to prove significantly profitable even with the debt. This is reinforced by the willingness of investors to re-finance the Vale investment over a 15 year period at an expected lower interest rate as part of the proposed 2017 changes to the concession agreement.

Key to this profitability is the income from the coal traffic that CEAR enjoys. Whilst there are costs associated with this traffic CEAR enjoyed an income of US$35.688 million for the transit of 6.595 million tonnes of coal. This equated to 91% of CEAR's total revenue in 2016. The rate per tonne for the coal traffic in Malawi is not known. It may be US$5.41 per tonne if the 2016 actual figures are used. However, the 2016 budget suggests that CEAR would have earned US$41.741 million for a reported "10 million tonnes" which is US$4.17 per tonne. It has been suggested to Atkins that Vale has agreed a "take or pay" arrangement in which they have committed to pay a minimum fee (unknown). It is not uncommon for such arrangements to include a minimum fee and a lower rate per incremental rate per tonne carried. If that were the case, then this may be a low as US$1.80 per tonne.[64] These different approaches generate a significant difference in the potential income that CEAR might earn at the forecast tonnage of 18 million tonnes per annum which is between US$55 million US and US$97 million.

It is vital therefore that the Government of Malawi has a clear understanding of the income that CEAR will enjoy at different coal traffic levels as this will have a very significant impact on the ability of CEAR to fund other enhancements and on the value of the asset that the Government of Malawi will enjoy at the end of the concession period. Considering the needs of financiers to be comfortable about CEAR's financial viability, in this report, Atkins has used an estimate of US$85 million. US$85 million also equates to 15.7 million tonnes at US$5.41 per tonne so may be a prudent assumption in case forecast coal tonnages are not reached.

**Recommendation**
The Government of Malawi employ experts to work with CEAR to establish in greater detail the revenue expected for different coal tonnage forecasts in accordance with the agreements in place between Vale, it subsidiaries including CEAR and external funders.

*64 US$1.80 per tonne calculated by looking at the incremental income and incremental tonnage between the 2016 budget and actuals for 2016.*

Coal expenses (within the 2016 accounts) are disaggregated at US$4.663 million. This 2016 actual costs for "Coal Expenses" was significantly lower than the budget forecast of US$43 million for Coal Expenses. It is interesting to note that this excludes a budget provision of US$1.8 million for the concession fee element driven by the coal traffic and is lower than the budget income for Coal Revenue for 2016 at US$41.7 million. It is not clear exactly what was included in this figure of US$41.7 million. CEAR has no haulage costs and only minimal staffing costs. It is equal to about 5% of the cost of the east line (at US$800-870 million) and around 4% of the west and east line combined (around US$1 billion). Atkins view is that this would be a prudent provision for maintenance for both lines.

The finances of CEAR are necessarily complicated. The refinancing makes them even more complicated. For example, Vale is expected to retain three types of equity after 2019 in CEAR. The accounts suggest that significant trading takes place between different Vale entities. Vale will not only be the largest shareholder in CEAR (with Mitsui) but will remain the main shareholder of the entities from whom CEAR will receive the vast majority of its revenue and incur the vast majority of its costs. The commercial basis for this is unclear. To Vale the chief concern of the railway is to ensure that there is a reliable means of exporting Vale's coal from Moatize as efficiently as possible. It seems the coal traffic is currently cross-subsidising other general traffic through transit fees and/or the physical development of the network, and that the debt incurred to develop and maintain the network (mainly for the coal traffic) does not require non-coal traffic for it to be repaid. Vale require its subsidiaries to operate a Railway Tariff Model that follows best industry practice. This regulates trade between Vale entities. However, it is not clear that the Government of Malawi audits the use of this model and the model ignores the fact that the biggest beneficiary of the railway is Vale who enjoy lower cost haulage as a result.

It is vital that the Government of Malawi understands the accounts in detail. Many railroads in Africa have been encumbered with debt that cannot be repaid and are unable to afford to enhance the railway in line with customer needs. This is leading to falling traffic volumes undermining income and the capacity to repay the capital cost further.

The executive management of CEAR, Vale and the Government of Malawi should be praised for proving the exception to the rule to date, but the Government of Malawi may need external expertise to assist it in its oversight role as the financial volumes become very much more significant.[65]

**Recommendation**
The Government of Malawi appoints external support to scrutinise the CEAR accounts from a commercial and accounting perspective on a regular basis.

**Recommendation**
The Government of Malawi, with support from CEAR, should, however, still undertake financial modelling to test how quickly the debt will be re-paid with different forecasts for the coal traffic. Given the progress on the 2017 amendment to the concession agreement this action is urgent and should be undertaken on an annual basis by an appropriate expert.

The 2016 accounts suggest that CEAR was expecting general freight traffic to grow significantly in 2016 but that this failed to happen. CEAR budgeted on US$7.5 million non-coal freight revenue but in fact only received US$3.2 million actual general, commercial freight non-coal revenue. This might be explained by line closures during much of 2016 and the fact that some of the proposed line speed and other improvements that are being delivered in the first half of 2017 were delayed from 2016. In particular Zambia traffic seems to be lower than forecast. Given that in 2016 CEAR carried 262,485 tonnes of non-coal traffic it is thought that CEAR expected to carry significantly more than 630,000 tonnes of non-coal traffic.[66]

*65 The Economist.*

*66 630,000 - tonnes was calculated by taking the 2016 actual tonnages and multiplying by the proportion of budgeted income as proportion of actual freight income. It is worth noting that grow traffic it is normally necessary and prudent for the operator to decrease the charge for carrying traffic (on a per tonne basis) and this is also reflects the reduced cost of carrying extra traffic at the margin. It is one of the advantages of rail freight that the costs per tonne fall significantly as traffic volumes rise allowing some of the benefit to be shared with customers and helping the economy more generally.*

## 9.3 Forecast of CEAR's future financial position

Railway accounts though are not always a good predictor of future traffic volumes. There is evidence that the investment made through CEAR by VALE has the potential to transform the finances of the railway. The key issue is not the absolute cost of rail but the relative cost (and price) when compared with other modes as even small relative differences in the price where the service offer is similar can completely shift traffic by mode. CEAR's business plan (July 2013) assumes that a significant rise in the capability of the railway will allow it to win back traffic to rail. In year 1 (2013) CEAR predicated a 47% uplift in revenues which then followed. The CDN/CEAR (undated) Nacala Logistics Corridor (plan): Getting Ready for the Future is more explicit: "to achieve breakeven it will be necessary to increase the revenue and reduce the cost by discounting market rates as a market share growing strategy." Larger volumes will allow CEAR/CDN to "implement a cost reduction programme – focus(ed) at operational and non-operational cost optimization. (Including) joint cargos of small volumes and short distance in "specific trains."

This is a classic railway strategy with a well proven track record. It critically depends on the following two factors: there being sufficient market demand and that the costs of railway operation can be optimised. These are discussed in more detail in Chapters 11 and 13 of this report.

Going forward the repayment of the debt for Vale's funding of the east line and of CEAR costs is likely to be between US$17 and US$20 million per annum subject to the level of the debt at the time of refinancing and the interest rate charged when refinanced over a 15 year period. The level of financing is expected to fall as the level of interest is reported to be very significantly below the current Vale rate of LIBOR +7%.

On conditions that:

- There are no further unbudgeted "other financing costs" and the interest rate costs fall to around US$10 million per annum;
- the debt is repaid at US$20 million per year;
- the coal traffic runs at up to 18 million tonnes as forecast at least until the end of the 15 years generating around US$85 million gain for CEAR per year;
- the direct "Coal Expenses" (excluding the concession fee and extra for track maintenance - see below) rise to at least the 2016 budget estimate of US$43 million[67];
- current general commercial traffic covers its direct operational costs and any increase in track maintenance costs (for the north and south lines);
- the costs associated with the passenger traffic increase but are less than US$2 million per annum net off revenue (even with two passenger sets operating each up to 3 round trips per week); and
- the concession fee is around US$5 million.

It is likely that the CEAR concession will generate a surplus, in addition to the concession fee, of around US$5 million per annum. This though is thought to be a conservative figure because it is probable that CEAR can be expected to actively manage their costs - particularly "Coal Expenses" down to around US$20 million which per annum is 10% of the line reconstruction cost. On that basis, a surplus of around US$25 million per annum for CEAR is considered more probable.

*67 This figure of US$43 million is from CEAR's 2016 statement of comprehensive income. It compares with US$4 million of actual cost. Clearly this is a significant variation and very significant in terms of the impact on CEAR's accounts. It is interesting to note that the Coal Expenses of US$43 million is higher than the forecast for 2016 for Coal Revenue of US$41 million US. This is explained by the fact that CEAR are having to account for irregular high expenditure costs (such as track re-building after washaways). US$43 million seems to the consultant to be hard to justify except on an exceptional basis as CEAR suggested that it only cost around US$200 million to refurbish the east line. It is unusual for track maintenance (and renewal costs) to be such a high proportion of the cost of the line as it implies that the line is effectively and completely rebuilt every 5 years which is unlikely. Even if the line was effectively rebuilt every 10 years the cost would be only around US$20 million.*

This range of US$5 - US$25 million per annum is very sensitive to the level of coal traffic carried and to the level of track maintenance required for the coal trains. On the upside, if "Coal Expenses" were the same as the figure for the 2016 actuals (US$4 million) and if Coal Income was $97 million, the CEAR could enjoy an extra surplus of US$39 million with regard to "Coal Expenses" and a net (extra) surplus of US$11 million US in terms of "Coal revenue" taking into account a US$1 million increase in the concession fee (which is charged as a percentage of revenue), which would in total generate a total net surplus of US$50 million.

However, if the north and south lines needed significant maintenance equal to the cost of the east line, and no other factors change, then the forecast surplus could become a deficit of US$39 million. Atkins considers the upside more likely than this downside risk because if track maintenance costs were US$43 million on the north and south lines over 15 years this would equate to US$645 million in total and would be enough to pay for a comprehensive rehabilitation of the line which should be linked with enhanced traffic levels – not least of because otherwise CEAR would seek permission to abandon general traffic. In this assessment, it is assumed that the net impact of the non-coal traffic is likely to be zero in the medium to longer term. CEAR will not grow the non-coal traffic unless they believe that revenues can over the longer term at least be no more than the incremental cost.

In summary, therefore, subject to more detailed analysis and dialogue with CEAR over their accounts it is believed that at very least the CEAR concession should be secure financially and may have sufficient revenue to repay its debt and enhance the network significantly. It is estimated that this could be between US$5 and US$25 million US per year, but should be closer to US$25 million.

It is vital, therefore, that the Government of Malawi develops the capacity or buys in the capability to model the financial performance of CEAR independently over multiple years going forward.

## 9.4 Models for managing forecast financial surplus and securing investment funding

There is an inherent conflict between the needs of financiers who are refinancing CEAR and the Government of Malawi. Whilst both need CEAR to be financially sustainable in order for financiers to be certain that their loans will be repaid and for the Government of Malawi to ensure that CEAR carries goods economically and enhances the network. The key worry of financiers is that the Government of Malawi will take too much from any financial surplus risking that CEAR will be less able to repay its loans in worse than forecast financial years. The Government of Malawi will be worried that any surplus is held within CEAR for too long and this defers potential useful investment.

It is, therefore, recommended that as part of the financial surplus negotiation which have been recommended for inclusion within the 2017 revision to the concession agreement that the Government of Malawi seek to agree the establishment of an enhancement fund. This fund would pay for all enhancements to the network, but not for maintenance and renewals (including rolling stock and system renewals) – i.e. for those investments not defined as commitments for CEAR within the concession agreement. This fund will be paid for out of the financial surpluses forecast to be enjoyed by CEAR. However, payments to this fund would only be made after other financial commitments of CEAR. These might include:

- CEAR having a defined minimum net cash surplus – to reassure financiers of its robustness;
- CEAR having paid any appropriate fees/ dividends to its owners;
- CEAR coal traffic not falling below a minimum forecast sum (6.6 million tonnes); and
- CEAR making appropriate financial provision for any losses from an enhancement to passenger services (above a defined threshold).

Having such an arrangement should help mature the relationship between CEAR and the Government of Malawi. Instead of the Government of Malawi seeking to lobby CEAR to invest, there would be a defined fund and only that fund. It will force the Government of Malawi to live within the capacity of CEAR to pay as no other funding or financing will be provided by Vale/CEAR. The better that CEAR does the more funds there will be to enhance the network. If CEAR does less well there will be less funds. This ties CEAR and the Government of Malawi closer and should ensure greater cooperation.

It is possible that after a few years on operation, once the finances of CEAR become more consistent and the Government of Malawi/CEAR more mature in their management of this fund, that the Government of Malawi may be able to seek financing (loans) against future income from the fund, which will give the Government of Malawi a way of paying for enhancements that will be revenue generative for CEAR.

Maleule train station – north of Lunzu

ATKINS

Malawi National Transport Master Plan

# 10 Identification and appraisal of specific investment projects

Rail Sub-Sectoral Plan

# 10 Identification and appraisal of specific investment projects

## 10.1 Introduction

The potential investment projects are divided into infrastructure, operational and other projects.

Where costs have been estimated, they are at a very high level for feasibility analysis only. In most cases the study team has used historical reports and then updated these. No new engineering work has been undertaken and no specialist quantity surveyor employed.

Table 10.1 summarises the most recent published or referenced cost estimate for railway works that have been used by the consultant.

## 10.2 Infrastructure proposals

The key potential investments are listed below. They are:

- Moatize avoiding line;
- Restoration of Sena (Beira) line north and south options);
- Upgrade of axle load (and line speed) of Nkaya – Chipata;
- Upgrade of axle load (and line speed) of Nkaya – Limbe/Sandama;
- New line from Kanengo/Salima to north of Malawi;
- Provision of intermodal facility at Liwonde;
- Investment in freight facilities (sidings and loading/discharge equipment);
- Train control technology extension;
- Capacity building: operational and management training; and
- Heritage rolling stock restoration.

These are mapped on the Figure 10.1.

**Table 10.1 Recent projects used for cost estimation**

| Line | Works | Km | Source | Cost ($M US) |
|---|---|---|---|---|
| West line | New build | 130.5 | Press reports on Vale's investment | c.800-870 |
| East line | Reconstruction and axle load to 20.5 tonnes | 99 | As above | c.200 |
| South: Limbe – Marka | Reconstruction – 20 tonne/axle | 201 | JICA report | 233 inc contingency and rolling stock |
| North: Nkaya – Mchinji | Refurbishment – 15 tonne/axle | 389 | June 2012 Feasibility Study | 145 |
| North: Nkaya – Mchinji | As above but with 18 tonne/axle | 389 | June 2012 Feasibility Study | 261 |
| North: Nkaya – Mchinji | As above but with 20.5 tonne/axle | 389 | June 2012 Feasibility Study | 507 |
| Chipata – Serenje, Zambia | New build | 388 | Press reports (Lusaka Times 03/ Nov'/2016) | 2,300 |

Excluded from this list is an extension of the line from Chipata to the Tazara line at Serenje as this is thought to be outside of the scope of this study and reported to be being examined by Zambian Railways currently. It is understood that CEAR and the Government of Malawi understand what is proposed. Even though this project is far from certain it is worth the Government of Malawi keeping in regular contact with the Government of Zambia and the sponsors of the scheme and asking if there is anything that the Government of Malawi can do to support the scheme in terms of lobbying funding or other bodies.

**Recommendation**
The Government of Malawi keep in regular contact with the Government of Zambia and the sponsors of the Serenje extension scheme to support lobbying.

Table 10.2 provides a summary of the key infrastructure proposals. Note that only civil engineering schemes that require significant investment or financial support are mentioned here. Schemes that do not require investment or are relatively low cost, or more operationally focussed are not listed. For example: one of the recommendations of this report is that the charges for wagon usage and for shunting should be disaggregated. This, though, does not require significant investment by CEAR and hence is not included in this list.

**Table 10.2 Summary of key infrastructure proposals**

| Title | Investment requirement | Purpose | Comment | Very high level estimate of cost (US$M) |
|---|---|---|---|---|
| Moatize avoiding line | 11 km new line | Access to Beira | Long route for Nkaya – Limbe/ Makhanga traffic | 56 |
| Sena line | 72 km of new line | Beira – Nsanje: proposed intermodal border location | 20.5 tonnes/axle | 298 |
| | 116 km of new line | Beira – Bangula: proposed intermodal location | 20.5 tonnes/axle | 480 |
| | 125 km of new line and 121 km restored line 237 km of restored line | Beira – Limbe | 20.5/18 tonnes/ axle | 765 . |
| Axle load upgrade Nkaya - Chipata | Part rebuild to deliver 18 tonne axle for 389 km | Enhance operational efficiency | 18 tonne/axle | 116 – 362 |
| | Part rebuild to 20.5 tonne for 389 km | Enhance operational efficiency | 20.5 tonne/axle | 362 plus risk factor of 100 |

| Title | Investment requirement | Purpose | Comment | Very high level estimate of cost (US$M) |
|---|---|---|---|---|
| Axle load upgrade Nkaya – Limbe | Part rebuild to 20.5 tonne/axle for 121 km | Enhance operational efficiency | 20.5 tonnes/axle | 80 |
| New line: Kanengo/Salima to north of Malawi | 260-500 km of new line | Enhance rail network coverage across Malawi | 20.5 tonne/axle to Mzuzu or Tazara line with Tanzania | 1,600 – 3,000 |
| New line Mbeya-Chilumba | 234 km of new line | Connect with port on Lake Maalwi | 20.5 tonnes/axle to connect with Tazara line | 968 |
| Intermodal facility at Liwonde | 2 km of new line + intermodal sidings | Increase rail and maritime network reach and interoperability | Excludes maritime infrastructure costs | 5 |
| Dry port at Salima | 2 km of new line + intermodal sidings | Increase rail and road network reach and interoperability | | 10 |

## Figure 10.1 Map showing civil infrastructure enhancement options


### Legend

- South SENA line open (potential axle upgrade: 18 or 20.5 t/a)
- Nkaya to Mutara Junction via Moatize Avoiding Line
- Recent upgrade of axle load completed
- Spot upgrade
- New line: Salima-Mzuzu
- Chilumba to Mbeya
- Chipata – Patauke – Serenjer potential extension
- Tazara Railway
- Other lines

ATKINS

WS Atkins International
Woodcote Grove
Ashley Road
Epsom
Surrey
KT18 5BW

Tel: +44 (0) 1372 726140
Fax: +44 (0) 1372 740055

**Client:**

Government Of Malawi

**Project:**

National Transport Master Plan

### 10.2.1 Moatize avoiding line

One lower cost option to rebuilding the Sena line between Limbe/Sandama and Mutararara - or prior to any rebuilding of the Sena line as part of a phased approach to help encourage traffic to grow - is to connect the Nkaya – Moatize line with the Moatize – Beira/ Macuse line.

Currently both lines go into the mine complex at Tete/Moatize so it is not operationally feasible to run a regular freight service without some means of avoiding the operational congestion that will be caused. Exceptional traffic including new wagons imported via Durban has been run this way, but this arrangement was too indirect, complicated and operationally problematic, in terms of having to run through the mine sidings and its use of line capacity, to be commercially viable for most traffic. A connecting, mine avoiding line could therefore be needed between the Nkaya – Moatize line and the Moatize – Beira line east of Moatize.

It is important to note that such a link line will still be relatively direct. The line from Nkaya – Moatize runs roughly south-east. It covers 60 km (as the crow flies in Mozambique). It is relatively straight. The Moatize – Beira line is less direct running north-east-east from Moatize for around 45 km before turning south at Caldas Xavier to run more directly to Beira. It would therefore be possible to build an 11 km connection near Caldas Xavier. Critically, because it is direct this new connection will allow trains to/from Nkaya to avoid Moatize and around 90km of wasted running.

Such an avoiding line should be relatively simple to build. A very high level estimate has been included below. There is a parallel road and no obvious large geographical obstacles (river crossings or mountains). It could therefore be constructed more cheaply and more quickly than any complete reconstruction of the Limbe/Sandama – Mutararara route, and might help grow the traffic and develop markets for a later reconstruction of Limbe/ Sandama reducing the traffic forecasting risk for funders/financiers/donors.

It is important to note that this option requires the Beira trains to operate on part of the west branch of the Malawi network. That line is used exclusively by coal traffic currently and is operated by Vale (not CEAR). Extra loops and other operating provisions would be required to persuade Vale that any Beira traffic would not risk the primary coal traffic. New access agreements would be required to regulate any arrangement. Because the coal traffic accounts for the clear majority of all traffic and underpins the CEAR's finances, Vale may not initially welcome any such option and may need considerable effort to be persuaded of its merit. This is probably the biggest single obstacle to this option being developed.

One of the other historic obstacles to developing the Moatize avoiding line option may be that the line from Moatize to Beira is operated by CFM and is not managed by Vale owned entities. Any traffic that runs to Beira via Caldas Xavier might be viewed as traffic that could have run to/from Nacala or via Bangula/Limbe if the Chiromo River crossing is rebuilt. This is made additionally complicated by the fact the Sena line is used for coal traffic and these exporters have an existing commercial relationship with CFM and it was this traffic that paid for the line upgrade construction works undertaken by RITES Ltd and IRCON International. However, whilst the Government of Malawi needs to be sympathetic to the commercial sensitivities of CEAR the opportunity to connect Beira by rail, the traffic that this will generate for CEAR and the competition this will bring to the existing Beira road operations probably outweighs any short-term dis-benefit to CEAR. One of the common complaints of road users to Beira is that CEAR rail haulage prices to Nacala are insufficiently competitive to make them switch because Beira is nearer. Having rail direct to Beira gives a greater chance of rail offering a more competitive product. More importantly, it is probably worth noting that CFM operate the existing railway between Mutararara and Beira, and that any restoration of the Sena route via Chiromo will require their cooperation anyhow. Engaging them early may be helpful.

It is recognised that this route is less direct than Nkaya – Beira via Limbe, Chiromo, Marka, Mutararara and Vila Nova de Frontiera, and it unlikely to pose a very long-term solution. In the long-run any operation from/to Nkaya via

Limbe and Chiromo crossing will be around 100 km more direct (around 30%) than using an avoiding line and therefore less expensive to operate in terms of fuel, staffing, locomotive and wagon provision and track wear. In the short to medium term this is likely to be acceptable for some traffic – excepting traffic that uses the southern branch.

However, currently, most non-coal traffic to/from Malawi runs to/from terminals between Nkaya and Limbe on the southern branch. For this traffic using rail to reach Beira it would involve a more circuitous journey. Some of the traffic on the Limbe branch originates further south – for example, much of the sugar traffic from Illovo originates from near Bangula and is trucked to Limbe for loading to rail – and for this traffic the rail route is likely to be too circuitous to be competitive. The road haulage already costs Illovo around US$20 per tonne but the rate varies. It would be hard therefore for rail to compete for this traffic to Beira against direct trucking.

Such an avoiding line might help opening up the option for rail to become the preferred mode for traffic between Durban and Malawi. Over this long distance rail should be price competitive with road haulage although transit times are unlikely to be much better because of the quality of the roads (in South Africa in particular) even allowing for the vulnerability of road hauliers over such an extended and multi-national route through complex jurisdictions and with different policing experiences. Any regular rail operation though would require the cooperation of four railways in South Africa, Zimbabwe, Mozambique and Malawi – however commercial arrangements are already in place between South Africa and Zimbabwe and between Zimbabwe and Mozambique, so it should be possible to extend these to Malawi. However, the volume of traffic that passes through Durban is relatively small when compared with Beira or Nacala. If the Sena line was rebuilt this would also allow the establishment of a regular rail operation between Malawi and Durban and this would be marginally more competitive than for a Moatize avoiding line but the journey time differential between a Moatize avoiding line and a reopened Sena line is unlikely to be the key factor given the total relative length of the rail route between Nkaya and Durban.

No cost has been produced previously for this option. Given that the route is 11 km in lengths and there are no major obstacles (such as river crossings) it has been estimated at the very highest level only that the total cost could be approximately US$76 million. This includes a provision for US$10 million for extra loops on the west branch between the new junction and Nkaya to ensure that any new trains to/from Beira do not use capacity reserved for the core coal traffic.

**Recommendation**
Consult with CEAR/Vale and consider Moatize avoiding line as an alternative (quicker) option to the proposed rebuild of the Sena line (options below).

### 10.2.2 Rebuilding the Sena line

There are two options for rebuilding the Sena line:

- The first and simplest is to build the entire route or build extensions further and further south from Limbe until the whole route is refurbished. This is the known as the "northern approach" option in this report because it effectively extends the railway from the north.
- The second is to extend the line from the Sena end towards Mozambique. This is the known as the "southern approach" option in this report because it effectively extends the railway from the south.

#### 10.2.2.1 Northern approach: extending from Limbe/Makhanga

This option involves rebuilding the line from Lime/Makhanga to Marka, on the Mozambique border, ultimately to Mutararara to connect with the Sena line. It provides the most direct route to/from Beira which is the preferred port for most Malawi imports and exports, and significant volumes of Zambian imports and exports. CEAR is currently restoring the line to Makhanga albeit at the existing 15 tonne axle load.

The restored line is expected to be used by passenger trains in the main as there are few historic freight users on the route. For this line to attract significant volumes freight traffic the line would need to be allow trains to operate to/from Beira. For this the Shire River crossing at Chiromo near Bangula would need to be rebuilt, the 114 km section within Malawi and Mozambique to Mutararara Junction also be rebuilt and the line section between Makhanga and Limbe further upgraded to at least 18 tonnes/axle and probably 20.5 tonnes/axle.

The existing freight line between Nkaya and Limbe is 18 tonnes/axle and CEAR will only restore the line between Limbe and Makhanga to 15 tonnes/axle, however the marginal cost of rebuilding the 114 km section completely to 20.5 tonnes axle (rather than 15 or 18 tonnes) means that for this option it has been assumed the whole line between Nkaya/Limbe and Mutararara will be restored to 18 or 20.5 tonnes/axle. It has been advised but has been unable to confirm that the Moatize/Mutararara - Beira section of the Sena line is 20.5 tonnes/axle so it would be inefficient for the branch line in Malawi to be lower than this.

This option is designed principally to provide access to Beira port. However, it would also connect new customers to rail and they would then get enjoy the option to use rail to Nacala and for domestic freight traffic (i.e. rail freight not imported or exported out of Malawi), and/or to/from Zambia. The impact is most simply illustrated through what would happen to Illovo – historically one of the most important customers in Malawi. Illovo only use rail for a minority of their traffic. This is mainly because of the high cost because Illovo are not connected to the rail network since the Chiromo washaway. Illovo must road all their rail traffic from near Bangula to Blantyre at a cost of around US$20 per tonne and then pay for the material to be transhipped to rail. This extra cost effectively means that rail is only competitive for their highest quality (lower volume) product for export through Nacala. Most of their local traffic is road hauled – both within Malawi to Kanengo and other destinations or for export including via Beira.

If the railway were extended to Bangula then it would be possible to load Illovo's products direct to rail. This might make it more economic to carry more of the 80% by volume by rail that goes by road currently. Other Malawi customers located between Limbe and Marka would also benefit.

Reopening the Sena line from the north has historically been the preferred default option. It is a logical progression of the existing network rehabilitations. One key advantage – and a reason why it is has been favoured by CEAR – is that it effectively and progressively extends their area of operation. Until the railway reaches Mozambique CEAR will not have to deal with CFM – the Mozambique operator of the Sena line. CFM is not part of the Vale group.

However, the northern option has three significant issues.

The first and most significant issue is the cost. Two feasibility studies have been undertaken on the route – one initial but comprehensive report funded by JICA and a second engineering feasibility report funded by DFID which has not been shared with this study team.[68] They are understood to differ significantly over estimated cost of restoring the route. The JICA study estimated that the civils element of the rehabilitation and reconstruction of the railway between Limbe and Marka (the Mozambique border) would cost US$152 million for 201 km, although in total this was increased with signal equipment and new rolling stock and 10% contingency to US$234 million.[69] It is understood that this reconstruction estimate included uplifting the axle load to 20 tonnes, however, no cost was included for raising the axle load between Limbe and Nkaya.[70]

*68 Calculated by using the Vale cost of west line US$800-870 million for 130.5 km on a per mile basis.*

*69 The consultant has been advised that the DFID report is still in draft form by the Government of Malawi and cannot be released. The consultant has also been advised that the cost estimates for the rehabilitation of the line are very significantly higher than the JICA repor.*

*70 JICA project for the Study of the Development of the Sena Corridor in the Republic of Malawi January 2012 for The Ministry of Transport and Public Infrastructure (MOTPI) Republic of Malawi, page S-35-36 tables 23+24 and page S-37 table 25. Summary with contingency on page S-52.*

The study team has updated this cost, and produced a very high level estimate of US$380 million for reconstructing this route and at the same time upgrading to 20.5 tonnes/axle. This was done by reviewing and updating the costs in the JICA report and then comparing these against the reported expenditure by Vale on the east and the west lines (which had not been built when the JICA report was published) and against the estimates in for the Nkaya – Mchinji (June 2012 feasibility report) for similar work on a different line in Malawi, and against the fact that no work has been undertaken to protect the existing route infrastructure from further damage, in particular the Shire River crossing, since the Chiromo washaway.[71] Although calculated on a whole route basis the US$380 high level estimate can be roughly disaggregated as US$80-100 million for upgrading the axle load between Makhanga and Limbe, US$180-200 million for the 114 km between Mutararara and Bangula via Marka, and US$100 million to restoring the Shire River crossing. It should be noted that this cost does not include any provision for increasing the axle load between Limbe and Nkaya.

The key infrastructure cost and area of cost risk is in the new bridge required to cross the Shire River and associated waterways, and whether any of the existing bridge can be used. The Shire River floods and it was one such flood that caused the washaway that destroyed the existing Chiromo crossing. Unfortunately, no work seems to have been undertaken since to maintain what was left of the bridge after that washaway so in this report it has been assumed that the bridge will need to be completely rebuilt. It is also unfortunate that Bangula, which is where Illovo's sugar plantations are based, is on the south (far) side of the Shire River. For rail to offer a competitive product from the north a rail bridge will need to be built across the river.

**Recommendation**
The Government of Malawi and DFID agree on status of DFID feasibility report into the reconstruction of the Sena line, and publish if practical.

71 *The JICA reports states (page 3-50) that "Two design axle loads of 15 tonnes/axle and 18 tonnes/axle are currently applied. It is intended to upgrade this to 20 tonnes/axle".*

The second issue is that restoring this route to the Mozambique border will not of itself be sufficient to operate trains to Beira (or Macuze). The extension to Bangula will only be worthwhile when it reaches Mutararara Junction on the Sena line because most forecast traffic will want to operate to/from Beira. From the new Shire River crossing the line would need to extend 77 km to the Mozambique border and a further 37.5 km within Mozambique to the rail junction at Mutararara. Whilst the cost for this has been included in the US$380 million estimate above this has not always been the case in previous reports. It is important to note that CFM enjoy the right to operate trains over the Beira corridor. Agreement will be needed between CEAR and CFM as to how they will divide the haulage of traffic. That agreement is likely to give CEAR the opportunity to market price any incoming traffic. The key danger with this is that CEAR use their position, either immediately or over time, to reinforce Nacala (from which they get more revenue) at the cost and loss of competitive pressure of the Malawian economy. One of the reasons that most Malawi traffic still uses Beira is that it is cheaper than Nacala.

The third issue is that because most the traffic will be to/from Beira and that requires the entire line to be built there is no worthwhile opportunity to phase the construction and the cost. Whilst a north facing connection to Bangula should attract some Illovo traffic to Nacala and other points within Malawi and Zambia it will struggle to win Illovo traffic to rail that uses Beira or further south. If construction of the line from the north were phased, the next significant phase of work, the Shire River crossing, would be the most expensive and most risky per km.

#### 10.2.2.2 South approach: extending from Mutararara junction

One alternative is to extend the Sena line from the south. Construction could then be divided into at least three phases. The first from Mutararara to an inland port (ideally with customs clearance) on the Mozambique/ Malawi border, the second to Bengula and the third across the Shire River and connect with the CEAR network. It should be noted that this suggestion of examining the option of a southern link and a phased approach to rebuilding the Beira corridor is not new.

A similar idea was raised in the EU and World Bank (2010) Malawi Transport Sector Multi-Modal Development & Potential Public Private Partnership Study (section 2.1.2 page 88 and 89) where it states "the consultant suggests studying the possibility to link the two networks between Bengula (Malawi) and Gundano (Mozambique). Guardano is on the Beira corridor almost due west of Bengula and is proposed rather than Mutararara because at this point it was not certain that that the coal route between Moatize and Nkaya would be built so it would have to carry both coal traffic and general goods traffic.[72] It would mean Malawi having to support a railway being built in Mozambique and the railway may initially at least have to be operated by CFM rather than CEAR.

The first and primary benefit of having an extension from Mutararara in the south towards Malawi is one of cost, and in particular the potential for phasing the cost to allow the market to be tested and develop.

For phase 1 it would be relatively inexpensive to build the 33.7 km to the Malawi border – around US$63 million.[73] If an inland port with customs pre-clearance was established just within Malawi (or at least a location where the trains can be customs cleared), it would be possible to attract new traffic to rail – in particular traffic that prefers to use Beira over Nacala.

That new traffic would not be restricted merely to the area west of the Shire River (noting that the Chiromo washaway destroyed both rail and road access) but from customers much further north along the Chikwawa corridor up to Blantyre and north – particularly customers who prefer or must use Beira port.

CEAR may worry that the new link to the Beira railway might undermine rail traffic to Nacala – but that can only be the case if CEAR are in some way currently able to exploit their position as the monopoly rail operator within Malawi. At the margin, there may be some general traffic that could run to Beira by rail and truck that is currently running to Nacala but this is likely to be small. Because all traffic to Beira with this option will need to be trucked to the inland port, nearly all the traffic will in fact be competing directly and in the main with direct road haulage. What the new route would do is offer the Malawian economy another choice from the current binary rail to Nacala or road to Beira or more distant ports offer that they currently enjoy. In the long run this may cap the opportunity of CEAR to exploit their monopoly rail provision but only for users who are rail and are port ambivalent.

It might be seen as a disadvantage for Malawi to support development of a neighbouring country's railways but this is unlikely to reduce the pool of available funding for Malawi's own railways. Malawi will be the main beneficiary from such a railway in terms of modal competition for traffic and will gain support which will be needed for when the line is extended further north.

In phase 2 the line could be extended to Bangula. Phases 1 and 2 combined of any south option are still expected to be significantly cheaper than any northern option and would connect Illovo at Bangula directly to rail. Together they are likely to cost around only half of the total cost of restoring the whole line between Mutarara and Limbe/Nkaya – around US$180-200 million. Intermediate options – perhaps to Nsanje are also possible. Currently the concession agreement with CEAR gives them monopoly rights within Malawi so unless an agreement can be reached CEAR CFM may have to reach a cooperation agreement with CEAR for haulage over the small section in Malawi.

*72 The average rate per km in the JICA report (US$1.16/km) albeit including rolling stock is not significantly different to the Nkaya – Mchinji June 2012 Feasibility report (US$1.3/km) allowing for inflation. This is significantly less expensive than building a new alignment for whilst the track and track bed will need replacing the alignment is assumed to be still usable and large scale earth works will not be needed. Updating this cost to allowing for further inflation and the uncosted 37 km to Mutarara within Mozambique required to connect to the Sena line, but considering the work committed by CEAR, gives a cost of around US$300 million. Some of the line is currently being refurbished by CEAR at this expenses so this cost may fall, however, the JICA report only included US$20 million for the 9 km section between Bangula and Makhanga that included the Chiromo Bridge over the Shire River. This seems optimistic given the time that has now passed since the washaway and this consultant would recommend that a very high level estimated provision of US$100 million should be added for the cost of rebuilding this bridge so that the risk of future washaways is reduced.*

*73 EU and World Bank (2010) Malawi Transport Sector Multi-Modal Development & Potential Public Private Partnership Study: section 2.1.2 – 2 pages 88 and 89*

It may be hard for CEAR to operate this service economically as any locomotive will be isolated from the rest of the fleet and the maintenance facility so CEAR may have to "buy in" services from CFM.

Phase 3 of a south option would involve rebuilding the crossing across the Shire River at Chiromo near Bangula, connecting with the proposed extension from Limbe to Sandama/ Makhanga and upgrading the axle load and the capacity of the route between Sandama/ Makhanga and Limbe/Nkaya. The total cost of phases 1, 2 and 3 would be the same as any final north option, although traffic levels should be greater on the first day of operation as some passengers would already being using rail from the investment phases 1 and 2.

The south option works better jointly with the Moatize avoiding line. It offers customers using Beira three alternatives: road as now, rail and road to inland rail port and direct rail. This is better than the north alternative for until a full connection is built any line extension from the north would require trains from Beira to use a very roundabout route that would be close on being twice the more direct truck route.

Whilst the south option is isolated and only provides a connection to/from Beira Port (and Durban it will promote competition between routes and prevent Ncala Port exploiting its monopoly rail access.

Because both the Moatize avoiding line and any investment in Mutarara Junction to Marka are in Mozambique it will be difficult to justify funding them with any of the financial surplus expected to be generated by CEAR. Although they will benefit the railways in Mozambique so funders in Mozambique may help, international donor support or funding will be required. However, both the options above can be linked with other schemes with in Malawi. The Moatize avoiding line can be linked with extra loops on the west line and with higher axle loads on the northern line. Any rebuild of Mutarara – Marka line can be linked with Marka – Bangula, or even Marka - Limbe. As a result, as part of any funding package, it should be able to negotiate with CEAR that they will fund associated investment.

**Recommendation**
Consult with the Government of Mozambique over phase 1 of the "southern" Sena option.

**Recommendation**
Consult with key clients (particularly Illovo) over "southern" Sena option.

**Recommendation**
Institute customs clearance procedures and dry port at Marka just within Malawi.

**Recommendation**
Consider whether phase 1 and phase 2 should be implemented together.

### 10.2.3 Upgrade of axle load (and line speed) of Nkaya – Salima/Chipata

The route between Nkaya and Chipata has an axle load of 15 tonnes because of the limiting section between Salima and Nkaya which is 15 tonnes only. This is lower than on the core east –west route and on the Nkaya – Limbe/ Sandama route. Having a lower axle load reduces the payload of each train.

However, increasing the axle load effectively requires the replacement of all the existing bridges and culverts on the section between Salima and Nkaya as the clear majority are incapable of supporting the higher axle load. The ongoing restoration of the route which involves work on key locations only does not include an upgrade of the axle load because of the cost of doing so. To upgrade the line in its entirety will cost between US$344 and US$361 approximately, although there is a risk that this could be around US$100 million more; that is the difference between a rehabilitation of the line as currently constructed or with extra/ longer loops and a rebuild to 20.5 tonnes axle load, with the risk factor added for items that are renewed and will need rebuilding.

This option was costed, studied and rejected by the June 2016 Feasibility Study for the Rehabilitation of the Mchinji to Nkaya Railway Line in Malawi by Team Engineering with D'Appolonia for the EU. To restore the line to 18 tonnes axle load will cost between US$116 million and US$344 million.[74]

However, should Chipata grow significantly as a hub for mining traffic or be thought likely to grow following a change to the existing logistical arrangements or mining operations, it may be worth upgrading the route to match the Nacala line (20.5 tonnes). Similarly, should the line be extended to connect with the TAZARA Railway the line it should be considered for an upgrade as otherwise this section will be the largest constraint in terms of operational efficiency measured as tonnage per train or per wagon, or even in terms of the total capacity of the line. At this moment CEAR have yet to decide how to handle the potential traffic from Zambia most efficiently. Should a connection to Serenje be built on the back of forecast traffic from Lusaka, the Copper Belt and other parts of Zambia then the route between Nkaya and Mchinji then the case for the route to be upgraded will be much easier to make as this section will become the constraining section.

**Recommendation**
The Government of Malawi and CEAR to consider whether renewal and maintenance standards should be uplifted to 18 or 20.5 tonnes.

74 *The cost for calculating the upgrade to 20.5 tonnes from the current 15 tonnes/axle less the cost of restoring the line as currently designed which CEAR is expected to undertake as part of the 2017 concession negotiations. It is possible that that the cost will be more than this because structures renewed as part of the line restoration will need to rebuilt to accommodate 20.5 for which the risk factor of US$100 million has been added. The upgrade costs for 18 tonnes involve less work locations so there is a greater chance that extra work will be required which accounts for the higher risk factor of US$228 million and that this is thought more likely so is included as part of a cost range. These figures should be clearer towards the end of the current refurbishment work when the asset condition is known better.*

It is also worth considering the standards that should be used for renewing and maintaining the line. The cost of rebuilding an asset with a higher axle load varies but is generally not very significantly more. Any such structure is likely to be typically more robust, at least for as long as the axle load of the train is not raised from current levels. It is worth considering therefore whether it is worth establishing a formal policy that as and when assets are renewed that they are renewed to 20.5 tonnes axle load, so that the cost of upgrading the line in future is reduced.

### 10.2.4 Upgrade of axle load (and line speed) of Nkaya – Limbe/Sandama

The routes between Nkaya and Limbe and between Limbe and Sandama have respectively axle loads of 18 and 15 tonnes. This is lower than on the core east – west route. Having a lower axle load reduces the payload of each freight train. However, as currently no trains run south of Limbe and no significant freight is forecast to do so unless the line is extended beyond the Shire River, this is really only currently an issue between Limbe and Nkaya.

Other options have examined the cost of extending the Sena line to Mutarara and have included the cost of increasing the axle load of the Limbe – Makhanga/Sandama section. In this section of the report it is considered as a separate and stand-alone scheme only.

At the moment, the wagon fleet and the locomotive fleet would be unable to take advantage of having a higher axle load on this route. Over time that will change, particularly if CEAR can persuade customers to invest in their own wagons. Therefore, until the rest of the Sena line is built this option is not recommended given the cost below. Unlike with the north line there is unlikely to be significant volumes of international traffic or mining traffic, unless the line is extended in which case this upgrade becomes part of that wider option.

The cost of increasing the axle load has been estimated by examining the JICA report and the difference between estimates produced for raising the axle load between Nkaya and Mchinji to 18 and 20.5 tonnes. On that basis, the study team produced a very high level estimate of around US$80 million.

### 10.2.5 New line from Kanengo/Salima to north of Malawi

It has been suggested to the study team that there is some political pressure for the railway to be extended north from Kanengo or Salima so that the potential benefits can be enjoyed by more of Malawi. There are three key difficulties with such an option.

The first is cost. Given that the new coal line cost Vale over US$800-870 million and is 130.5 km long, it is unlikely that any line to Mzuzu would be anything less than US$1.6 billion.[75] If the line were extended to the Tanzanian border and then connected through to the Tazara railway the cost would be closer to US$3.0 billion.[76]

The second issue is that until the rest of the CEAR network is brought fully up to standard then any branch to the north would be isolated from the rest of the network operationally. To take full advantage of any line to the north it would probably require some form of investment in the rest of the network first.

The third issue is that currently there is no significant and loud customer demand for rail – or at least from any customers willing to commit to use rail haulage for significant volumes of traffic. This is because the products that are carried currently are also often carried by truck in that part of Malawi served by rail. Should a large mining operation or other industry emerge the dynamics of a new line to the north could change significantly, but it should be borne in mind that Vale's operation at Moatize is world class in terms of the volumes of coal that it produces that require transportation and it would probably require something of a similar scale to transform the economics.

*75 The rail distance is not known exactly as an alignment has not been designed but it is unlikely to be less than 260 km.*

*76 The rail distance is not known exactly as an alignment has not been designed but is unlikely to be less than 500 km.*

This raises the question of how the Government of Malawi and CEAR interact with their customers on a collective basis. The study team was impressed by the level of customer knowledge by the sales representatives of CEAR and CFM. However, there are few opportunities for customers to communicate with CEAR (and the Government of Malawi) on a collective basis. When freight customers meet, they find that they have common issues and potentially a common view on the strategy that should be adopted by the railway and the Government. In those nations where rail freight is most developed such customers often form formal organisations to ensure that their concerns are understood appropriately. If there were the case for a line from the north such customers would be important supporters.

**Recommendation**
The Government of Malawi and CEAR to establish a formal rail freight users group.

It is worth noting that the provision of an efficient intermodal facility at Liwonde or Chipoka could also serve the north of Malawi with traffic carried on rail between Nacala (and Beira) ports by rail and Liwonde/Chipoka and by rail between Liwonde/Chipoka and points on Lake Malawi.

### 10.2.6 Provision of an intermodal facility at Liwonde and inland port

When the railway was first built one of the key locations it sought to first connect to was Lake Malawi. At Chipoka an intermodal facility was built on the lake. The size, and in particular the length of Lake Malawi, means that it can connect parts of Malawi that otherwise might be too difficult to do so by rail given the high cost of extending the railway north of the Mchinji – Kanengo – Salima axis.

Unfortunately, the Chipoka facility is currently non-operational. The crane needs refurbishing. Most importantly the draft is now insufficient to accommodate vessels of sufficient size.

**Figure 10.2 Chipoka terminal**



Chipoka Port is not currently operational due to the low water levels which prevent the vessels from accessing the port facilities. Dredging alone is not feasible, as it could undermine the existing quay which has not been constructed to face the extreme low water levels that the Lake Malawi is presently experiencing. Chipoka Port could be rehabilitated by extending the existing quay into deeper waters.

At upstream Liwonde the depth of the Shire River is constant due the hydroelectric station dam. It should be possible to build sidings, a crane and a new quay at this point. It is not yet clear exactly what the draft would be but it thought to be significantly deeper than at Chipoka taking into account the road bridge at Mangochi can be navigated. With an appropriate vessel, it should be possible for containers to make a weekly circuit from Liwonde to points to the north of Lake Malawi and back to Liwonde in time for the next arrival from Nacala (and potentially Beira).

At the moment, there is no regular service – especially from the Liwonde. However, with a new rail connection to Beira it is possible that with a rail connection at Liwonde that a regular vessel might be commercially viable. However, the lack of any customer demand for intermodal (rail – water) services and the lack of any obvious industrial users currently suggests that the rail connection to Nacala is not sufficient of itself. However, it is recommended that once a Beira connection looks likely that establishing a potential rail and water port at Liwonde is considered as an option and a client consultation exercise is undertaken.

**Recommendation**
Liwonde to be considered a potential location for any new intermodal facility between the lake (and the Shire River) and rail for the medium-long term.

### 10.2.7 Investment in freight facilities (sidings and loading/discharge equipment)

Whilst the development and improvement of the railway is typically described in terms of the network for customers the capacity of their sidings and (un)loading equipment can be more important. In some instances, restrictions on the size of customers' sidings and their (un) loading equipment can cause operational complexity and cost for CEAR. In some cases customers are effectively using a CEAR asset because they have not got adequate facilitates, particularly where CEAR locomotives have to shunt wagons using the mainline for (un) loading.

In addition to the proposal to disaggregate the cost of shunting and wagons CEAR should consider whether there is an investment case that would avoid the need. It is recommended that CEAR undertake an audit of all customers' sidings and the method of working, which will be required anyhow to determine any disaggregated shunting cost, to determine if any modest investment in facilities might save operational costs.

Whilst funders are unlikely to consider supporting a single customer but one or more investments, such as the building of a separate shunting or siding access line, for a group of customers may be received better.

**Recommendation**
Undertake an audit of the operational methodology at all private sidings including an estimate of the cost to CEAR and the investment options for reducing this. It is recognised that CEAR has already undertaken significant work previously but a systematic approach combined with looking at investment options may be worthwhile.

### 10.2.8 Extension of proposed train control technology

It was not possible to test the safety of the paper based train control system employed on the north and the south lines. The description given to the study team was not consistent beyond that "paper" was used to grant the required authority to proceed. the east and west line are satellite controlled and are expected to be switched to a radio based system. It is recommended that the safety of the operation on the north and the south lines be reconsidered in the light of expected growth in passenger and freight trains – in particular whether the system used meets the appropriate international standards for controlling access to single line sections and notifying drivers to undertake an emergency stop in a section should a track defect be discovered or other such emergency. Paper systems can be "fail safe" but often require a high degree of un-centralised authority. Given that a decision to replace or supplement the existing satellite system on the east and west lines is expected to be made the cost of extending this to the south and north lines may be marginal at this time.

**Recommendation**
Evaluate the cost of extending radio train control system to the south and to the north lines.

**Recommendation**
The Government of Malawi to seek donor support for this investment.

Railway accidents are rare but the consequences can be tragic and can cause significant economic harm. The Government of Malawi may wish to seek international funding support for an extension of the train control system as it is something that will resonate well with donor nations.

### 10.2.9 Capacity building: Operational and management training for CEAR and the Railways Directorate of the Government of Malawi

It is believed that professionals at the Railway Directorate and the management team at CEAR should be praised for the way that they have managed the concession to date. Excepting the recent investment in the coal line and more recent investment by CEAR in wagons. CEAR has historically been operated on a shoe string with legacy equipment and yet has managed to survive despite the closure of the routes to Beira and Mozambique.

However, it is also the case that there are some skills gaps and significant areas where there is shortage of local expertise. Because of this CEAR rely heavily on expert support from outside of Malawi. It is also clear that despite the skill and knowledge of the individuals within the Railway Directorate that they have to rely on CEAR or international experts provided by donor organisations. Having the Government of Malawi relying on CEAR for technical support to help manage the CEAR concession agreement is not ideal.

It is, therefore, recommended that a senior skills training programme be instituted to enhance the technical capacity of both organisations. To reduce cost and to increase cooperative working it is recommended that this programme be instituted jointly.

The Institute of Railway Operators (IRO) is probably the mostly widely recognised railway skills organisation with its membership recognised internationally – particularly in Europe, parts of the Middle East, South-East Asia and in South Africa. The IRO, in partnership with the University of Johannesburg and Glasgow Caledonian University help Transnet in South Africa run a three-tier programme in railway operations that includes complimentary commercial and other elements that will also be of value. Participants can study for a Certificate, Bachelor's degree or a Master's degree.[77] The study team has spoken with the IRO, and although more detailed investigations would be required by CEAR, the Government of Malawi and potential funders, it is thought this offers an opportunity for a small number of CEAR and Government of Malawi staff to develop and/or formalise their skills. Transnet has been previously concerned about sharing access with Australian railways when approached because it has been concerned that its staff (particularly drivers) might be poached to work in Australia but that is less likely to be the case with Malawi. Other international railway bodies exist, such as the UIC, although their training offer is currently less well developed albeit worth considering particularly around compliance with international railway technical standards.[78]

**Recommendation**
Retain any increase in the concession fee to the Railway Directorate to further improve oversight of the concession and planning

**Recommendation**
Seek donor support for capacity building

**Recommendation**
Consider approach to IRO/Transnet or development of similar distance learning programme.

77 http://www.railwayoperators.co.uk/membership/international-membership/. *The IRO course is mainly distance learning with occasional opportunities for contact sessions including with fellow students and alumni.*

78 http://uic.org/ and http://uic.org/expertise-development-training

## 10.3 Other Interventions

In June 2017, the China Machinery Engineering Corporation, the China National Complete Engineering Corporation (CNCEC), in a consortium with Mota-Engil Engenharia e Construção, Africa S.A., a Portugal-based company and a subsidiary of Mota-Engil SGPS with Thai Mozambique Logistica S.A. have signed a contract for the construction of the Moatize – Macuse 484km railway and port project in Mozambique. The Macuse project is 60 per cent owned by the Italian Thai Development Company of Thailand, 20 per cent by CODIZA and 20 per cent by Mozambique's publicly owned port and rail company, CFM.

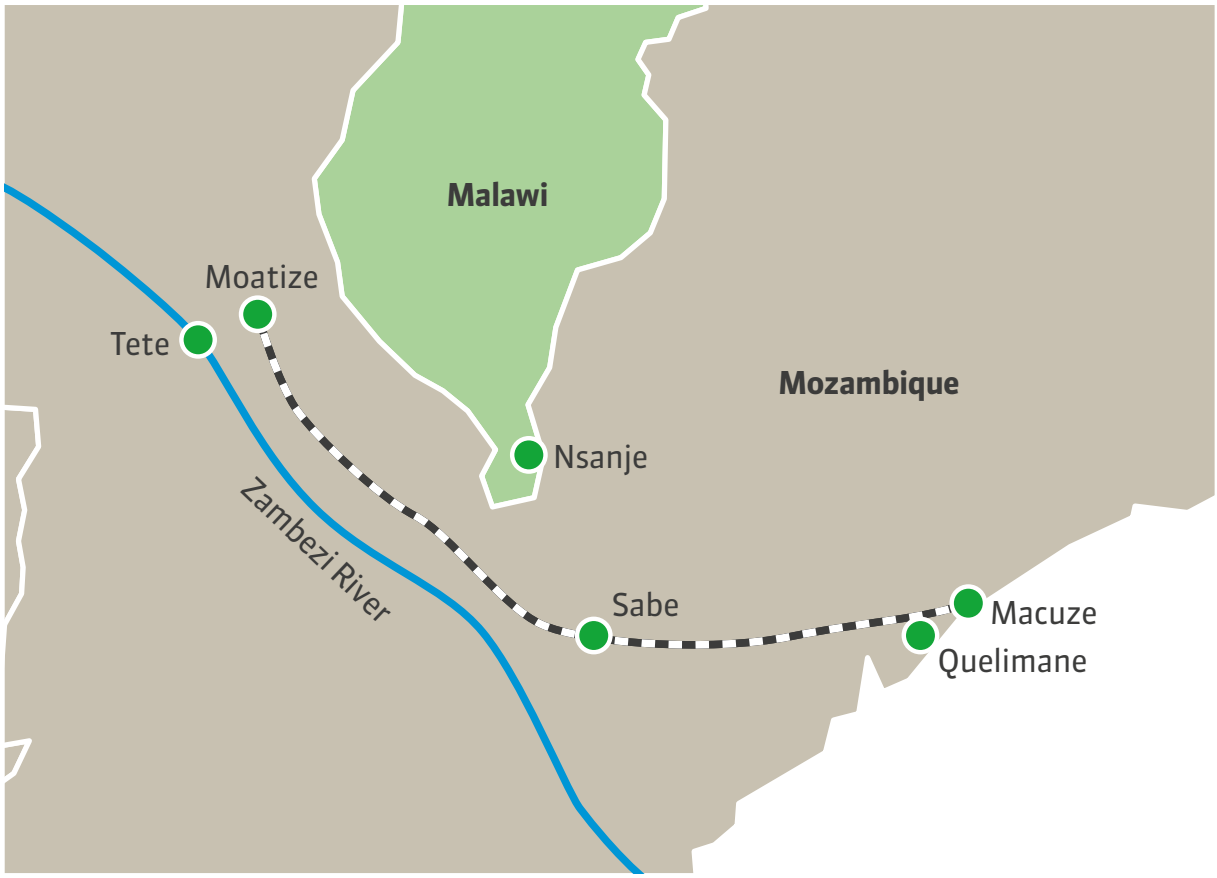
The railway to Macuse will be the third route for exporting Moatize coal, aside from the lines to Beira, and to port of Nacala. The Macuse project has two competitive advantages. Firstly, the railway, at between 480 and 500 kilometres in length will be shorter than the lines to Beira or Nacala, and secondly, Macuse Port will be able to receive ships of up to 80,000 tonnes, considerably larger than the ships that can dock at Beira.

The contract value amounts to approximately US$2,389 million. The corresponding amount of the contract value in respect of the scope of work of CNCEC is an approximate US$1,194.5 million. The project is expected to be completed in approximately 44 months from its commencement date.

Any potential connection to this line could offer a shorter distance to port, than a line to Beira. In addition, the line would pass close to the Port of Quelimane (section 2.2.2). The line may well be dedicated to coal traffic, as will the construction of the Port at Macuse, but in the longer term capacity might be available for general freight.

**Recommendation**
Engage with CFM, as project owner, as to the long term possibilities for accessing the port of Macuse by rail.

Figure 10.3 Moatize-Macuse proposed railway line




## 10.4 Freight forecasts

Freight traffic forecasts for the existing railway network with an axle load upgrade to 20.5 tonnes on Nkaya-Mchinji are summarised in Table 10.3, and shown in Figure 10.4.

International freight traffic forecasts for the proposed infrastructure schemes are shown in Table 10-4. By and large, the effects of the proposed rail extensions to reach the port of Beira have little effect on the rail traffic to/from Nacala. They mainly divert traffic which would have otherwise have used road.

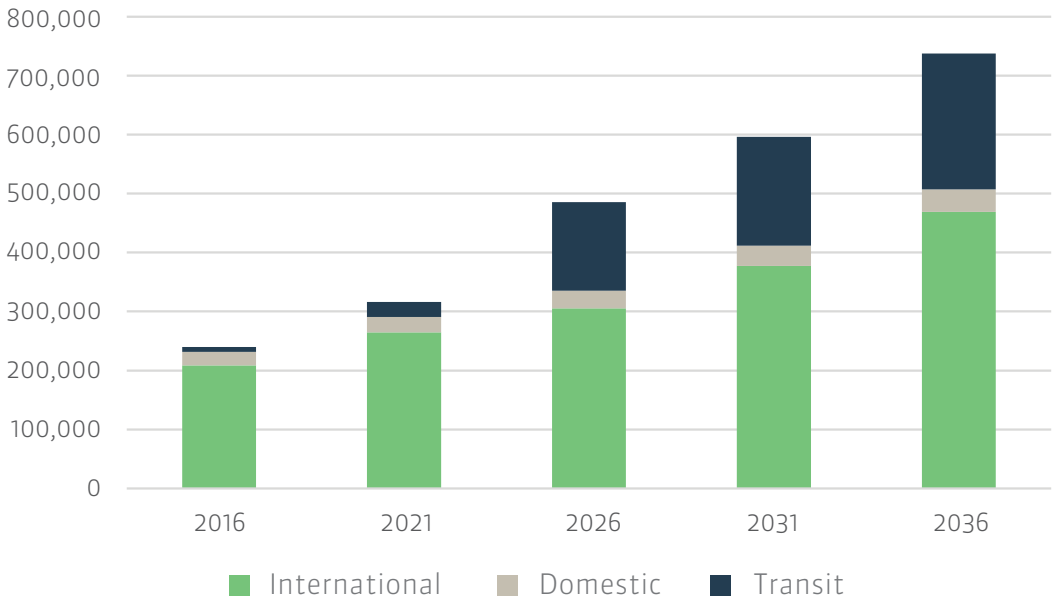
Table 10.3 Do-minimum freight traffic forecasts (tonnes)

| Year | International | Domestic | Transit | Total |
|---|---|---|---|---|
| **2016** | 208,600 | 23,224 | 8,000 | 239,824 |
| **2021** | 264,600 | 26,400 | 25,000 | 316,000 |
| **2026** | 305,400 | 29,900 | 150,000 | 485,300 |
| **2031** | 377,400 | 34,000 | 185,000 | 596,400 |
| **2036** | 468,600 | 38,600 | 230,000 | 737,200 |

Table 10.4 International freight traffic forecasts (tonnes)

| Intervention | Beira | Nacala | Dar es Salaam | Total | % by Rail |
|---|---|---|---|---|---|
| **Do minimum** | 0 | 468,600 | 0 | 468,600 | 13 |
| **Moatize avoiding line** | 372,600 | 451,500 | 0 | 824,100 | 23 |
| **Beira to Marka** | 979,500 | 406,200 | 0 | 1,385,700 | 38 |
| **Beira to Bangula** | 1,616,000 | 373,000 | 0 | 1,989,000 | 52 |
| **Beira direct** | 1,664,000 | 364,000 | 0 | 2,000,000 | 55 |
| **Dar via Chipata** | 0 | 468,300 | 9,900 | 478,200 | 13 |
| **Mbeya-Chilumba** | 0 | 440,400 | 340,500 | 789,900 | 22 |
| **Salima Dry Port** | 0 | 478,500 | 0 | 478,500 | 13 |

Figure 10.4 Do-minimum freight traffic forecasts (tonnes)




A non-operational locomotive

ATKINS

Malawi National Transport Master Plan

# 11 Railway passengers

Rail Sub-Sectoral Plan

# 11 Railway passengers

## 11.1 Strengthening the existing offer

Whilst it is understood that the passenger services are lower priority than freight to freight they have the capability of becoming more important.

A detailed examination of the existing passenger railway was undertaken and reported in Chapter 6. The railway in Malawi is primarily a freight railway, which is becoming increasingly vital for the continued economic growth of the country. Passenger services are operated by CEAR as part of their Corporate and Social Responsibility obligations, with services making a loss of approximately US$150k per annum on operating costs. Note that the infrastructure costs are considered to be marginal as the railway is being provided for much heavier freight services, and the rolling stock is considered a sunk cost as the new coaches have been purchased already. The reality is that the primacy of the freight services will continue, given the importance of the freight railway to the Malawian economy.

The existing passenger railway is essentially incremental to the freight railway, taking advantage of the investment that has been put into running efficient freight services. It is effectively a rural rail service, centred around Limbe/Blantyre, Balaka and Liwonde. It historically concentrated on serving areas currently underserved by mini-buses either historically or because of poor road access, and on carrying passengers with large amounts of luggage.

### Soft measures – quick wins

In the short to medium term the passenger railway will effectively perform the same role as it does today, particularly as the Concession Agreement with CEAR is about to be re-signed, albeit that passenger serves will be restored to Makhanga. The passenger railway will remain an incremental provision to the freight trains, provided for corporate and social responsibility obligations. That said, however, there are several short-term measures that can be taken to improve passenger operations.

In Chapter 6 a series of detailed recommendations were made to strengthen the existing passenger railway offer. These can be summarised below:

- **Passenger timetable.** It is recommended that a passenger timetable be produced, and displayed at each station. In addition, each station should be equipped with a 'Next Train' sign, giving the time and date of the next trains to depart the station in each direction. Finally, the CEAR website should be updated and maintained to contain the timetable, plus any updates on the running of the next trains.
- **Journey time improvements.** The railway is currently being improved through the removal of temporary speed restrictions, with these improvements being recognised in the freight running times. These improvements should also be translated into improved passenger train run times to allow the current journey times to be substantially reduced.
- **Fares.** A review of the current fares policy should be undertaken. The rail passengers have benefitted enormously in recent years through the introduction of new Rolling Stock, but this has not been accompanied by an increase in the fares charged. In addition, fares information should be displayed prominently at all stations, in an easy to understand format.
- **Stations.** An inventory should be undertaken of each station, to determine both facilities available and the condition of the stations. Any remedial measures identified should be undertaken, including a regular paint of the station.

Each of the four measures identified are relatively easy, quick, and cheap to implement, and are all aimed at improving the current operations of the passenger services. Implementing these measures should be possible in the short-term, and will result in increased passenger confidence in the railway, which should then translate to increased passenger numbers.

Implementing these short-term measures should also result in the subsidy currently identified for the incremental provision of passenger services reducing slightly. Passenger number growth through increased certainty associated with better information provision, along with a rationalisation of the fares, will result in revenue growth of the operation. Similarly, reduced journey times, and better operational performance, will result in operational efficiencies, which should translate into a reduced cost of the passenger operations.

**Medium term objectives**

The key short to medium term objective is to return services to the section of line from Limbe to Makhanga. Examination of the passenger demand data, prior to the closure of the line, suggests that this service had good patronage levels, with the railway serving areas not currently well reached by roads. It is understood that this route is currently being surveyed with the intention of re-instating services as far as Sandama by 2019 as part of the 2017 revision of the concession Agreement. The current expectation is that section from Sandama to Makhanga will then be surveyed and opened thereafter.

There are 2 options for CEAR. The first is to use the same set at the existing passenger service or take advantage of the fact that CEAR has 15 new passenger carriages and up to two locomotives normally used on passenger services. Should a new set be used, which would be the recommendation of this study team as relying on a single set will be a risk in terms of reliability and punctuality, it will be possible for that to make several round trips per week. It is only 120.6 km between Limbe and Makanga.

Once the new operational rigour has been implemented in the immediate short term, the increased operating speeds, and thus shorter journey times between stations, should also allow the passenger services to be extended further and operated more frequently.

At a minimum, these measures should allow a return to the previous weekly working pattern of one train serving the areas to the north and west of Limbe (to Bilila and then to Nayuchi) on a 3-day cycle with a 2-day cycle in place serving areas to the south of Limbe to Makhanga.

In the concession Agreement the Corporate and Social Responsibility obligation is to operate more than one train per week to all of the destinations. Once the performance of the operation is improved, following the implementation of the measures outlined, and the efficiencies realised, then it should be possible to operate more trains per week. There are currently two locomotives and 15 new passenger coaches so it should be possible to form two train sets and serve the areas to the north and south two times per week by provision of this additional train set.

In the medium term, other operational patterns could be examined. This could involve services perhaps running from Makhanga through Limbe and Blantyre perhaps to Balaka, with the other set running from Salima through Nkaya to Nayuchi. Care would have to be taken though around the location of train maintenance, but the common section between Balaka and Nkaya should enable the sets to be swapped between routes for maintenance purposes if only one depot is maintained at Limbe.

In the longer term, if this incremental approach to improving passenger railways in Malawi is adopted and is successful, then it should be possible to establish an operation around Lilongwe, which effectively mirrors that around Blantyre/Limbe. The line runs east-west through Lilongwe from Mchinji in the west on the border with Mozambique through to Salima in the east, near Lake Malawi. This will allow communities on the route to connect with a major city in Lilongwe, and provide access to the border at Mchinji. This connection to Mchinji will allow trading opportunities for Malawians, similar to those currently provided at Nayuchi on the existing passenger operation. It should also be possible to provide interchange opportunities with the existing north-south line at Salima.

The north branch is freight only, and is currently closed for maintenance following track washaways. Like the north-south line this line is gradually being improved, so the possibility of running incremental passenger services should be possible.

**Figure 11.1 Potential site for a station in Lilongwe Kanengo**

In fact, there are likely to be less freight services operated on this line, given that commerce tends to be centred on Blantyre rather than Lilongwe, which should make it easier to run passenger services as there will be more train paths available. It is understood that passenger services did operate on this line in the time of Malawi Railways, but that services terminated in the 1990s.

Providing services to connect to Lilongwe is more difficult than at Blantyre and Limbe as the rail network skirts to the north of the city rather than through the centre. The major focus of the railway in Lilongwe at the present time is Kanengo, which is located on a spur from the main line, and is effectively a freight terminal situated in the industrial area of Lilongwe. The area around Kanengo includes large numbers of businesses, and thus is a large site of employment, so it would make sense to provide a passenger station at this point. The railway site at Kanengo is extensive, with large numbers of sidings, and even contains a maintenance pit. If passenger services were to resume on this line it would make sense to run services in and out of Kanengo, and to construct some form of maintenance facility there.

However, whilst the railway does not serve the central area of Lilongwe it does run through Area 25 of the city. Area 25 is a fast growing part of the city with poor existing transport links, so provision of new rail stations would provide much needed accessibility to the residents of this area.

It is understood that there was once a passenger station serving Area 25, but this has long been abandoned. Consideration should also be given to tying the new station into the provision of urban public transport at this location. The proposed Bus Rapid Transit (Phase 1) for Lilongwe would have a station at this point.

It is suggested that a more detailed study be undertaken of the feasibility of running passenger services on the east-west between Mchinji and Salima. This should include an examination of potential operational patterns and running times, as well as a detailed examination of potential sites for passenger stations. It is over 20 years since passenger services were run on this line so inevitably there will be changes in land use along the route. The growth of the city of Lilongwe would merit a detailed investigation of potential station locations.

## 11.2 **Intercity**

This section discusses the options of developing and operating an Intercity express service. A number of previous studies of the railway in Malawi have been undertaken. These have tended to assume that passenger services will be extended to include inter-city services between Lilongwe (Kanengo) and Blantyre, thus connecting the two major cities of the country. These studies include the June 2016, Feasibility Study for the Rehabilitation of the Mchinji to Nkaya Railway Line in Malawi (page 26 – Table 5.2), undertaken by TEAM Engineering and D'Apollonia). This assumes that rail will capture 70% of the passenger market between Lilongwe and Blantyre, estimating that this will result in around 354 passengers per day in 2031. There is no detail on how the demand forecast has been undertaken.

However, it is hard to see how rail can be competitive. The table below summarises the relative competitive strengths of rail and coach.

The rail journey of 365 km will take at an absolute minimum 7.5 hours in 2031, even with the proposed upgrade detailed in the study. This assumes that the passenger train will be able to run at full line speed of 50 kmph the whole way despite the gradient and other traffic. It is more likely that the best practical journey time achievable is closer to 10 hours. This compares with 4.5/5 hours for the express

coach.[79] The coach serves key locations within Lilongwe and Blantyre. Unfortunately, that is less true for rail, as whilst the rail station in Blantyre is well located, Kanengo is not central within Lilongwe. Fares on the coach vary between MWK13,000 and MWK6,350 (that is between US$18 and US$8.76 at 725 Malawian Kwacha to US$1 the quoted rate of 10th March 2017). The rail fare cannot be known at this point however it can be estimated from the approximate. The June 2016 Feasibility Study for the rehabilitation of the Mchinji to Nkaya railway line in Malawi based their market assessment on an operating cost per passenger of US$0.0395 per passenger km which equates to a cost of US$14.41 per passenger (which the same report suggests is around 50% more than the coach operating cost). On this basis the rail operating cost is likely to be greater than the typical coach fare and coach operating cost likely to be on average about 50% less than the rail. Any rail fare is likely therefore to be charged at a premium unless subsidised by the Government.

If fares are charged at the current rates for passenger services of approximately 11 Malawian Kwacha per kilometre, this would equate to a fare of US$5.5, which suggests that a heavy subsidy would be required if the current fare structures is retailed.

It has been suggested that rail might somehow win market share because of other factors which should give it an advantage in terms of passenger satisfaction. Whilst the reliability of the general coaches is not great the premium coaches are as reliable as the current train service (which is unlikely to get better with rising volumes of freight trains taking up spare capacity). There are several coaches a day but even if rail was to take 70% of the market there would not be enough traffic to justify more than one train each way each day. The comfort of the existing train is not better than the comfort of the coach services although the final offer cannot be known at this stage.

It is worth bearing in mind that rail will face competition from more than coach operators. Private car use will continue where convenience and price is valued much higher than price. Equally mini-bus use will also continue where convenience and price is valued much lower than price. Critically road based alternatives to rail offer a range of services that closely match a wide range of passenger priorities. In addition, road based public transport is mainly privately owned and already competitive, and is certain to respond competitively to any attempt by rail to grow market share.

*79 Source: travel of commission team and https://www.axacoach.com/faqs*

**Table 11.1 Differences between rail and coach on Lilongwe - Blantyre**

| | Rail | Coach |
|---|---|---|
| Journey time | 10 hours | 4.5-5 hours |
| Fare | MWK15,000 | MWK13,000 - MWK6,350 |
| City centre access Blantyre | Good | Excellent |
| City centre access Lilongwe | Poor | Excellent |
| Reliability | Currently not wholly satisfactory, but expected to improve | Satisfactory |
| Frequency | Poor | Good |
| Comfort | Very good | Good |

## 11.3 **Urban rail**

This section discusses the option and the potential operation of an urban public transport service by rail. It has been suggested that this might be possible using the existing railway in some (undefined) way.

Blantyre and Limbe suffer from road congestion, and with a forecast increase in road traffic and the increasing urbanisation of Malawi, this is likely to get worse. A rail service may reduce this crowding by providing an alternative modal choice for passengers. Such a service might operate between a new station on the existing line at Mbayani and a new station at Bangwe on the existing line via Blantyre and Limbe.

The problem with this suggestion is that it ignores the lack of capacity on the route – the line is nearly all single track. Additionally, there are lots of private sidings. Many of these lack sufficient space for trains to shunted for (un) loading without using capacity on the mainline.

In theory, it might be possible to timetable a way around this with some additional infrastructure (loops etc.), but an urban railway service requires a high frequency to compete with road based traffic. That would require a separated operation – in effect a new railway next to the existing alignment. It is hard to see that there is any room for this. Constructing a new line would be very expensive and, because it will be built alongside the existing railway, potentially disruptive.

Most importantly any rail operation will struggle to compete on price – at the very least they will need to be no more expensive than the existing mini-bus fares and it would be hard for a rail service to match as rail would not enjoy any journey distance efficiency. Any metro service between Limbe and Blantyre (just over 8 km) would require 2 trains sets plus an extra spare set to operate a 15 or 20 minute interval service – assuming a very ambitious and optimistic average running time of 50 kmph. Extending this further could require up to 3 times the number of trains. This would give a capacity of something like 1,500 passengers per hours per direction (assuming either 3 tph at 500 passenger/train or 4 tph at 375 passenger/train), around 40-60,000 passengers per day in total highly subject to the length of the day, the size of the train and the train service schedule.

It is likely that this is significantly in excess of current or forecast demand. The population/employment density of Blantyre is not sufficient or high enough by world standards.

Lilongwe is also less than suitable for an urban rail service. The city centre is not rail served and where the existing railway line does pass through the city it does not do so on the busy corridors.

The current rail operation of locomotive hauled carriages is entirely inappropriate for urban transport operations, and new Diesel Multiple Unit (DMU) rolling stock would be needed, at a cost of around $50 million. It is vital that operating costs are covered by revenues so that such a system would not require subsidies.

An urban rail system would be unlikely to pay back any of the capital investment without requiring much denser urban conditions than are expected in the next 20 years. Nevertheless, the potential for such systems should be monitored during the plan period.

The work on this report on the competitive position of rail in the different markets suggest that there is unlikely to be sufficient demand to build a positive business case for an intercity product. The costs and operational complexity of introducing a metro operation are also likely to be prohibitive. However, the is an opportunity to maximise use of the existing rolling stock and upgrade in line speeds to operate faster and more frequent rural services and, over the long term, potential for a small-scale tourist train operation.

## 11.4 Enhancement to rural passenger services

It is believed that it should be possible to operate up to 12 services per week using the existing rolling stock and significantly enhance the passenger benefit from the railway, taking advantage of the faster times made possible by recent investments.

The exact pattern of service will need to be agreed by CEAR and the Government of Malawi but one option is for a southern service as shown in Table 11.2.

**Table 11.2 Proposed southern service route and schedule**

| Set | Route – with calls at local halts also |
|---|---|
| **Set 1:** | |
| Monday + Wednesday + Friday | Blantyre via Limbe – Sandana/Makhanga |
| Tuesday + Thursday + Saturday | Makhanga/Sandana – Blantyre via Limbe |
| **Set 2:** | |
| Monday + Friday | Limbe + Blantyre - Balaka - Nayuchi |
| Wednesday | Limbe + Blantyre – Balaka – Biliria (and potentially Liwonde) |
| Tuesday + Saturday | Nayuchi – Balaka – Limbe via Blantyre |
| Thursday | Biliria (potentially Liwonde) – Balaka - Blantyre + Limbe |

Each set could consist of 6 passenger coaches (and goods as required), which would still leave sufficient spare for operations and maintenance.

It is recognised that this is a considerable improvement on the service offered currently by CEAR but given the recent line improvements it is likely to be possible albeit challenging.

With a further two sets of passenger vehicles and continued improvements to line speeds the study team it would be worth considering a return service three times per week between Salima and Blantyre/Limbe (which would allow the Bilila train to serve Liwonde/Nayuchi instead), and also considering a Mchinji – Salima service via a new station in Kanengo. All the sets, and particularly this last set, would need to be rotated regularly to ensure that they could be maintained at Limbe. These services proposed are similar in character to the existing service, that is rural and with frequent stops. A through service that does not stop and, therefore, that might catch freight trains and use up significant capacity is not proposed. Three service options are considered: once, twice and thrice daily.

**Recommendation**
Maximise the use of the existing passenger fleet to create two sets and operate a more ambitious 12 trains/ week schedule.

**Recommendation**
The Government of Malawi to undertake financial analysis with CEAR to test the case for acquiring a further two passenger sets to operate a Mchinji – Kanengo – Salima service

The study team believes that the marginal cost of operating enhanced services should initially be low given that the rolling stock is already paid for and the wear on the track is likely to be minimal because of the light axle load of the trains. The only significant costs are fuel, staffing and the mechanical wear on the locomotive and the passenger carriages. If there is a significant uplift in passenger numbers in response to the uplift in frequency and speeds then consideration should be made of reintroducing premium fares and, finally, uplifting fares so that there is no significant crowding. This will raise extra revenue that will pay some of the extra operational costs. More detailed financial analysis may be required.

## 11.5 Passenger forecasts

Under the scenarios tested, rail would have a very small share of total public transport trips, as shown in Table 11.3. Because the northern and southern options are mutually exclusive, the potential for both combined is to increase the number of passengers from the current (2016) figure of 157,000 to 1,131,000 passengers in 2036.

The majority of future rail passenger using the enhanced services would be diverted from road (minibuses). A reduction in minibuses on the road would result in economic savings as shown in Table 11.4.

**Table 11.3 Daily rail passenger forecasts, 2036**

| | Do minimum | Southern enhancements (Table Rail 11-2) | Salima-Mchinji | | |
|---|---|---|---|---|---|
| | | | Daily | Twice Daily | 3 x daily |
| Minibus | 430,789 | 429,621 | 430,599 | 430,460 | 429,693 |
| Coach | 56,917 | 56,037 | 56,973 | 57,075 | 57,210 |
| Rail South | 871 | 2,912 | 871 | 871 | 871 |
| Rail North | - | - | 157 | 224 | 858 |
| Ferry | 644 | 648 | 651 | 652 | 652 |
| Total | 489,222 | 489,218 | 489,251 | 489,282 | 489,283 |
| Annual Rail Passengers | 261,364 | 873,658 | 308,363 | 328,618 | 518,722 |

**Table 11.4 Annual economic benefits of rail passenger services, US$M, 2036**

| | Time saving | Vehicle operating cost saving | Fuel consumption saving | Carbon reduction | Loss in fuel levy | Total |
|---|---|---|---|---|---|---|
| Southern enhancements | 11.6 | 3.3 | 2.3 | -0.03 | 0.3 | 16.9 |
| Salima Mchinji Daily | 15.4 | 2.8 | 2.5 | -0.03 | 0.3 | 20.3 |
| Salima Mchinji Twice Daily | 16.0 | 2.9 | 2.6 | -0.03 | 0.3 | 21.2 |
| Salima Mchinji 3 x Daily | 16.1 | 3.0 | 2.9 | -0.03 | 0.3 | 21.7 |

## 11.6 **Rail tourism**

Malawi has a rich railway history which can be marketed as part of a tourist package to speciality interests. This can be done as passenger services are improved and extended. In addition, some of the old locomotives (Figures 11.2 and 11.3) can be exhibited publicly to both foreigners and Malawians.

Figure 11.2: Steam locomotive at Kanengo

Figure 11.3: Steam locomotive at Limbe


New CDN locomotive


ATKINS

Malawi National Transport Master Plan

# 12 Climate change mitigation

Rail Sub-Sectoral Plan

# 12 Climate change mitigation

## 12.1 Improving motor efficiency

Diesel engine efficiency can be improved to reduce fuel consumption and to reduce emissions. Some of the current motors in locomotives are over 40 years old, and their replacement with something modern would drastically reduce fuel consumption and increase reliability for both passenger and freight services.

## 12.2 Increasing axle loads

Increasing the axle load will increase payload of trains which will increase carbon efficiency ($Co_2$ per tonne/passenger hauled) and also increase financial efficiency which in turn will support a shift towards rail from road.

## 12.3 Alternative fuels

Whereas the transition from steam to diesel predominantly focused on diesel's operational benefits, the main driver for change today is the need to reduce greenhouse gas (GHG) emissions and fuel consumption. In the short term cleaner diesel fuel is required.

Among the ways to shift the rail industry in the medium term away from diesel operation, two options have been gaining particular traction. Rail fuel technologies can be split into short-term and long-term solutions. The use of liquefied natural gas (LNG) is being championed as an eminently achievable short-term option. In the long-term, hydrogen power, or hydrail as it has become known in its rail application, brings with it the potential for the most sustainable and eco-friendly form of rail transport to date.

### 12.3.1 CNG and LPG

Diesel Power Cars (DPCs), as part of Diesel Multiple Units (DMU's) can run on Compressed Natural Gas (CNG), either alone or in hybrid system. DMU's can also run on LNG.

From a cost perspective, LNG offers a compelling reason to move from diesel fuel – the average US diesel prices for 2012 (US$3.97 per gallon) can be compared to the price of the equivalent amount of energy from natural gas (US$0.48).

The potential emissions reduction from the use of LNG is also significant, with initial estimates suggesting that the application of LNG for rail operations could reduce carbon emissions by 30%, while nitrogen oxide emissions could be decreased by up to 70%[80].

There are regulatory and safety issues that come with installing LNG tanks on rolling stock.

### 12.3.2 Hydrogen

Locomotives powered by hydrogen fuel cells emit nothing but water at the point of operation. The use of hydrogen fuel cells in railways or Hydrail, is still in its infancy, with several small-scale demonstration projects around the world representing the limit of its development so far.

However, hydrail could be the world's dominant railway propulsion technology. It harnesses sustainable and renewable - but intermittent - non-carbon energy sources to power railways and transit lines electrically, but without the high cost and visual pollution of overhead wires.

The means of hydrogen production can be independent of oil - nuclear, wind and solar power are all feasible options. Small amounts of GHGs are emitted in the generation of hydrogen, but these emissions are negligible when compared to diesel-based operation. Hydrogen fuel cells can replace the diesel engines and generators used in modern diesel-electric trains, using energy generated by the fuel cells and electricity stored in batteries, which is produced by regenerative braking.

*80 GE and enelgy (LNG industry promoter)*

Old station at Limbe

ATKINS

Malawi National Transport Master Plan

# 13 Legal and institutional reforms

Rail Sub-Sectoral Plan

# 13 Legal and institutional reforms

## 13.1 Introduction

It is important that the planning, construction, operation and management of the rail network in Malawi is undertaken through a strong, transparent and up-to-date legal and regulatory framework by institutions with the structure, capacity and skills to discharge the required functions effectively and efficiently. On both counts, Malawi's current arrangements exhibit key challenges. These are examined in this Chapter, together with the Government's currently proposed reforms and our own recommendations to improve overall governance of railways in combination with other sub-sectors.

These recommendations are also set out in the Institutional Reform Plan and Regulatory Reform Plan which are being prepared under the NTMP.

## 13.2 Legal background

The Railways Act [Cap. 69:03 of the Laws of Malawi], enacted in 1907, provides for the regulation of construction, control, management and operation of all railways in Malawi. The RA is framed in a way that provides for public sector and private sector participation in the railways subsector in Malawi. For example, section 7 of the RA provides for contracts between a responsible public body and a private sector party in the construction and works of a railway. The provisions of the RA have facilitated the operation of Malawi's first PPP concession of Malawi Railways, which has operated for 17 years and was entered in 1999 with CEAR and is now concessioned to Vale.

The challenges with the RA are that its provisions do not prescribe clearly for the operations of concessions and other forms of PPP arrangements, such as Build-Operate-Transfer (BOT). There is a need to enhance the legislative framework for concessions and other forms in the RA. This would make the RA conform with Statement 3.2.2 in the National Transport Policy that requires the promotion of private sector participation in railway operations under concessionary arrangements. This would also make the RA in line with the Article 7.2 of the SADC Protocol on Transport, Communications and Meteorology which requires increasing private sector involvement in railway investment with a view to improving railway work and service standards and lowering unit costs for the services.

Notwithstanding the provision of public sector and private sector participation in railways, section 3 of the RA requires every person, natural or juristic, intending to construct and/or operate a railway to obtain prior approval of the Minister responsible for Transport as the regulator of the railways subsector. This means that no person may venture into railways services without prior written approval of the Minister.

With the enactment of the PPP Act in 2011, section 3 of the RA is in conflict with section 31 of the PPP Act which prohibits unsolicited bids. Railways facilities being infrastructure for public good would fall in the category of PPP where the railways facilities and/or ensuing services are initiatively private-financed and provided by the private sector. Section 31 of the PPP Act requires that every unsolicited bid or expression of interest for a PPP to a public body should be referred to the PPPC and not responded by the public body. It is clear that section 3 of the RA is in conflict with section 31 of the PPP Act. There would be need to amend section 3 of the RA to make it in line with section 31 of the PPP Act.

Once the Minister has granted approval in terms of section 3 of the RA, section 4 of the RA requires that the submission for approval of plans, sections etc. of the railway. Section 5 of the RA requires every railway constructed under the RA to be made and maintained in accordance with the levels shown on the approved plans and sections. Section 5 makes no reference to the requirement of the plans or sections to conform with international standards. The effect of section 5 is to make any plans or sections that have been approved by the Minister to be self-fulfilling as the technical standards for the railway.

Statement 3.1.2 in the National Transport Policy fails to step up the legislative requirements to the level of international standards as it simply requires that the railways infrastructure should be maintained and rehabilitated to the required standards (without referring to international standards). Section 5 is therefore likely to be deemed to deviate from the recommended regional and international standards. For example, Article 7.5 of the SADC Protocol requires that Member States should promote the development and implementation of compatible standards with respect to infrastructure and operational equipment.

The provisions of section 31 of the RA subjects railway administrations to the levying of rates by local authorities. The provisions of section 31 also prescribe how the levies are to be charged on every railway administration. It would be important to consider how section 31 of the RA reconciles with other provisions of the laws of Malawi, such as the Local Government Act which also provides for similar levies. In the past, there have been conflicts resulting in legal dispute in the High Court of Malawi between the way section 31 was applied to grant CEAR exemption in rates and the way some local authorities, such as Liwonde Town Assembly and Salima Town Assembly, applied the provisions of the Local Government Act to require CEAR to pay rates.

Section 33 of the RA protects any rolling stock, machinery, plant, tools, fittings, materials or effects used or provided by a railway administration for the purpose of the traffic on its railway or of its stations or workshops from being taken in execution of any order of any court or of any local authority or person having by law power to attach or distrain property. Nonetheless, this statutory requirement does not affect the authority of any court to attach the earnings of a railway in execution of a judgment or order. The provisions of section 33 are critical as they protect rolling stock, machinery, plan, tools, fittings, materials or effects used by railway administration from being taken in execution. This provision is likely to promote private sector participation in the railways sector.

Notwithstanding that the RA has some provisions which are relevant to modern operations of railways services, it is clear that the RA needs to be amended to make it more private investor-friendly, reflect the current policy of concessioning rail operations, and come into line with modern technical standards and regional laws as a way of harmonizing the legislation and regulatory framework with neighbouring states. These reforms also need to be reflected institutionally. It is hoped that such an approach will enable the railways to adopt common safety rules and regulations governing railway signs, signals and rolling stock with the SADC region.

Section 33 of the RA protects any rolling stock, machinery, plant, tools, fittings, materials or effects used or provided by a railway administration for the purpose of the traffic on its railway or of its stations or workshops from being taken in execution of any order of any court or of any local authority or person having by law power to attach or distrain property. Nonetheless, this statutory requirement does not affect the authority of any court to attach the earnings of a railway in execution of a judgment or order. The provisions of section 33 are critical as they protect rolling stock, machinery, plan, tools, fittings, materials or effects used by railway administration from being taken in execution. This provision is likely to promote private sector participation in the railways sector.

Notwithstanding that the RA has some provisions which are relevant to modern operations of railways services, it is clear that the RA needs to be amended to make it more private investor-friendly, reflect the current policy of concessioning rail operations, and come into line with modern technical standards and regional laws as a way of harmonizing the legislation and regulatory framework with neighbouring states. These reforms also need to be reflected institutionally. It is hoped that such an approach will enable the railways to adopt common safety rules and regulations governing railway signs, signals and rolling stock with the SADC region.

## 13.3 **Draft legislation**

In 2015, a draft Malawi Railway Bill was developed, which will repeal the Railways Act when enacted. The Draft Railway Bill aims at a comprehensive approach by addressing many areas relating to the rail transport sub-sector, including operations and regulations of rail transport services. The scope of the Bill also extends to covering the rail services under PPP and other concession arrangements. The Bill also attempts to establish a new institution, the Malawi Railways Regulator, which would be mandated with the powers of enforcing safety standards in the entire rail transport sub-sector. The establishment of the Railways Regulator under the law is expected to enhance the regulation of the rail transport and promote the effective operation or management of rail transport services in Malawi.

The Railway Bill comprises 12 parts. Part I of the Bill contains preliminary provisions. Clause 1 provides the short title and makes provision in respect of the commencement of the legislation. Clause 2 of the Bill is the definitions clause. Part I is standard in terms of legislation drafting in Malawi. Build, Own, Operate and Transfer (BOOT) has been defined as a financing arrangement available under the PPP Act in which a Railways Infrastructure Manager designs, builds, owns and operate rail facility. This definition is misleading and limits the types of PPP arrangements available to the Railways Infrastructure Manager under the PPP Act. It would be more appropriate for the Bill to make a general reference of and adopt the definitions in PPP Act instead of attempting to define each technical term, such as 'Build, Own, Operate and Transfer (BOOT)' according to the PPP Act.

Part II deals with general provisions. Clause 3 provides for the responsibility of Government of Malawi to develop the railway transport policy without providing expressly MoTPW as the responsible line ministry in charge of initiating and/or developing the railway transport policy. Clause 4 gives the MoTPW Minister the responsibility of implementing the railway transport policy without providing expressly about the initiation or development of the policy by the Minister.

Part III establishes a new Railway Regulator (See below) and outlines the objects, powers and funding of the Regulator. The Bill does not provide provisions clarifying whether the Regulator will be established within MoTPW or, independently or standalone, outside the institutional framework of MoTPW. The wording of Clause 9 implies that the Regulator would not benefit from appropriations from the national budgets.

Part IV provides that all railway infrastructures on public land is to remain public property and only to be concessioned to any Railway Infrastructure Manager under PPP arrangements and also provides for railway facilities constructed on private property as belonging to private sector parties. Part IV also provides for functions and other activities by the Railways Infrastructure Manager. The inclusion of the functions and activities of the Railways Infrastructure Manager under Part IV has the potential of bringing ambiguity in the law as issues relating to the Railways Infrastructure do not speak closely to the issues relating to the Railway Infrastructure Manager per se.

Part V deals in an incoherent manner with matters relating to railway operating licensing, how one can apply for the licence, the process for consideration of the licence and under the circumstances in which a licence can be suspended or revoked, among other issues. Part V prohibits the transfer of licences.

Part VI provides for freight rail transportation by a railway operator, including contractual obligations, compensation, indemnity and claims.

Part VII provides for passenger rail transportation by a railway operator, including luggage, ticketing, contractual obligations, compensation, indemnity and claims.

Part VIII establishes the railway system, its inter-operability, conformity assessment and inspections in the railway system.

Part IX deals with safety matters relating to rail transport services, including promoting safe operations, safety management systems, safety management plans, inspections and certifications, safe regulations and investigation processes.

Part X provides for powers of the Railway Regulator to control over certain activities in the construction of rail infrastructure and operation of the rail transport services, including empowering the Railway Regulator to impose penal orders on violations in the rail transport sub-sector.

Part XI enhances the powers of the Railway Regulator by providing for offences and penalties and empowering the Railway Regulator to impose penalties due to offences committed in the rail sector.

Part XII of the Bill contains repeal and saving provisions.

## 13.4 Institutions

Under current conditions, the Ministry of Transport and Public Works plays the leading public sector role in guiding, regulating, planning and overseeing the rail sector in Malawi. This is undertaken via the Department of Rail Services which has the following mandate:

- Promotion of railway safety and environmental protection;
- Ensuring that the Railways Act and other legal instruments are updated periodically and strengthened;
- Improvement of operational efficiency and commercial viability of railway companies;
- Prevention of adverse environmental effects of railway construction and ensuring that the infrastructure is environmentally friendly; and
- Improvement of levels of service to all users including people with disabilities at an affordable cost.

The Department is responsible for all matters relating to railway transportation as well as the implementation of policies and directions sanctioned by the Government and various regional and international conventions to which Malawi is a party.

There is a range of evidence, already presented in this Report, that the Government has struggled to fulfil these functions. Indeed, the Department for Rail Services has only two professional staff, whilst its effectiveness is further weakened by limited skills, supporting systems and data, and the necessary joint working with CEAR to move the sub-sector forward. This reflects a wider limitation in capacity across MoTPW in its role as overall steward of the transport sector as detailed elsewhere under the NTMP.

## 13.5 Institutional reform proposals

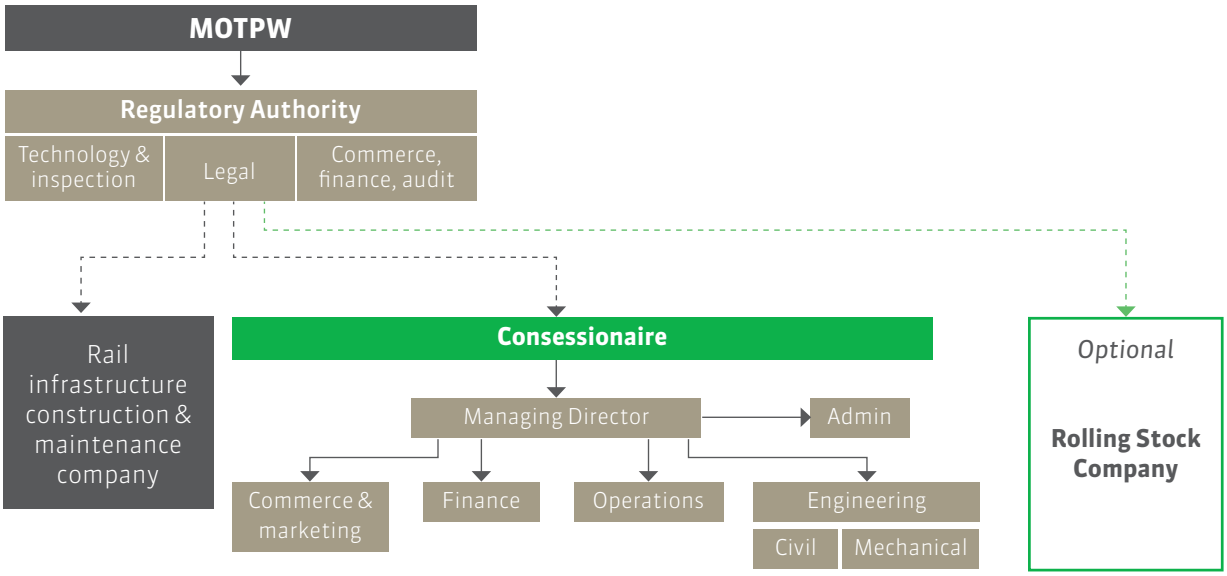
In line with its wider institutional and regulatory reform programme, discussed below, the Government has previously considered proposals to strengthen the specific governance of the rail sub-sector. These proposals are based on the GOPA Consulting Report (2009) and are now being progressed through the 2015 Railway Bill as set out above.

The report is premised on the potential for the rail sector to transport increased volumes of passengers and freight over medium and long distances more cost effectively than road. This will require extensive rehabilitation, renewal and upgrading of track infrastructure, signalling and rolling stock focusing first on Nacala Corridor and later on Beira Corridor. The proposed costed programme is set out as economically viable under a range of future scenarios.

The report argues that achieving long-term sector development will require the existing weak institutional and regulatory framework to be updated and strengthened by:

- Establishing an up-to-date legal framework from 1907 Railway Law, including separation of rail infrastructure and operations, allowance for private concessions and new institutional responsibilities;
- Establishing a new Rail Regulator to specify, license and oversee infrastructure and operational provision, financing and contract management;

**Figure 13.1 Previously proposed structure for rail sub-sector in Malawi**




Source: Malawi - Beneficiary Framework Contract Lot 2: Transport and Infrastructure: Technical Assistance to Rail Sector Development. Final Report. Gopa Consulting (2009)

- Assuming the Government retains ownership of the network, a new Rail Infrastructure Company to undertake maintenance, upgrading and construction with funding from concession fees, the Government of Malawi and donors, as well as a new rolling stock company; and
- Concluding new and more effective concession agreements from the current CEAR contract based on the new legal and institutional arrangements.

However, given the small scale of the Malawi rail network, even with substantial growth in demand, it is suggested by GOPA that the above arrangements could be simplified, shared or coordinated across national borders, in the first instance through a tri-lateral approach for the whole Nacala Corridor, or nationally with other transport Sub-Sectors (e.g. Inland Water).

At the current time, the 2015 Railways Bill remains a draft document and further details need to be developed on the precise form and function of the proposed Rail Regulator, the residual functions to be retained within MoTPW and a clear and robust implementation plan, including the organisational development and capacity building of the existing and new organisations.

Nevertheless, we concur with the basic proposition that detailed planning, regulation and coordination of the rail sub-sector should be separated from the Government which should focus on the setting, monitoring and oversight of policy. We also concur that these arrangements should be set out in primary legislation which will replace the 1907 Act.

All of this means that we recommend that a Rail Regulator be established and that proposals for the Rail Infrastructure Manager and rolling stock company are not taken forward at this time.

## 13.6 Proposals for regulating the rail sector

The Government of Malawi has a long-standing vision for transforming its national transport outlook. Since the 1990s, the Government has embarked on a series of major policy and structural reforms aimed at promoting the development and operation of an efficient and competitive transport sector for Malawi. A key theme has been the (functional and institutional) separation of public policy and planning, regulation and delivery, combined with the progressive commercialisation and privatisation of existing operations and opening up of the market to competition. It has also sought to embed these changes within an updated legal and regulatory framework.

This rationale lies behind creation of a separate Road Authority and Road Fund Administration in 2006, concessioning of operations in rail and inland waterways, as well as liberalisation of road freight and passenger transport. Whilst the reforms in the roads sub-sector have been (relatively) successful, concessioning of rail and marine services (ahead of, and separate from, enabling legislation) has delivered slightly lower investment, operational efficiency or user benefits that thought likely at the time. Further reforms of policy intent, institutional, legal and regulatory frameworks, and associated funding mechanisms, may therefore be required, and have been proposed, to put these sub-sectors on a firmer basis. Perhaps of greater importance is that CEAR's is effectively a monopoly operator within Malawi, without any regulatory constraints on pricing but with the Government support for enhancements to its network and having a powerful position over key industries within Malawi.

On this basis, the proposal, set out in draft legislation, to create a new Rail Regulator for infrastructure and service licensing, network access, economic and technical regulation and safety certification and assurance is a credible way forward and should be pursued. However, the scale of the rail network and demand for its services remains very small relative to road, and it may be organisationally inefficient and financially costly to establish rail regulation as a separate and dedicated agency in its own right.

With this in mind, we propose organisational amalgamation between planning and regulatory functions for different sub-sectors to shape the way forward. The arguments for this approach have already been set out elsewhere in the NTMP Institutional Reform Plan to ensure efficiency in resource use, stronger mandate and authority and integration of working practices.

The ultimate goal of this proposal will be to include rail regulation within a new National Transport Authority (NTA). This will combine regulation of road operations, rail and maritime and wider economic regulation of transport costs within a single body responsible for all forms of surface transport.

The ultimate National Transport Authority will provide a strong, independent regulator which will supervise, monitor, direct and intervene as necessary to ensure Malawi's surface transport for road, rail and marine networks comply with technical and legal requirements, are safe, efficient and deliver public objectives at reasonable cost. In carrying out this function, it will have the following objectives:

- regulate all surface passenger and freight transport activities in Malawi, including concessions, licenses, permissions or contracts granted by the Government;
- ensure transport access is arranged between operators on a fair, transparent and non-discriminatory basis, subject to concessions, licenses and contractual agreements which may apply;
- solely, or in conjunction with other agencies, develop and enforce technical standards for infrastructure, vehicles, other assets and operations;
- determine, monitor and enforce transport charges, tariffs and fares;
- monitor, determine and refer to the relevant delivery and enforcement agencies, anti-competitive, unsafe or other harmful behaviour by transport operators which may be against consumers' interest;
- drive and promote the use of the surface transport sector, with a focus on those modes which are operationally efficient, economically advantageous and environmentally sustainable, as well as the integration between them, to the extent which is practicable and justified;

- advise the Government (principally MoTPW) on new policy, law and regulations for surface transport sector, including the management and granting of new concessions and contractual agreements with the private sector;
- participate in, and undertake activities in compliance with, relevant bilateral, international or regional agreements and obligations; and
- solely, or in conjunction with other independent bodies, monitor and enforce surface transport health and safety, protect users and undertake or support investigations into all accidents involving harm to life or property.

As well as technical, economic and social remits, the Authority will also provide independent safety regulation, certification and assurance for the rail and inland water sub-sectors.

Detailed organisational design, legal establishment, development of processes and systems will need to be undertaken once Government of Malawi approval of the proposal has been granted.

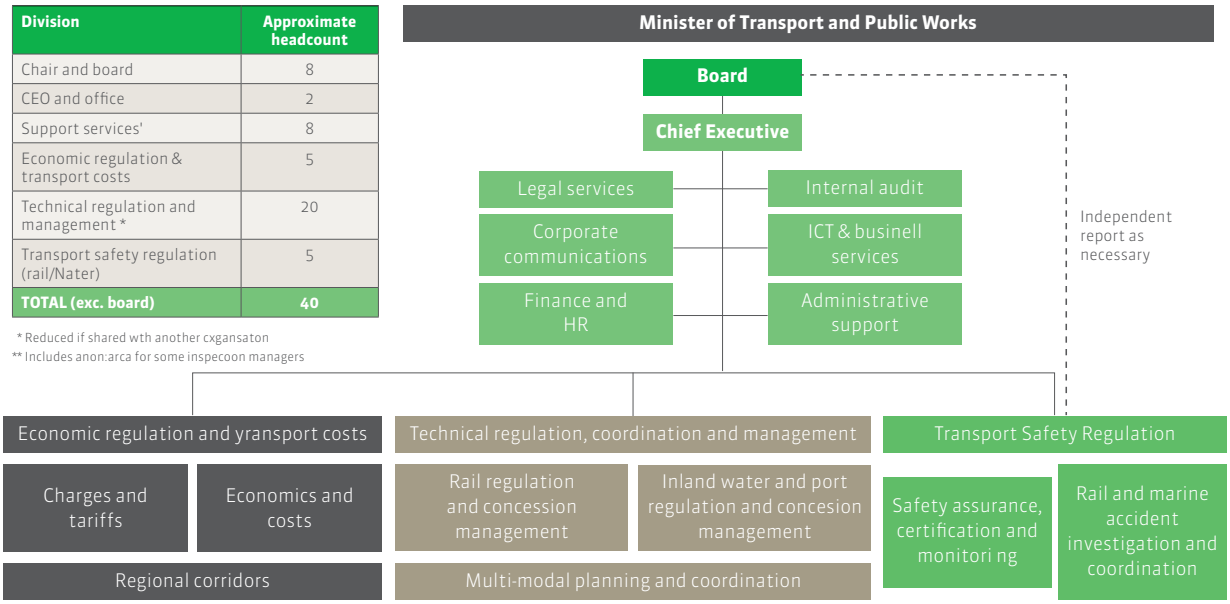
It is recognised that creating the NTA represents an ambitious agenda at the current time, especially given the challenges of developing the Roads and Traffic Authority from the current Department for Roads, Traffic and Safety Services.

Therefore, we propose the first stage of creating the NTA should be the creation of a new Rail and Maritime Authority (RAMRAM), with the potential to incorporate regulation of road operations at a later date.

## Figure 13.2 Proposed structure for the Malawi Rail and Maritime Regulator

| Division | Approximate headcount |
|---|---|
| Chair and board | 8 |
| CEO and office | 2 |
| Support services' | 8 |
| Economic regulation & transport costs | 5 |
| Technical regulation and management * | 20 |
| Transport safety regulation (rail/Nater) | 5 |
| **TOTAL (exc. board)** | **40** |

* Reduced if shared wth another cxgansaton
** Includes anon:arca for some inspecoon managers




**Overall role of authority**

**A strong, independent regulator which will supervise, monitor, direct and intervene as necessary to ensure Malawi's surface transport for rail and marine networks comply with technical and legal requirements, are safe, efficient and deliver public objectives at reasonable cost.**

**Key functions**

1. Regulate all passener and freight transport activities by rail and inland water in Malawi, including infrastructure, concessions, licenses, permissions or contrads granted by the Government.
2. Ensure transport access is arranged between operators on a fair, transparent and non-discriminatory basis, subject to concessions, licenses and contractual agreements which may apply.
3. Solely or in conjunction with other agencies, develop and enforce technical standards for infrastructure, vehicles, other assets and operations.
4. Determine, monitor and enforce transport charges, tariffs and fares.
5. Monitor, determine and refer to the relevant delivery and enforcement agencies, anti-competitive, unsafe or other harmful behavior by transport operators which may be against customers' interests
6. Drive and promote the use of the rail and maritime sectors with a focus on those modes which are operationally efficient economically advantageous and environmentally sustainable, as well as the integration between them, to the extent which is practicable and justified.
7. Advise Government on new policy, law and regulations for the rail and maritime sectors, including new infrastrudure investment the management and granting of new concessions and contractual agreements with the private sector.
8. Participate in, and undertake activities in compliance with relevant bilateral, international or regional agreements and obligations
9. Solely, or in conjunction with other independent bodies, monitor and enforce health and safety, environment, protect users and undertake or support investigations into all accidents involving harm to life or property.

**Key organisational elements**

1. Independent Board and Appointment Procedures of 6 – 8 Members
2. Executive – around 40 Professional Staff, Technical Support & Processes
3. Departments for Rail, Ports and Maritime, plus Economic Regulation and Costs
4. Working Protocols with Range of Other Agencies, including RA, MoPTW, District Councils, PPP & Competition Commissions, Police & Regional Corridor Bodies.
5. Incorporates Independent Transport Safety Regulator for Rail and Maritime.

**Recommendation**
Create an independent regulator for the rail sub-sector, either as a stand-alone agency or in combination with the regulation of other sub-sectors to secure stronger technical, economic, environmental and safety coordination in line with national and regional goals.

**Recommendation**
Following separation of the regulatory function from MoTPW, restructure the residual functions of the Department of Railway Services to focus on effective policy making, monitoring and oversight.

**Recommendation**
Seek Parliamentary approval for a new Railways Act (or equivalent legislation) to determine the future sub-sector structure, with provisions for the Minister and rail regulator to make regulations and guidelines as may be required to achieve a safe, efficient, integrated and financially sustainable rail sub-sector over the duration of the NTMP.

The first phase for the Rail and Maritime Authority will perform similar functions as the NTA for rail and inland water modes, as well as wider economic regulation, but omit direct jurisdiction over road operations, until such time as restructuring involving DRTSS and its transition to RTA is complete and embedded.

Proposed organisational arrangements and functions for the RAMRAM are set out below, with a dedicated department focused on rail regulation and concession management. Establishing and building this body will be a major exercise and will require well-structured and sequenced implementation plans. The draft Railways Bill[81] may need to be amended, in due course, to take account of our proposals, including the relationship between the Authority and the PPP Commission in letting and managing concessions.

It is important the revised Railways Bill also defines the residual functions of MoTPW with regards to setting of rail policy, monitoring and oversight, makes provisions for the Minister and the RAMRAM to make secondary regulations of various kinds, issue guidelines, set and enforce penalties and take steps, where relevant to harmonise Malawi domestic and regional standards.

Were the draft legislation to be re-introduced in 2017, then creation of the independent rail regulatory function and clarification of MoTPW's policy role ought to be enabled, with appropriate capacity building and technical assistance by 2019.

81 *It may be possible to draft a combined Railways and Inland Water Shipping Bill*

The proposal is intended to meet the objectives of the sub-sector plan and assist the following eight outcomes:

1. **Strategic leadership and direction** - The proposal provides a more coherent, logical and structured mechanism for leadership, control and coordination of the Sector or within or between Sub-Sectors.
2. **Meeting the transport needs of the population** – The proposal addresses the existing and future transport needs in line with expected components to be delivered under the NTMP, which include the need to reduce transport costs for all.
3. **Separation of policy, regulation and (commercialised) operations in line with the Government of Malawi's reform agenda** - The proposal is consistent with the Government's stated reform agenda, and addresses gaps or delays in the agreed approach in practice.
4. **Capacity to deliver or complement sector/ sub-sector investment and improvement** - The proposal is likely to drive and incentivise key Sector or Sub-Sector stakeholders to consider, invest in and promote improvements, including delivery of, or over and above, current commitments or agreed programmes.
5. **Cost and efficiency in using scarce professional skills and capacity** – The proposal present a good use of available capacity and resources.
6. **Ease of implementation and stability of outcomes** - How the proposals are relatively practical and easy to implement?
7. **Stakeholder representation and collaboration** - The proposal promotes expanded stakeholder representation and involvement across the rail mode and facilitates greater participation of the private sector in operations and funding.
8. **Level of stakeholder support** - The proposal commands stakeholder support.

Track renewal work at Limbe yard

ATKINS

Malawi National Transport Master Plan

# 14 Investment Action Plan

Rail Sub-Sectoral Plan

# 14 Investment Action Plan

Table 14-1 lists the investments proposed in four tranches over the plan period, with funding sources shown in Table 14-2

**Table 14.1 Investment Plan (US$ Millions)**

| | 2017-2022 | 2022-2027 | 2027-2032 | 2032-2307 | Total |
|---|---|---|---|---|---|
| **RAMRAM** | | | | | |
| Establish RAMRAM | 2 | | | | 2 |
| Running costs | 1.25 | 1.25 | 1.25 | 1.25 | 5 |
| Business planning process | 5 | 5 | 5 | 5 | 20 |
| | | | | | |
| **Passenger services** | | | | | |
| Enhanced Limbe-Balaka-Nayuchi | 2 | Self-funding | | | 2 |
| Mchinji - Salima | 2 | Self -funding | | | 2 |
| | | | | | |
| **Infrastructure** | | | | | |
| Beira - Marka | | 158 | | | 298 |
| Marka-Bangula | | | 249 | | 249 |
| Bangula- Limbe | | | | 242 | 242 |
| Nkaya-Mchinji | 254 | 254 | | | 508 |
| Nkaya-Limbe-Sandama | 80 | | | | 80 |
| Mbeya-Chilumba | | | 484 | 484 | 968 |
| | | | | | |
| **Train control** | | | | | |
| North line | 18 | | | | 18 |
| South line | 11 | | | | 11 |
| | | | | | |
| **Intermodal** | | | | | |
| Liwonde wet port | 10 | | | | 10 |
| | | | | | |
| **Capacity building** | | | | | |
| Department of Rail Services | 4.5 | | | | |
| RAMRAM | 1.5 | | | | |
| | | | | | |
| **Heritage rail** | | 10 | 2 | 2 | 14 |
| | | | | | |
| **Level crossings** | 5 | 3 | 3 | 3 | 14 |
| | | | | | |
| **Total** | **396.25** | **431.25** | **744.25** | **737.25** | **2,309** |

### Table 14 2 Action Plan funding sources

| | Funding source | Total (US$ mn) |
|---|---|---|
| **RAMRAM** | | |
| Establish RAMRAM | GoM | 2 |
| Running costs | Concession Fees | 5 |
| Business planning process | IFI | 20 |
| | | |
| **Passenger services** | | |
| Enhanced Limbe-Balaka-Nauychi | CEAR | 2 |
| Mchinji - Salima | CEAR | 2 |
| | | |
| **Infrastructure** | | |
| Beira - Marka | Development Partner / GoM | 298 |
| Marka-Bangula | Development Partner / GoM | 249 |
| Bangula- Limbe | Development Partner / GoM | 242 |
| Nkaya-Mchinji | Development Partner / GoM | 508 |
| Nkaya-Limbe-Sandama | Development Partner / GoM | 80 |
| Mbeya-Chilumba | Development Partner / GoM | 968 |
| | | |
| **Train control** | | |
| North line | CEAR | 18 |
| South line | CEAR | 11 |
| | | |
| **Intermodal** | | |
| Liwonde wet port | PPP | 10 |
| | | |
| **Capacity building** | | |
| Department of Rail Services | Concession Fee | |
| RAMRAM | Concession Fee | |
| | | |
| **Heritage rail** | PPP | 14 |
| | | |
| **Level crossings** | CEAR | 14 |
| | | |
| **Total** | | **2,309** |

Table 14.3 shows the Action Plan for enabling actions and the agreements reached with CEAR on the recommendations.

### Table 14.3 CEAR Actions and Agreements on Recommendations

| No | Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|---|
| 3 | Operations investment | Review potential extension of the east-west route train control system to include Limbe branch. | CEAR | 2.4.1 | Under Consideration |
| 4 | Regulation | Type GT26 locomotives to be licenced for this route (Nkaya-Limbe) to improve operational flexibility. | CEAR | 2.4.1 | Agreed |
| 5 | Operations | Conduct further trials to test the maximum trailing load west and east between Nkaya and Kanengo and Chipata– partly for publicity and partly to plan potential traffic on this route in a way that optimises efficiency. | CEAR | 2.5 | Test is in progress |
| 6 | Operations investment | Review potential extension of the east-west route train control system to also include the north branch. | CEAR | 2.5 | Under Consideration |
| 8 | Operations retail | An annual paint programme for each station. This is in addition to any maintenance plan. Take care to ensure that the station retail front is maintained appropriately. | CEAR | 2.7 | Agreed |
| 9 | Operations retail | Display station opening times in information where it can be seen by public. | CEAR | 2.7 | Agreed |
| 12 | Operations | Publication of the CEAR freight timetable. | CEAR | 4.1.2 | Fixed train schedule being developed |
| 13 | Operations retail | Production of public timetable with days and times of departure for every station with date of the publication of the next proposed timetable, no more than 12 months ahead. | CEAR | 4.2.1 | Agreed |
| 14 | Operations retail | Publication of timetable on website – revised whenever there are amendments e.g. because of line closures. Also public the freight timetable on the same site. | CEAR | 4.2.1 | Agreed |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|---|
| 15 | Operations retail | Once a passenger timetable has been produced it should then be displayed each and every station. Most stations already have a notice board for displaying information to passengers so it could easily be added. | CEAR | 4.2.1 | Agreed |
| 16 | Operations retail | CEAR to develop media plan and liaise with national public radio and other media over publicity regarding scheduled and unscheduled changes to the timetable or its operation. | CEAR | 4.2.1 | Agreed |
| 17 | Operations retail | Consideration to be given to "next train" signs at all manned stations displaying date, time and day of the next train in each direction. This would require station staff to update the signs once each train has departed. | CEAR | 4.2.1 | Agreed |
| 18 | Operations | CEAR are in the process of removing a number of temporary and (semi) permanent speed restriction currently in force. These improvements should be factored into a new calculation of the journey time between stations (and the whole working timetable). This would provide passengers with a direct benefit from CEAR's investment in the freight traffic. This process should be repeated – and a new public timetable produced - no less than once per year. | CEAR | 4.2.2 | To be started 2017 |
| 19 | Operations retail | With the publication of a timetable, and more disciplined approach to operations, CEAR should formalise a reduction in the dwell time at each station to no more than 3 minutes at the smaller halts and 5 minutes at larger stations – less where practical. Note that reduced dwell times may already be included in the working timetable which may explain why it is up to an hour different in end-to-end times than the website timetable, The journey time savings that this generates should be factored directly into the public timetable. | CEAR | 4.2.2 | To keep minutes average |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|---|
| 20 | Operations retail | Include at least one premium coach per scheduled train. If this recommendation is rejected then the existing premium coaches should be declassified at a minimum and potentially reconfigured as standard coaches, and all reference to premium fares be removed from CEAR publications. | CEAR | 4.2.5 | Agreed |
| 22 | Passenger marketing | Consider merging the two premium fares – "Premium" and "Business". | CEAR | 4.2.5 | Agreed |
| 23 | Passenger marketing | Consider the level of fare differentiation between premium and standard and what other services might be offered to premium passengers – perhaps a coffee, tea or soft drink service. Conduct regular usage level surveys – if the premium coach is empty then reduce fare differential and increase level of service. If premium coach is full then increase fare differential. | CEAR | 4.2.5 | Agreed |
| 24 | Passenger marketing | A review of the fares policy for all fares in the light of current operating conditions, bearing in mind the corporate and social responsibility element of the service, and the need to enhance revenue to help reduce CEAR's operating loss. Once determined, the new fares should be published and displayed at each of the stations on the station notice boards. The fares should also be displayed on the company website. | CEAR | 4.2.5 | Agreed |
| 25 | Passenger marketing | Simplify and unify the way that the fares are shown at stations. | CEAR | 4.2.5 | Agreed |
| 29 | Operations | A thorough review of the passenger counting process is undertaken including how that data is used and reported. This then needs to be agreed with GoM. Passenger count data can then be exchanged with the Government on a regular basis to aid with the understanding of the success of the services operated. | CEAR | 6.1 | Counting process reviewed |

| No | Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|---|
| 32 | Freight marketing | That CEAR/CDN should work with the Zambian Railways Limited (ZRL) to agree what they could do to improve the railway service short of increasing the axle load. Additionally, they should agree on a list of target customers to approach to sell this new service, in particular, whether it is worth approaching any of the mining operations in Zambia. | CEAR | 7.2.2.4 | Agreed |
| 33 | Freight marketing | Include Port of Nacala in workshops on developing rail service offer for Zambia. | CEAR | 7.2.2.4 | Agreed |
| 35 | Freight marketing | That CEAR/CDN should work with ZRL to agree what they could do to improve the railway service including increasing the axle load to complement potential line extensions within Zambia. As above, additionally, they should agree on a list of target customers to approach to sell this new service and whether it is worth approaching any of the mining operations in Zambia. | CEAR | 7.2.2.4 | Under Consideration |
| 37 | Strategy | Maintain Beira as an option for Zambian traffic forecast to use the proposed extension from Chipata. | GoM/CEAR | 7.2.3 | Being considered |
| 41 | Infrastructure investment | Consider whether phase 1 and phase 2 of the southern approach for Sena line should be implemented together. | GoM | 10.2.2.2 | Phase 1 (Limbe to Sandama) to be implemented first quarter of 2018 |
| 43 | Marketing freight | Consult with key clients (particularly Illovo) over "southern" Sena option. | CEAR | 10.2.2.2 | Initial consultations suggest Ilovo and other key clients in the tea industry are interested in the Sena option |
| 46 | Operations investment | Government of Malawi and CEAR to consider whether renewal and maintenance standard should be uplifted to 18 or 20.5 tonnes. | GoM /CEAR | 10.2.3 | Agreed |

| No | Area | Description | **Lead owner** – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|---|
| 49 | Operations investment | Undertake an audit of the operational methodology at all private sidings including an estimate of the cost to CEAR and the investment options for reducing this. It is recognised that CEAR has already undertaken significant work previously but a systematic approach combined with looking at investment options may be worth while | CEAR | 10.2.7 | Agreed |
| 50 | Operations investment | Evaluate the cost of extending radio train control system to the south and to the north lines. | CEAR | 10.2.8 | Agreed |
| 52 | Capacity building | Consider approach to IRO/Transnet or development of similar distance learning programme. | GoM /CEAR | 10.2.9 | Agreed |
| 57 | Operations | Maximise the use of the existing passenger fleet to create two sets and operate a more ambitious 12 trains/week schedule. | CEAR | 11.5 | Demand to be assessed |


Old steam locomotive

ATKINS

Malawi National Transport Master Plan

# Appendix A
# CEAR actions agreements on Action Plan

Rail Sub-Sectoral Plan

# A.1 CEAR actions agreements on Action Plan

| Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|
| Capacity building | Consider approach to IRO/Transnet or development of similar distance learning programme. | GoM /CEAR | 11.2.9 | Agreed |
| Freight marketing | Work with the Zambian Railways Limited (ZRL) to understand and agree what can be done to improve the railway service short of increasing the axle load. Additionally, they should agree on a list of target customers to approach to sell this new service, in particular, whether it is worth approaching any of the mining operations in Zambia. | CEAR | 8.2.2.4 | Agreed |
| Freight marketing | Port of Nacala on developing rail service offer for Zambia. | CEAR | 8.2.2.4 | Agreed |
| Freight marketing | Work with ZRL to understand and agree what they could do to improve the railway service including increasing the axle load to compliment potential line extensions within Zambia. As above, additionally, they should agree on a list of target customers to approach to sell this new service and whether it is worth approaching any of the mining operations in Zambia. | CEAR | 8.2.2.4 | Under consideration |
| Infrastructure investment | Consider whether phase 1 and phase 2 of the southern approach for Sena line should be implemented together. | GoM | 11.2.2.2 | Phase 1 (Limbe to Sandama) to be implemented last quarter of 2017 |
| Marketing freight | Continue to consult with key clients (particularly Illovo) over “southern” Sena option. | CEAR | 11.2.2.2 | Initial consultation suggests Illovo and other key clients in the Tea Industry are interested in the Sena option |

| Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|
| Operations | Factor reduction in speed restrictions into a new calculation of the passenger journey time between stations. This process should be repeated – and a new public timetable produced - no less than once per year. | CEAR | 5.2.2 | To be started 2017 |
| Operations | Maximise the use of the existing passenger fleet to create two sets and operate a more ambitious 12 trains/week schedule. | CEAR | 11.1.1 | Demand to be assessed |
| Operations | Conduct further trials to test the maximum trailing load west and east between Nkaya and Kanengo and Chipata with different locomotive types – partly for publicity and partly to understand optimal operational efficiency. | CEAR | 3.5 | Test is in progress |
| Operations | Consider optimum operating methodology should Chipata line be extended. | CEAR | 8.2.3 | Being considered |
| Operations | Publication of the CEAR freight timetable - at least to staff and potential customers. | CEAR | 5.1.2 | Fixed train schedule being developed |
| Operations | Review the passenger counting process including how that data is used and reported to GoM. | CEAR | 7.1 | Counting process reviewed |
| Operations investment | Examine the cost and consider the case to extend (the east-west route) train control system to include Limbe branch. Consider donor funding given safety concerns. | CEAR | 3.4.1 | Under consideration |
| Operations investment | Review potential extension of the east-west route train control system to include the north branch. | CEAR | 3.5 | Under consideration |
| Operations investment | Consider whether renewal and maintenance standard should be uplifted to 18 or 20.5 tonnes – and also consider incremental case for each and every renewal if higher standard is not adopted. | GoM /CEAR | 11.2.3 | Agreed |

| Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|
| Operations investment | Undertake an audit of the operational methodology at all private sidings including an estimate of the cost to CEAR and the investment options for reducing this. | CEAR | 11.2.7 | Agreed |
| Operations investment | Evaluate the cost of extending radio train control system to the south and to the north lines. | CEAR | 11.2.8 | Agreed |
| Operations retail | Production of passenger timetable with days and times of departure for every station with date of the publication of the next proposed timetable, no more than 12 months ahead. | CEAR | 5.2.1 | Agreed |
| Operations retail | Publication of passenger and freight timetable on website – revised whenever there are amendments e.g. because of line closures. | CEAR | 5.2.1 | Agreed |
| Operations retail | Publication of timetable by poster at all stations (even halts). | CEAR | 5.2.1 | Agreed |
| Operations retail | Develop media plan and liaise with National Public Radio and other media over publicity regarding scheduled and unscheduled changes to the timetable or its operation. | CEAR | 5.2.1 | Agreed |
| Operations retail | Formalise a reduction in the dwell time at each station to no more than 3 minutes at the smaller halts and 5 minutes at larger stations – less where practical. | CEAR | 5.2.2 | To keep 15 minutes average |
| Operations retail | Include at least one premium coach per scheduled train. If this recommendation is rejected then the existing premium coaches should be declassified at a minimum and potentially reconfigured as standard coaches, and all reference to premium fares be removed from CEAR publications. | CEAR | 5.2.5 | Agreed |

| Area | Description | Lead owner – note that others may lead activity | Section in report | CEAR action to date |
|---|---|---|---|---|
| Operations retail | Institute an annual paint programme for each station. Take care to ensure that the station retail front is maintained appropriately. | CEAR | 3.7 | Agreed |
| Operations retail | Display station opening times where information can be seen by public ideally near "next train" display. | CEAR | 5.2.1 | Agreed |
| Operations retail | Introduction of "next train" signs at all manned stations (showing time and day and direction). Consider at unstaffed stations also using on board staff. | CEAR | 5.2.1 | Agreed |
| Passenger marketing | Merge the two premium fares – "Premium" and "Business". | CEAR | 5.2.5 | Agreed |
| Passenger marketing | Review the level of fare differentiation between premium and standard and what other services might be offered to premium passengers – perhaps a coffee, tea or soft drink service. Conduct regular usage level surveys – if the premium coach is empty then reduce fare differential and increase level of service. If premium coach is full then increase fare differential. | CEAR | 5.2.5 | Agreed |
| Passenger marketing | Review all fares in the light of current operating conditions, bearing in mind the corporate and social responsibility element of the service, and the need to enhance revenue to help reduce CEAR's operating loss. Once determined, the new fares should be published and displayed at each of the stations on the station notice boards. The fares should also be displayed on the company website. | CEAR | 5.2.5 | Agreed |
| Passenger marketing | Simplify and unify the way that the fares are shown at stations. | CEAR | 5.2.5 | Agreed |
| Regulation | Secure license for Type GT26 locomotives to operate on the southern branch (at least as far as Limbe) to improve operational flexibility. | CEAR | 3.4.1 | Agreed |

**Steven Fraser**
**Sion Haworth**

Atkins
Woodcote Grove
Ashley Road
Epsom
KT18 5BW

**Steven.Fraser@atkinsglobal.com**

**www.atkinsglobal.com**

Ministry of Transport
and Public Works
Private Bag 322
Capital Hill
Lilongwe 3
Malawi

ATKINS

WORLD BANK GROUP

EY
Building a better working world