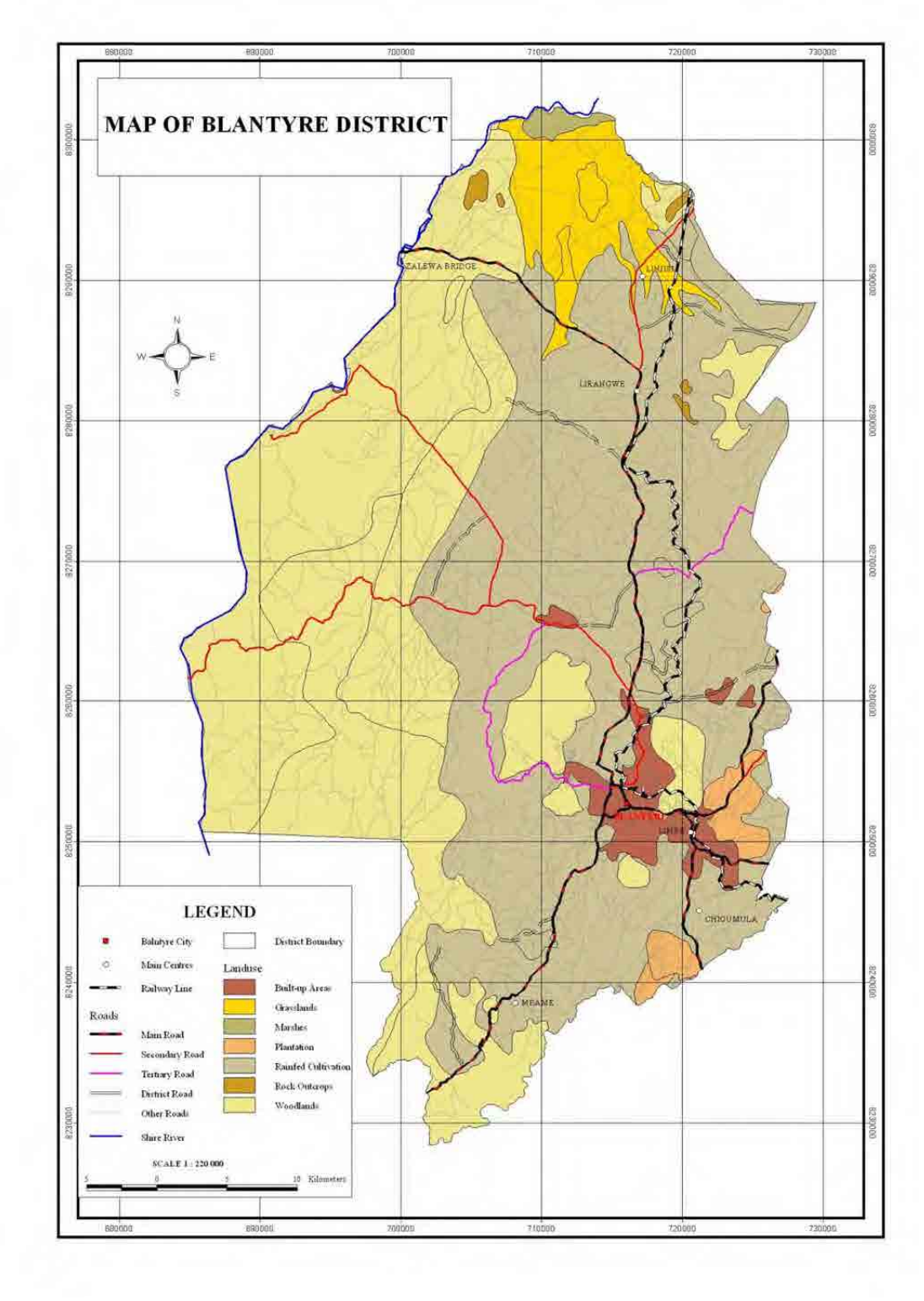
APPENDICES

Appendix-1 Land Use Map of Districts in the Study Area

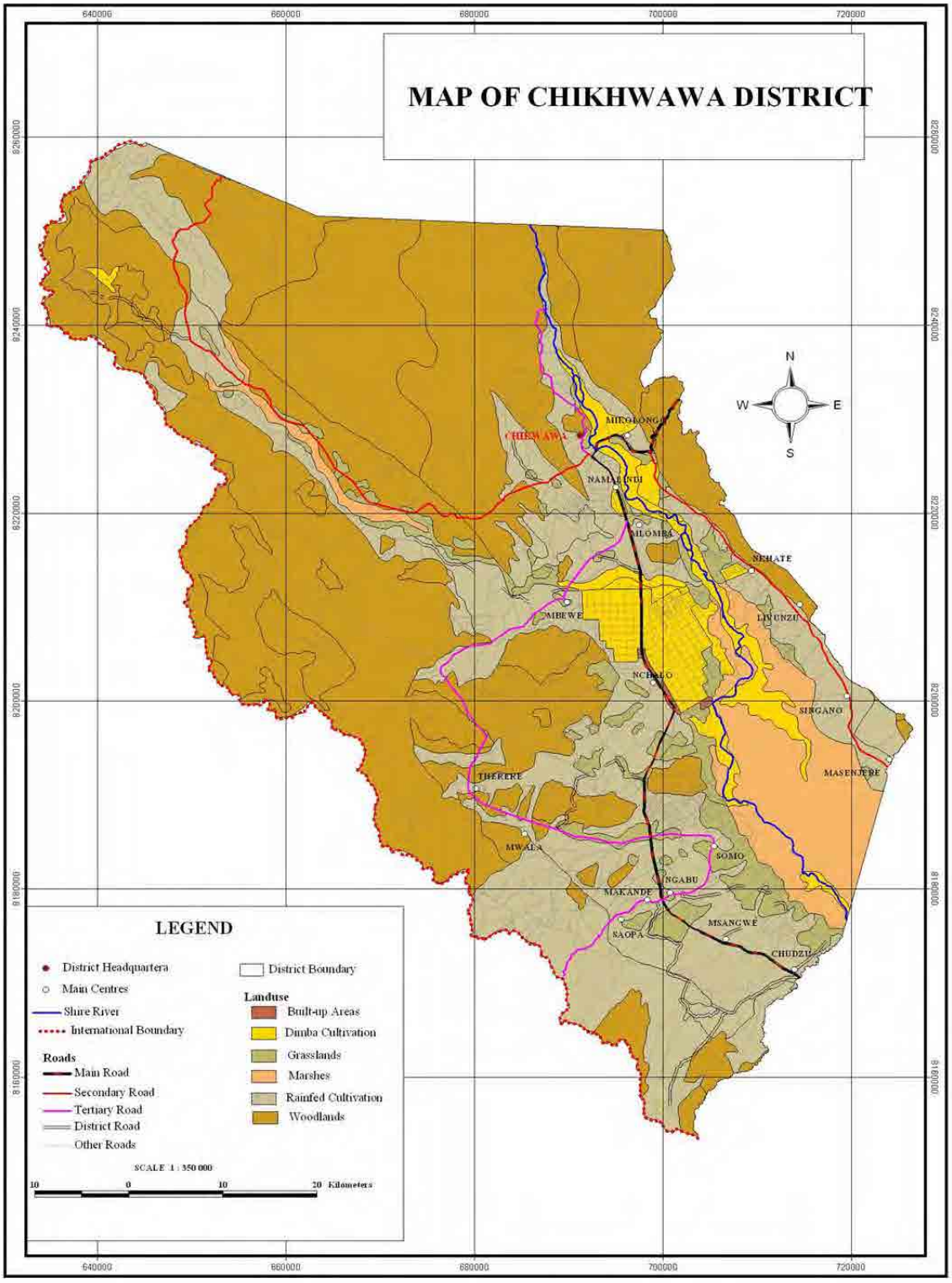
(1) Blantyre District



Source: Survey Department

Figure A1-1 Land Use Map of Blantyre District

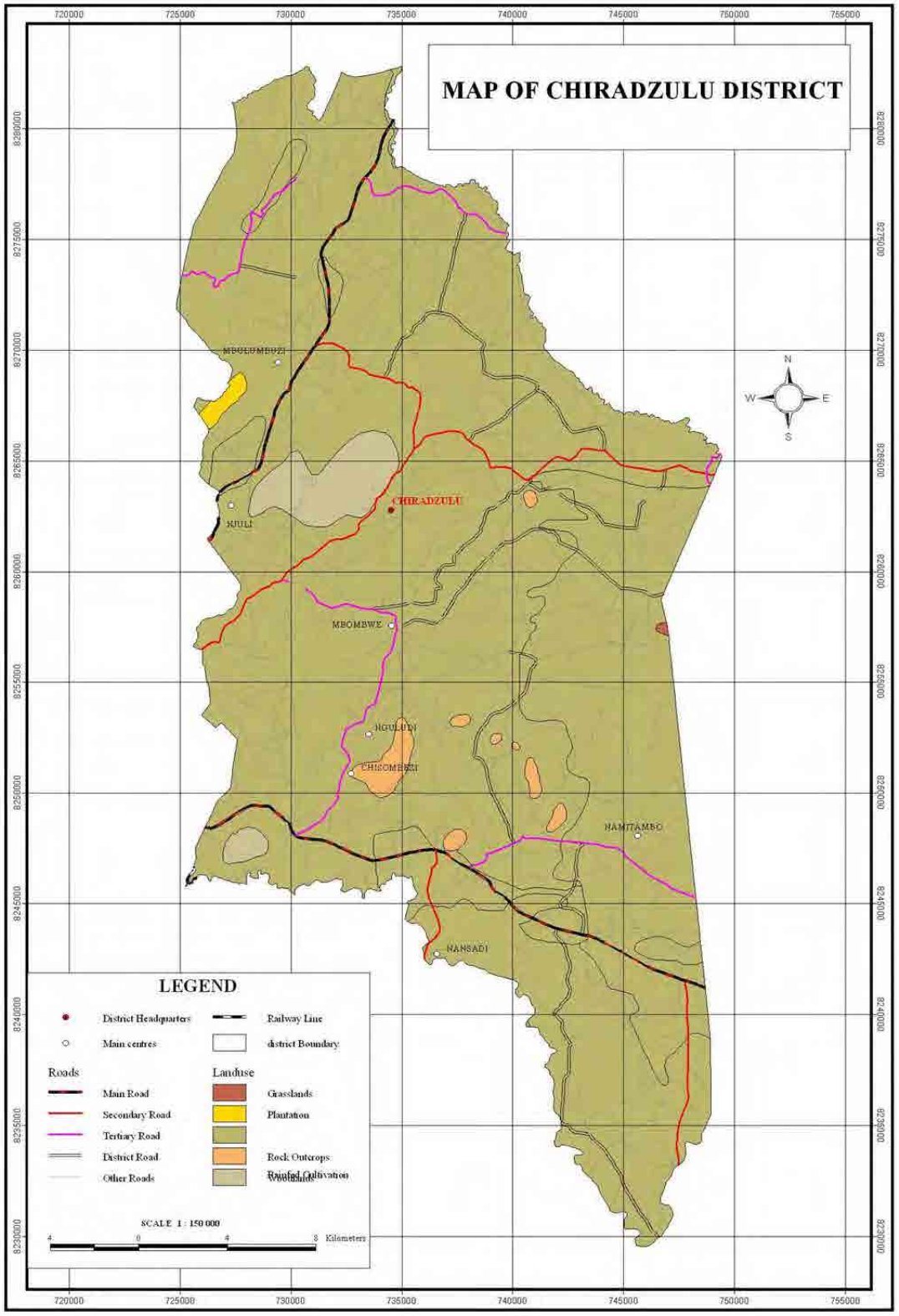
(2) Chikwawa District



Source: Survey Department

Figure A1-2 Land Use Map of Chikwawa District

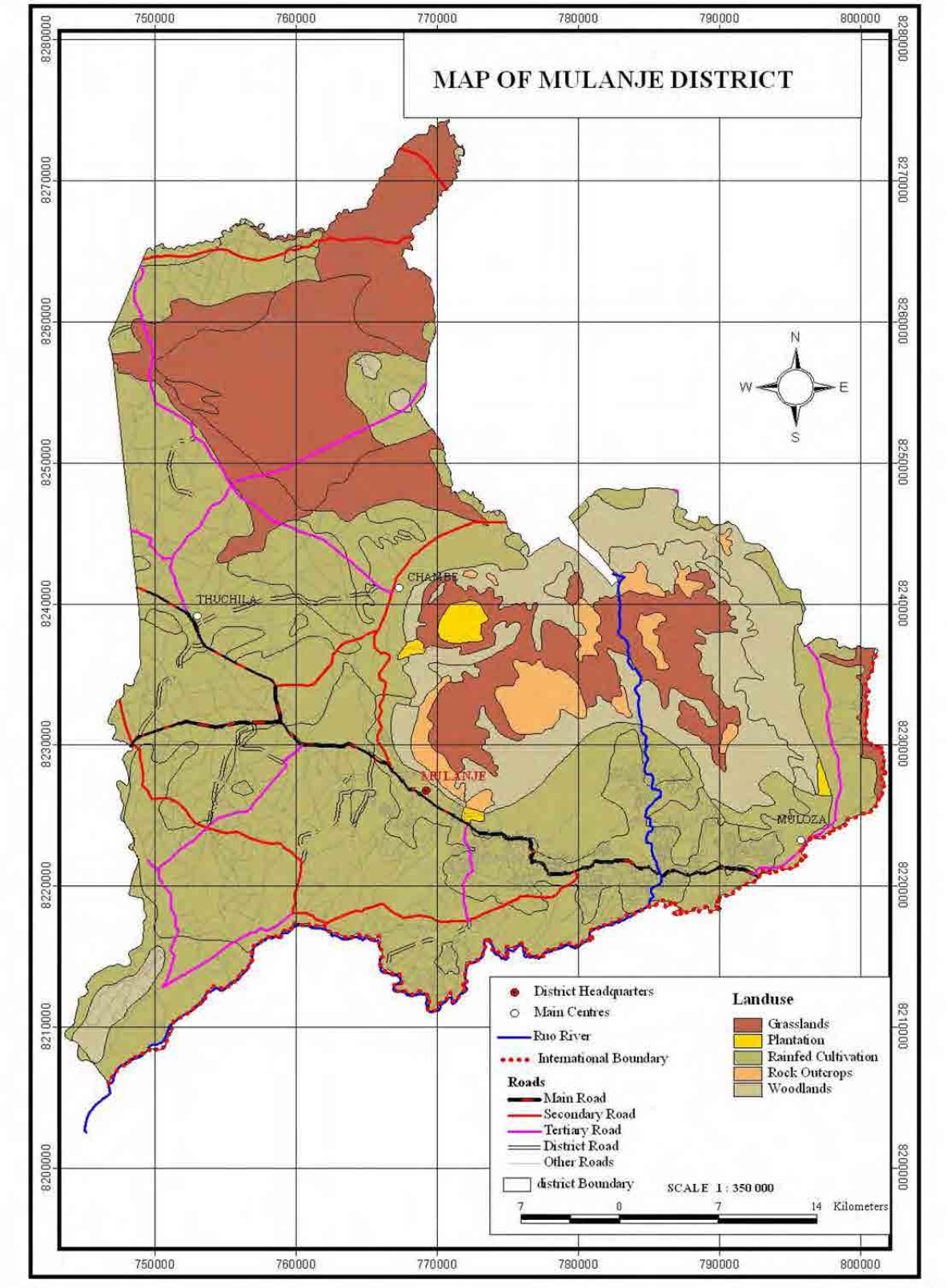
(3) Chiradzulu District



Source: Survey Department

Figure A1-3 Land Use Map of Chiradzulu District

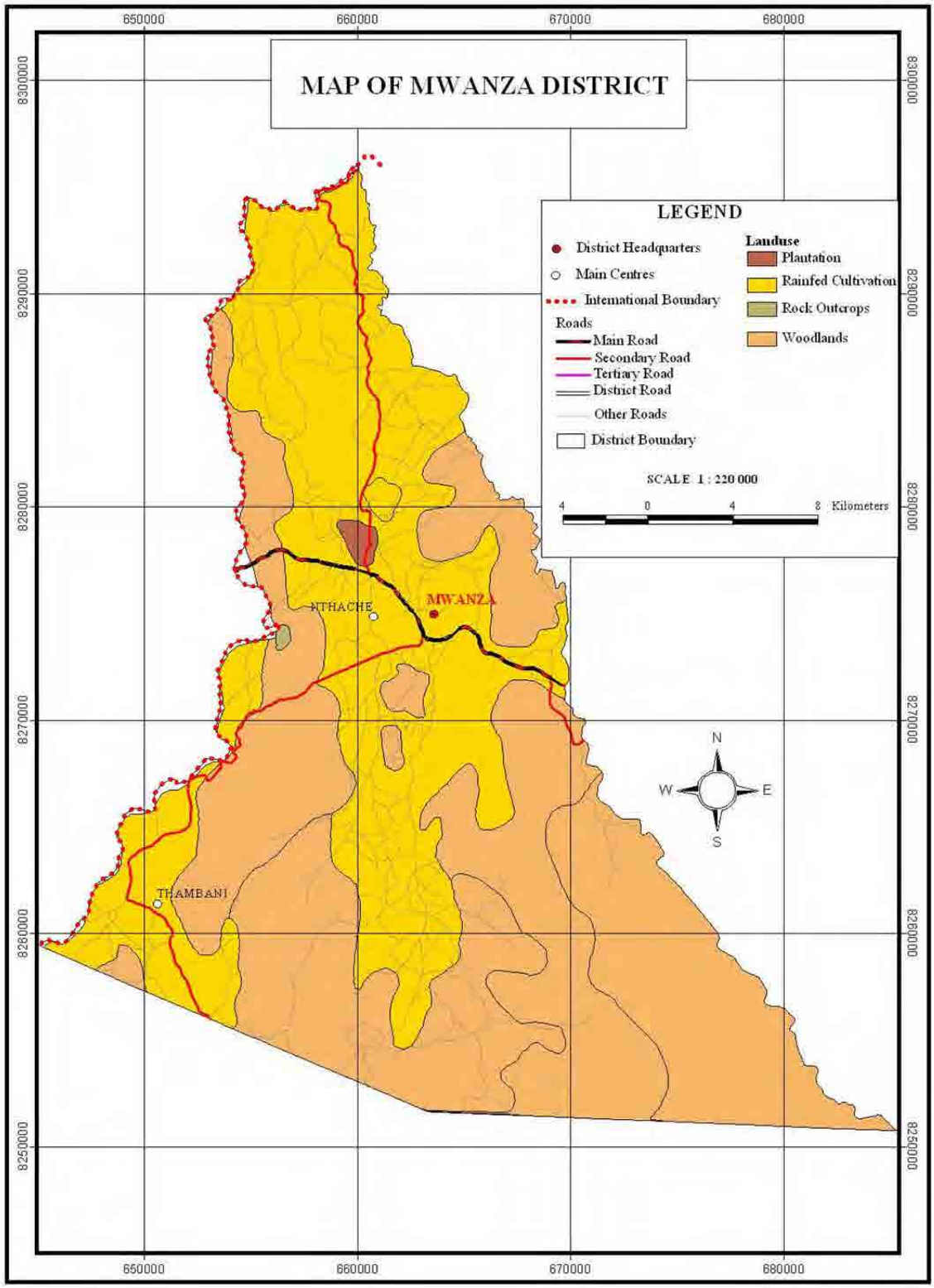
(4) Mulanje District



Source: Survey Department

Figure A1-4 Land Use Map of Mulanje District

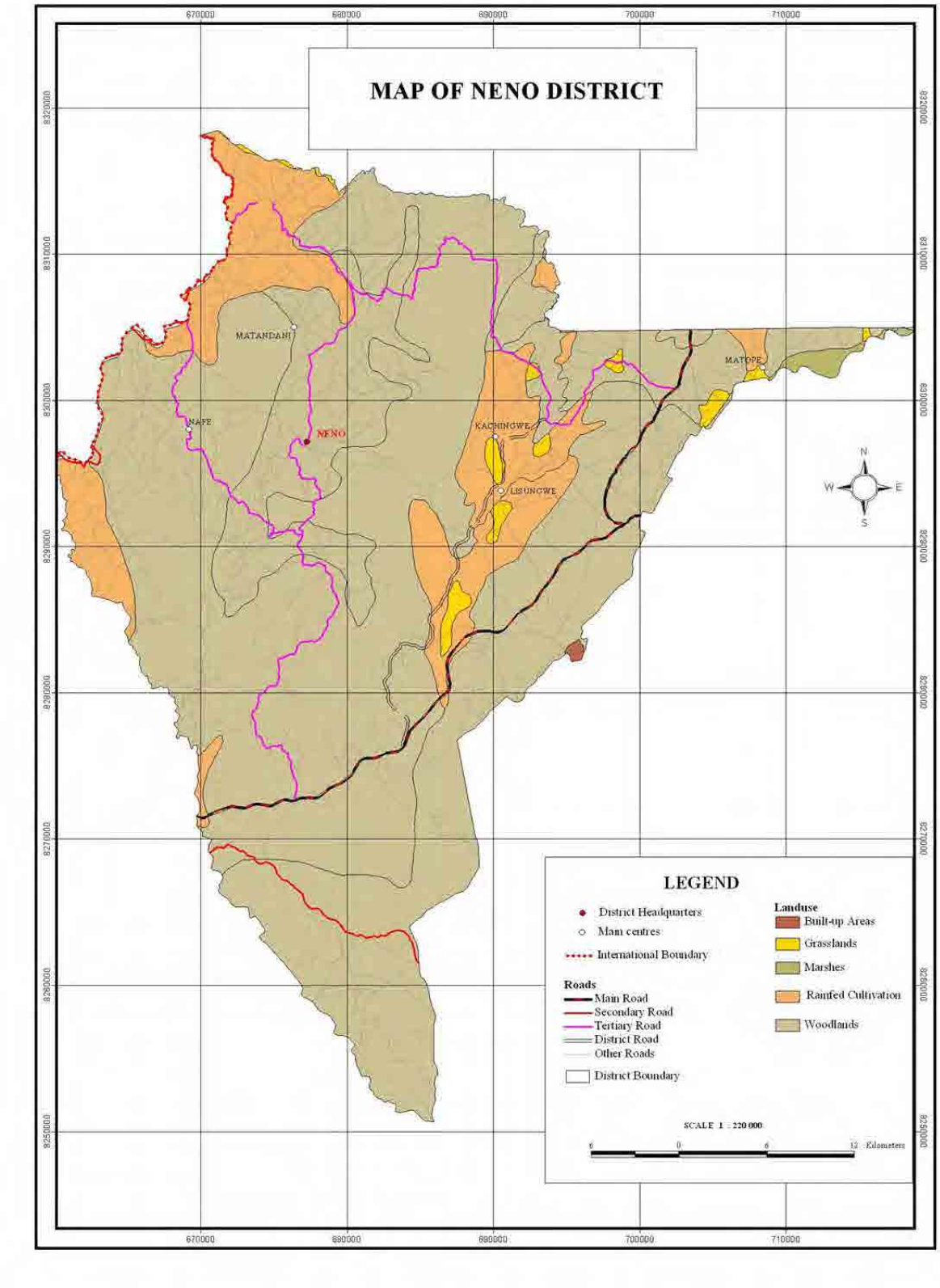
(5) Mwanza District



Source: Survey Department

Figure A1-5 Land Use Map of Mwanza District

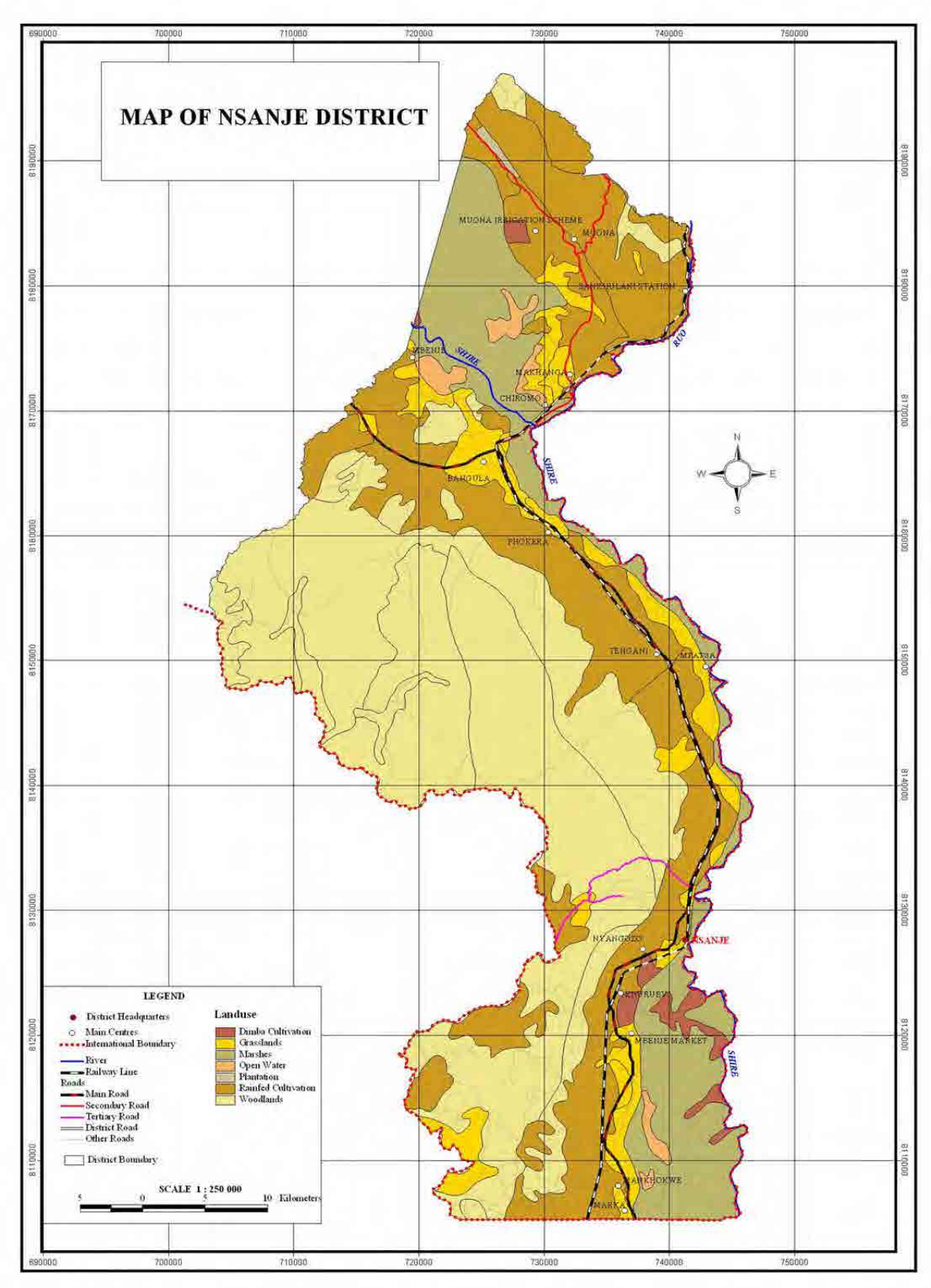
(6) Neno District



Source: Survey Department

Figure A1-6 Land Use Map of Neno District

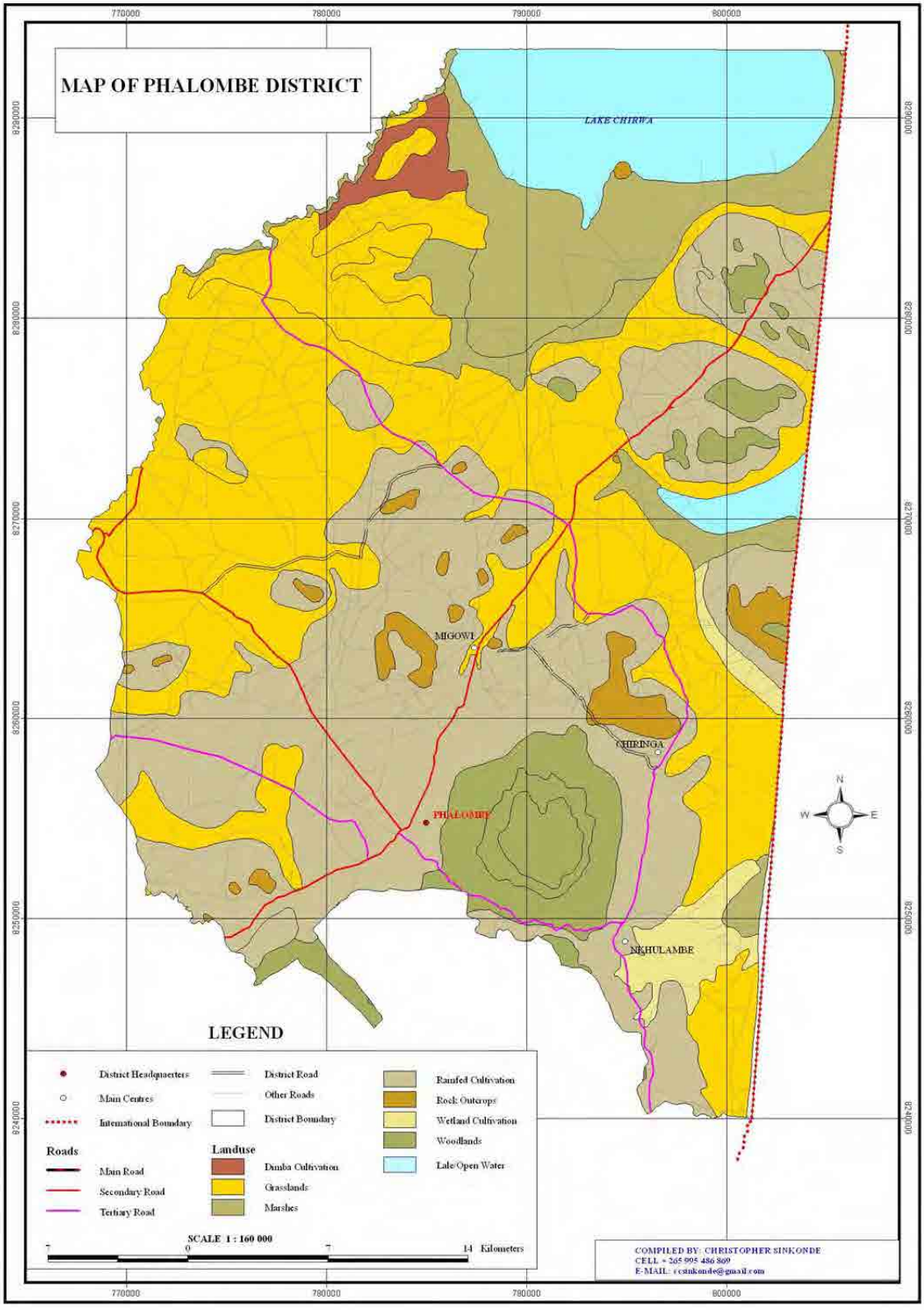
(7) Nsanje District



Source: Survey Department

Figure A1-7 Land Use Map of Nsanje District

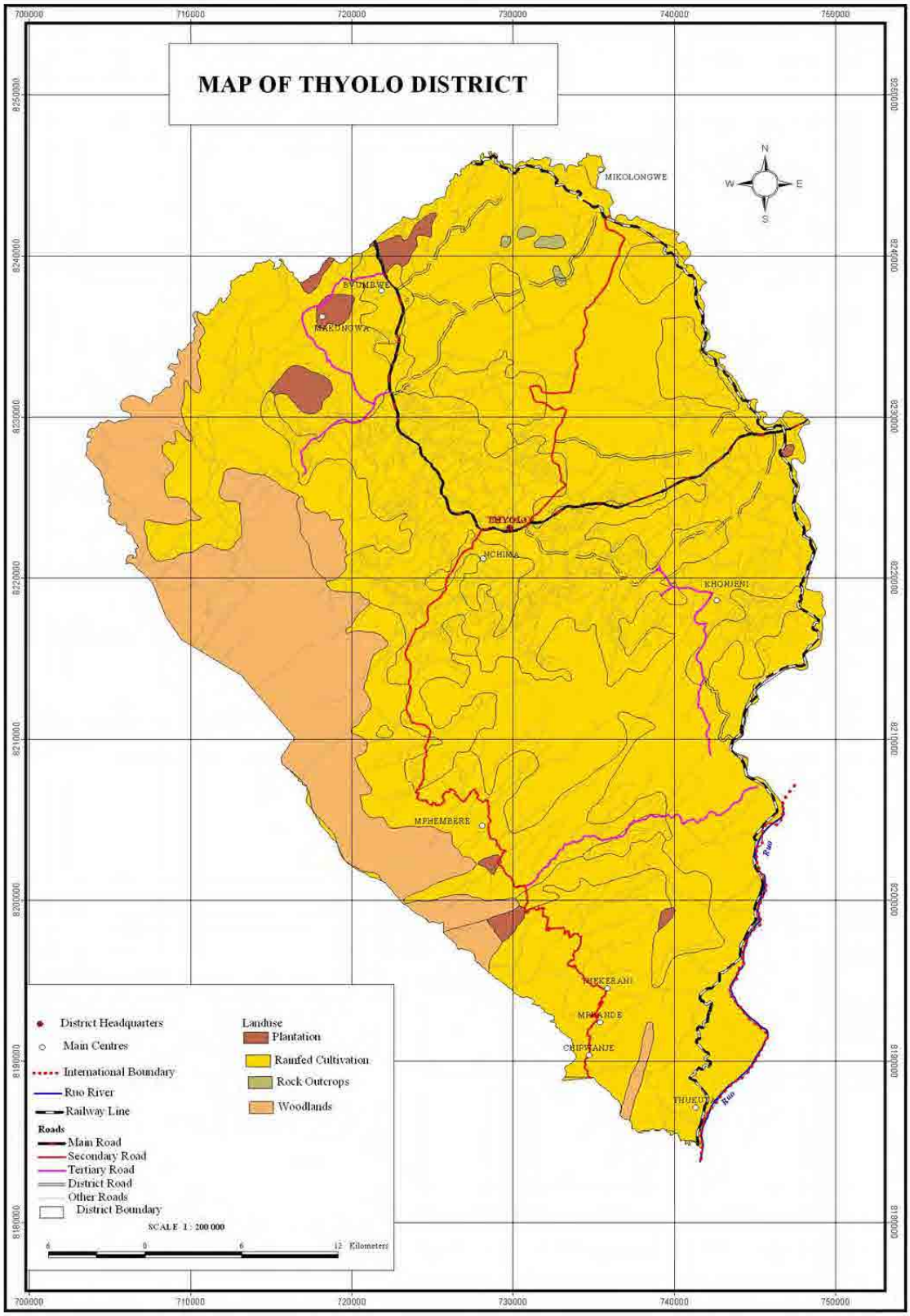
(8) Phalombe District



Source: Survey Department

Figure A1-8 Land Use Map of Phalombe District

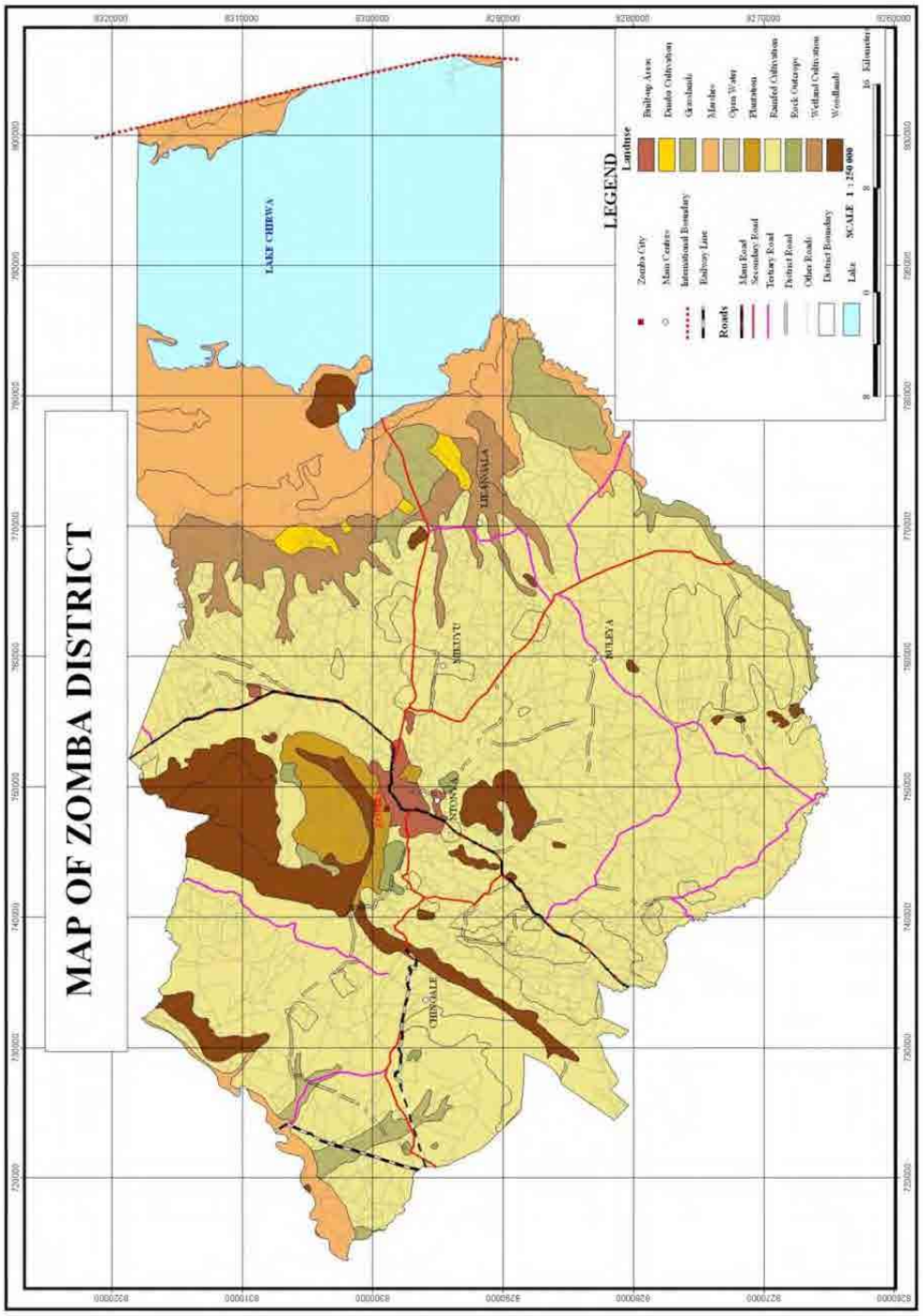
(9) Phalombe District



Source: Survey Department

Figure A1-9 Land Use Map of Thyolo District

(10) Zomba District



Source: Survey Department

Figure A1-10 Land Use Map of Zomba District

Appendix-2 Problems Caused by Regional Disconnection in the Chiromo Area

(1) Regional Disconnection in the Chiromo Area

Regional connectivity is one of the main requirements for harmonised regional development. However, connectivity is often disturbed by a natural barrier such as a large/medium-scale river or a mountain range. In such cases, socio-economic activities develop independently and are performed on either side of the physical barrier, causing economic disparity if there is a large gap in economic development between the two sides.

The area between Bangula and Makhanga is administratively under the TA Mlolo of Nsanje District. By 1997, this area was physically connected with the other part of Nsanje District by the rail/road bridge at Chiromo, which had been reconstructed in 1975 after the collapse of the previous railway bridge. At that time, people in the TA Mlolo and an area further east were able to freely move between both sides of the Shire River and brought agricultural products to Bangula, which is one of the core commercial centres in Nsanje, second to Nsanje Boma. Also, there was a daily train between Limbe and Nsanje which transported passengers and goods between Nsanje and Thyolo Districts to the main commercial city of Blantyre.

In 1997, part of the railway embankment near Bangula was washed away by a heavy flood, entirely cutting off both the rail and road links. Since then, adequate measures have not been taken to connect both sides of the washaway section and people have been forced to cross the washaway section by boat at their own expense. The disconnection has thus created regional disparity, because administratively and socio-economically, one region was suddenly physically disconnected and lost its transport links and mobility.

(2) Negative Effects for People Living in Both Sides of Chiromo Washaway

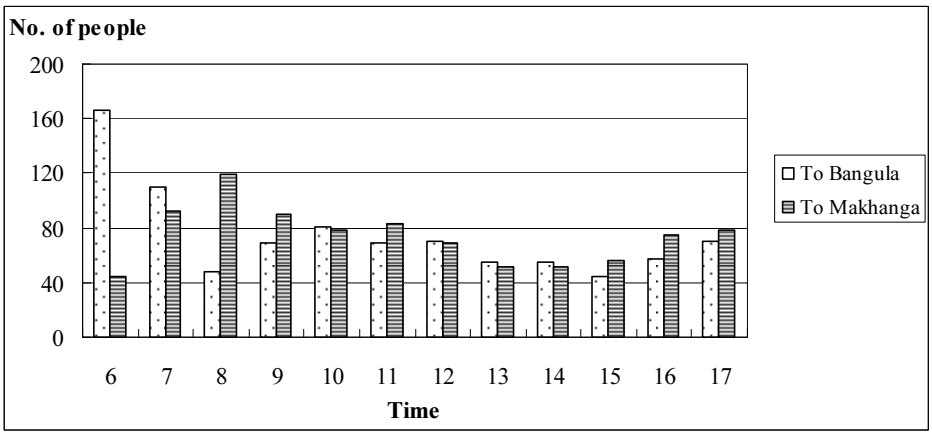
a) Results of the Mobility Survey

In order to identify problems caused by the disconnection at Chiromo, the Study Team conducted a mobility survey by interviewing people crossing at the washaway section in Chiromo, residents of the Chiromo Area and at the Makhanga Market.

1) Number of People Crossing the Washaway Section

Figure A2-1 shows the hourly fluctuation of the number of people crossing the washaway section of the Chiromo by direction. Since the counting was carried out on a Saturday when the market was open in Bangula, 276 people crossed toward Bangula between 6:00 a.m. and 8:00 a.m. just after the boats started operation at 6:00 a.m. 301 people then crossed toward Chiromo between 7:00 a.m. and 9:00 a.m. After these peak hours, the number of people crossing was almost constant at between 50 to 80 for both directions.

In total, 1,044 people were recorded to cross the washaway section by boat for both directions.

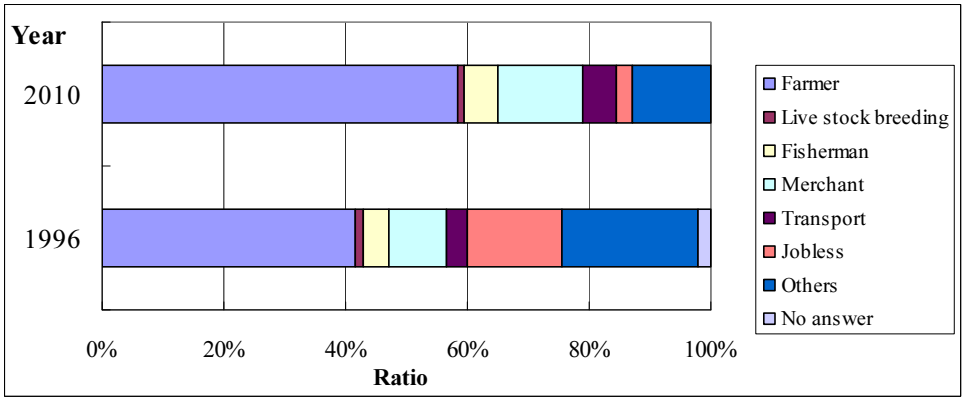


Source: Mobility survey conducted by the Study Team on November 27, 2010.

Figure A2-1 Hourly Fluctuation of People Crossing the Washaway Section

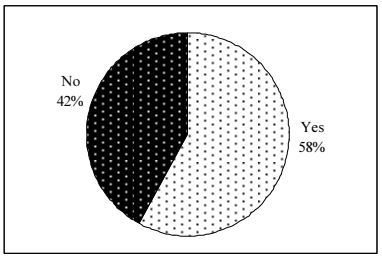
2) Comparison of Occupation

Figure A2-2 compares the interviewees' occupations in 1996 and 2010. Compared with occupations in 1996, approximately 20% and 10% of interviewees have changed their primary occupation to farmers and merchants, respectively. In addition, 58% of interviewees stated that the disconnection at Chiromo had caused them to change their occupation (see Figure A2-3).



Source: Mobility survey conducted by the Study Team on 26th and 27th November, 2010.

Figure A2-2 Comparison of Occupation between 1996 and 2010



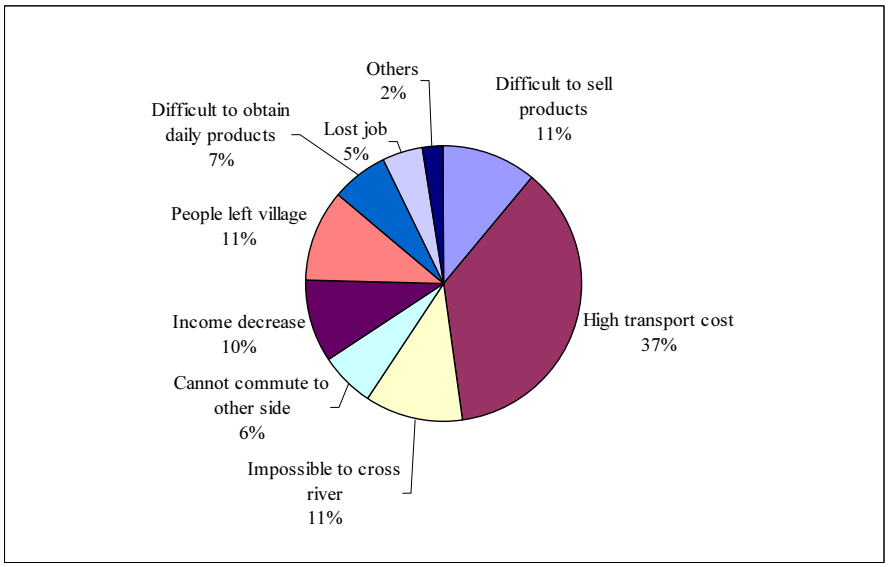
Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

Figure A2-3 Effect of Disconnection at Chiromo on Changing Occupation

3) Major Problems after the Washaway in 1997

Figure A2-4 summarises the major problems that local residents have faced after the

washaway in 1997. Some 37% of people claimed "High transport cost" (cost of boat), followed by "Difficult to sell products", "Impossible to cross river during rainy season" and "People left village" (each at 11%).



Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

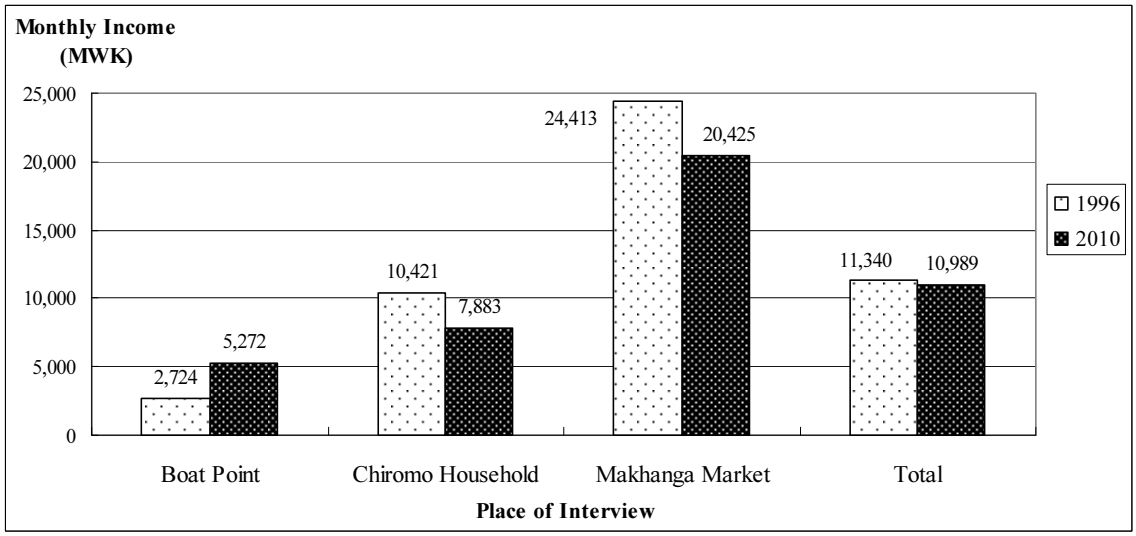
Figure A2-4 Major Problems after the Washaway in 1997

4) Comparison of Monthly Family Income between 1996 and 2010

Figure A2-5 compares the monthly family income, including both primary and secondary occupation of the interviewed residents. Even though the monthly income of interviewees (mostly farmers) at the boat point has increased from MWK 2,724 in 1996[1] to MWK 5,272, most of them are still below the poverty line[2]. On the contrary, the monthly income of interviewees in the Chiromo households and Makhanga market (fewer farmers and more other occupations, such as merchants) was much higher than that of interviewees at the boat point, but their income has decreased about 20%. Overall, interviewees' incomes have decreased from 1996 to 2010, in spite of the rapid GDP growth of Malawi.

[1] Answers for monthly family income in 1996 were fully depending on memory of interviewees and those answers did not reflect the consumer price index (CPI) between 1996 and 2010 (7.6 times higher in 2010). Hence, conversion of income in 1996 price or in present price is not used for this analysis because of a large gap between answers and CPI increase.

[2] Poverty line: MWK16,165 per year per head, Ultra poverty line: MWK 10,029, IHS2

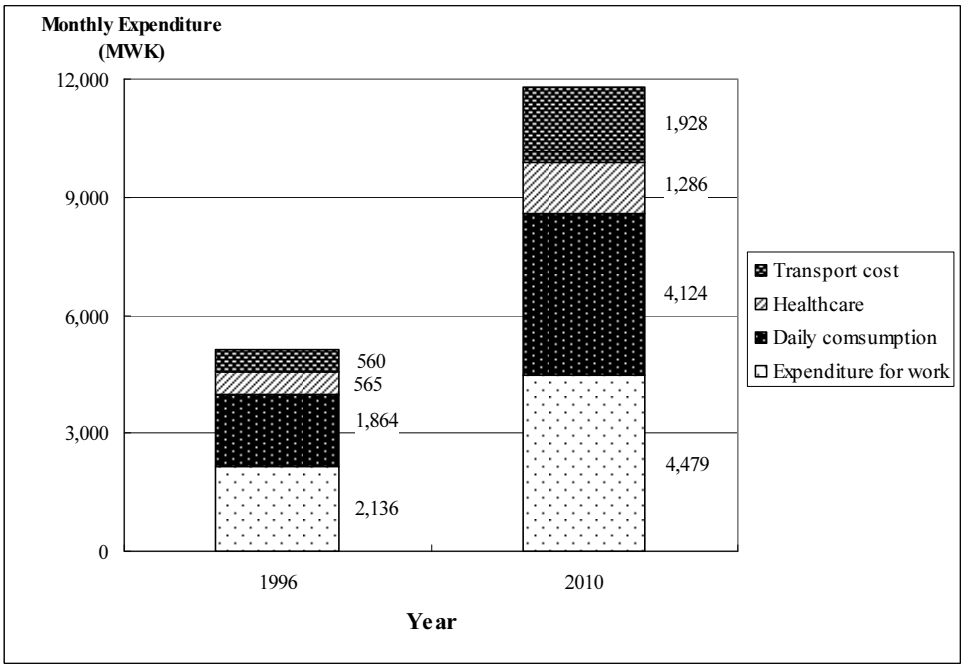


Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

Figure A2-5 Comparison of Monthly Income between 1996 and 2010 by Place of Interview

5) Comparison of Monthly Family Expenditure between 1996 and 2010

Figure A2-6 compares the monthly family expenditure by item between 1996[3] and 2010 of all interviewees. The total expenditure has almost doubled, while transport cost has increased by as much as 3.5 times.



Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

Figure A2-6 Comparison of Monthly Expenditure between 1996 and 2010 by Major Item

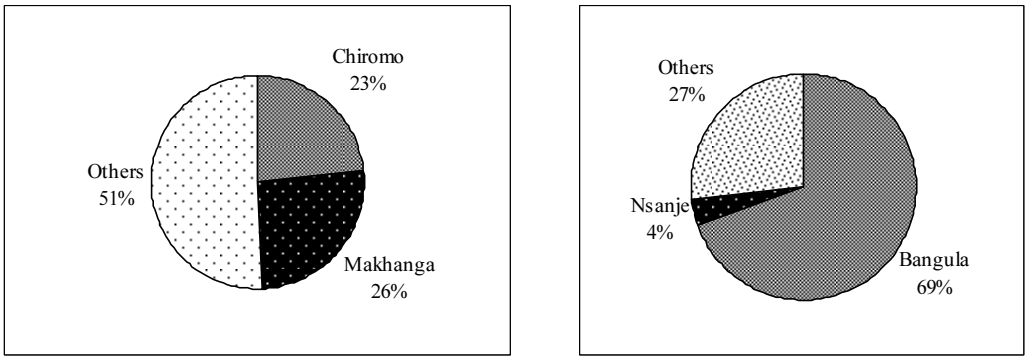
[3] Answers for the monthly expenditure in 1996 were fully depending on memory of interviewees and those answers did not reflect the consumer price index (CPI) increase between 1996 and 2010 (7.6 times higher in 2010). Hence, conversion of monthly expenditure in 1996 price or in current price is not used for this analysis because of a large gap between answers and CPI increase.

6) Origin and Destination of Trip

Figure A2-7 shows the origin (eastern side of the washaway section) and destination (western side) of trips made by interviewees crossing the washaway section.

Regarding the origin of trips, about half of the people started their trips either from Chiromo or Makhanga, while the other half started their trips from locations beyond Makhanga. Some people had travelled for 5 to 6 hours on the eastern side of the washaway. Some people living in Bangula made their trips from their cultivation places, or so-called "gardens", which are the areas along the Shire River inundated during the rainy season.

Regarding the destination of trips, Bangula is the predominant destination accounting for 69% of interviewees. About 90% of people return the same day to the origin of their trips.



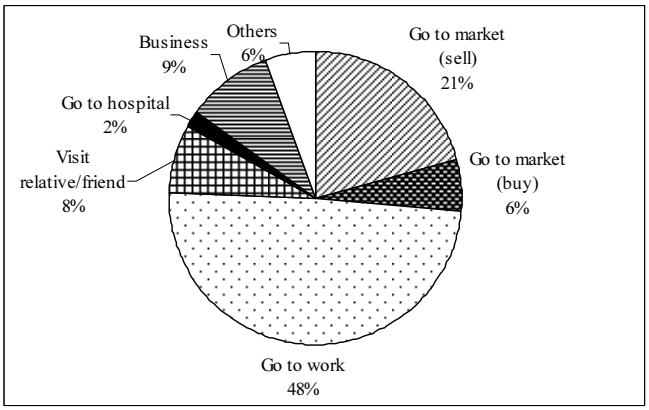
Origin of Trip **Destination of Trip**

Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

Figure A2-7 Origin and Destination of Trips Made by People Crossing the Washaway Section

7) Trip Purpose

Figure A2-8 shows the trip purpose of interviewees crossing the washaway section. About half of interviewees made their trips for "Go to work", followed by "Go to market (sell products)" (21%), "Business" (9%) and "Visit relative/friend" (8%).

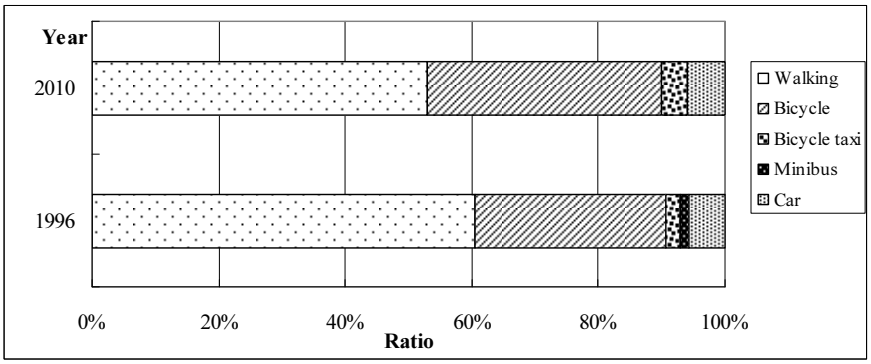


Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

Figure A2-8 Trip Purposes of Interviewees

8) Transport Mode

Figure A2-9 shows interviewees' transport mode for their trips. There is not much difference in transport mode between 1996 and 2010, as about 90% of interviewees made their trips by their own means of transport (walking or bicycle).



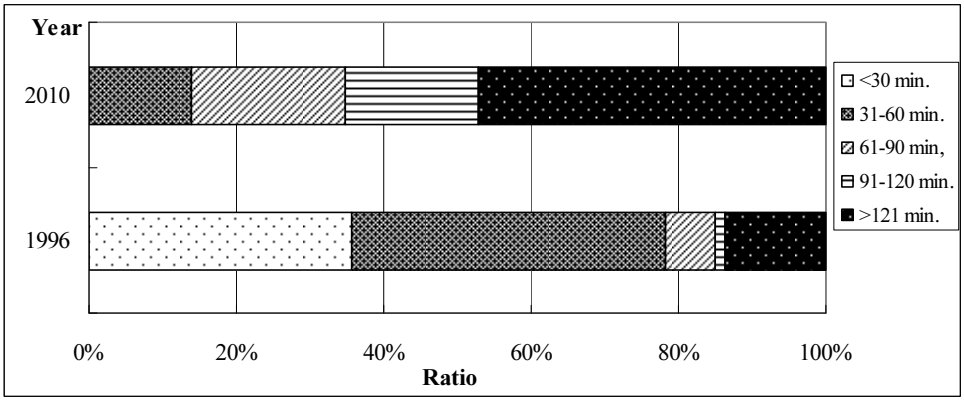
Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

Figure A2-9 Comparison of Transport Mode Used by Interviewees between 1996 and 2010

9) Travel Time

Figure A2-10 shows the travel time of interviewees from origin to destination. For the data for 2010, a 20-minute travel time by boat is added to their total travel time.

There is a big difference in travel time pattern between 1996 and 2010. In 1996, the travel time of about 80% of people was less than 60 minutes, with only 15% taking more than 120 minutes, whereas in 2010 about 55% took more than 120 minutes.



Source: Mobility survey conducted by the Study Team on 26th and 27th November,, 2010.

Figure A2-10 Comparison of Travel Time between 1996 and 2010

10) Transport cost

Approximately 90% of interviewees use their own means of transport to/from the washaway section. The major burden is the cost of the boat rowed by a fisherman. These fishermen set tariffs for 1) people, 2) goods per piece, 3) bicycle, 4) live animal, 5) motorcycle, etc. The mobility survey showed that the money paid to a fisherman varied from MWK50.00 to MWK400.00, with an average of about MWK 69.00. This means that people crossing the washaway section have to pay MWK138 for their return trip per day on average.

b) Major Problems Identified by the Mobility Survey

The results of the mobility survey identified the following major problems:

- The additional burden of transport cost by boat, even though the average monthly income of people who often cross the washaway section has increased.
- Much longer travel time between origin and destination.
- Impassable road section between Makhanga and Bangula, and Chiromo washaway section during the rainy season due to higher water level.
- Risk to life of people crossing the Chiromo washaway section during the rainy season.
- Decrease of monthly income for people living in the Chiromo Area and working in the Makhanga market, even though expenditure has doubled, in spite of high GDP growth in Malawi.
- Clear negative impacts for people living in TA Mlolo's area of Nsanje District, and Chikwawa District (eastern side) and Thyolo District (southern side).

Appendix-3 Results of Railway Inventory Survey between Marka and Makhanga

Table A3-1 (1) Conditions of Track (1)

No.	Location (km)	Rail Condition																																		Bridge and Culvert					
		Rail								Sleeper											Ballast					Fastening						Fishplate						Type	Size	Damage			Remarks
		Type (kg/m)			Condition					Type			Condition								Type		Condition			Type		Condition				Condition								good	fair	poor	
		30	37.5	40	good	fair	poor			steel	wooden	concrete	good	fair	poor					Spacing (m)																							
							bending	defect	lost						decay	bending	defect	lost	0.7	measured value	stone	earth	good	fair	fouled	Bolt	Pandol	good	fair	defect	lost	good	fair	defect	lost							
																																									All bridges in this section are steel girder deck spans unless otherwise stated.
	Marka																				x				x																
T- 1	0.30	x				x					x							x		n/a	x				x	x				x	x					Bridge	1 - 7.1m span		x		
T- 2	1.00	x				x					x							x		n/a	x				x	x				x	x					Bridge	1 - 3.15m span		x		Apron scoured
T- 3	1.20	x				x					x							x		n/a	x				x	x				x	x					Bridge	1 - 3.7m span		x		
T- 4	1.75	x				x				x								x		n/a	x				x	x				x	x					Pipe culvert	1 - 0.6mm dia		x		
T- 5	2.00	x						x			x							x		n/a	x				x	x				x					x	Bridge	2 - 7.4 each totalling 14.8m for all spans		x		
T- 6	2.55	x				x					x							x		n/a	x				x	x				x	x					Bridge	1 - 4.45m span			x	Structure cracked
T- 7	2.95	x				x				x								x		n/a	x				x	x				x	x					Bridge	1 - 2.2m span		x		bridge has concrete slab under rails across channel
T- 8	3.10	x				x				x								x		n/a	x				x	x				x	x					Bridge	1 - 3.3m span		x		bridge has concrete slab under rails across channel
T- 9	3.55	x				x					x							x		n/a	x				x	x				x	x					Bridge	1 - 3.3m span		x		
T- 10	3.90	x					x				x				x			x		0.80	x				x		x			x					x	Bridge	4 - 16.12m each totalling 64.48m for all spans			x	Abutment earthworks washed away
T- 11	5.00	x				x					x							x		n/a	x				x	x				x					x	Bridge	Not measurable ie structure washed away			x	Structure washed away. 20m opening requires new structure
	5.99	x				x				x								x		n/a	x				x		x			x	x					channel opening les than sleeper spacing	box culvert	o.6m wide	x			0.6m wide water crossing structure. Not picked on initial survey
	6.15	x				x					x				x					0.70	x				x		x			x	x					Bridge	1 - 2.5m span			x	No abutment walls
T- 12	7.35	x				x					x							x		0.80	x				x	x				x	x					Bridge	1 - 5.48m span			x	One abutment washed off
T- 13	7.85	x				x				x						x				0.90	x				x	x		x			x					Bridge	2- 7.7m each totalling 15.4m for both spans		x		
T- 14	8.30	x				x				x								x		n/a	x				x		x			x		x				Bridge	1 - 3.3m span		x		crack widening along expansion
T- 15	9.70	x				x				x								x		n/a	x				x	x				x	x					Bridge	Not measurable ie structure washed away			x	Both abutments collapsed. New 15m opening bridge required
T- 16	10.25	x				x					x							x		n/a	x				x	x				x	x					Bridge	1 - 3.3m span		x		
T- 17	10.70	x				x				x			x							0.60	x				x	x		x			x					Bridge	1 - 2.3 span		x		
T- 18	11.05	x				x				x			x							0.70	x				x	x				x	x					Bridge	1 - 2.7m span			x	Had walls knocked off
T- 19	11.85	x				x				x			x							0.80	x				x	x				x	x					Bridge	1 - 2.1m span		x		
T- 20	11.90	x				x				x								x		n/a	x				x	x				x	x					Pipe culvert	1 - 0.6m dia pipe		x		
T- 21	12.20	x				x				x								x		n/a	x				x		x			x	x				Rail in thick bush	Bridge	3 - 3.05m total for spans		x		Concrete structure with slab and 2 supports very close
T- 22	12.80	x				x				x								x		n/a	x				x	x				x	x				Rail in thick bush	Bridge	3 - 3.05m total for spans		x		Concrete structure with slab and 2 supports very close
T- 23	13.80	x				x					x				x					0.80	x				x	x				x	x					Bridge	3 - 17.02 each totalling 51.06m for all spans	x			structure is good and it's a long bridge
T- 24	14.05	x				x					x				x					0.80	x				x	x				x	x				2 span	Bridge	2 - 3.16 each totalling 6.32m for all spans		x		Concrete Bridge with slab deck
T- 25	14.35	x				x					x				x					0.80	x				x	x				x	x				2 span	Bridge	2 - 3.16 each totalling 6.32m for all spans		x		
T- 26	14.90	x				x					x							x		n/a	x				x	x				x		x				Bridge	5 - 2 0f 6.75 & 3 of 6.83 each totalling 33.99m for all spans		x		80% silted, piers 3 & 5 have sunk approx 100mm
T- 27	15.45	x				x				x				x						0.80	x				x	x		x			x					Bridge	1 - 2.55m span			x	Cracked
T- 28	16.00	x				x					x				x					0.80	x				x	x				x	x				1 span	Bridge	1 - 7.0m span		x		Wing walls require attention ie
T- 29	16.60	x				x					x							x		n/a	x				x	x				x	x				1 span	Bridge	1 - 7.50m span		x		Wing walls require attention ie
T- 30	16.85	x				x					x							x		n/a	x				x	x				x	x					Bridge	1 - 3.7m span		x		
T- 31	16.90	x				x				x				x						0.80	x				x	x		x			x					Bridge	1 - 2.5m span	x			good
T- 32	17.55	x				x					x							x		n/a	x				x		x			x	x					Bridge	1 - 4.7m span	x			
T- 33	18.05	x				x					x							x		n/a	x				x	x				x	x				Sleepers lost	Bridge	3 - 14.1m total for 3 spans	x			
T- 34	18.55	x				x					x				x					0.80	x				x	x				x	x				60% sleepers lost	Bridge	4 - 7.38m totalling 29.55 spans	x			
T- 35	19.10	x				x					x				x					0.80	x				x	x				x	x				60% sleepers lost	Bridge	2 - 7.1m span totalling 14.2m	x			
T- 36	20.05	x				x					x							x		n/a	x				x	x				x	x				All sleepers lost	Bridge	3 - totalling 11.2m for all the 3 spans	x			
T- 37	20.65	x				x				x				x						0.80	x				x		x			x	x					Bridge	1 - 2.5m span		x		
T- 38	20.80	x				x				x				x						0.80	x				x	x				x	x					Bridge	2 - 2m each totalling 4m		x		
T- 39	21.00	x				x				x				x						0.80	x				x	x			x		x					Bridge	2 - 2m each totalling 4m		x		
T- 40	22.00	x				x					x							x		n/a	x				x		x			x	x					Bridge	4 span - total length 30m		x		
T- 41	22.50	x				x					x							x		n/a	x				x	x			x		x					Bridge	2- totaling 3.43m		x		
T- 42	22.85	x				x				x				x						0.80	x				x	x			x		x					Pipe culvert	1 - 0.9m dia pipe		x		
T- 43	22.90	x				x				x				x						0.80	x				x	x			x		x					Pipe culvert	1 - 0.9m dia pipe		x		
T- 44	22.95	x				x					x							x		n/a	x				x	x			x		x					Bridge	1 - 3.3m span		x		cracked wing wall
T- 45	23.40	x				x				x								x		n/a	x				x	x				x	x				Sleeper lost	Bridge	3 - 3.87m span		x		Concrete Bridge
T- 46	24.70	x				x				x								x		n/a	x				x		x			x	x				Sleeper lost	Bridge	1 - 1.5m span		x		Ant Hill on track needs removing
T- 47	25.40	x							x	x								x		n/a	x				x	x				x				x	Wash away	Bridge	1 - 5.5m span		x		
T- 48	24.32	x				x				x								x		n/a	x				x	x				x	x				Sleeper lost	Culvert	1 -0.3m pipe culvert			x	Culvert silted
T- 49	25.70	x							x									x		n/a	n/a				n/a	x				x					No railway	No structure				No structure
T- 50	25.75	x							x									x		n/a	n/a				n/a	x				x					No railway	No structure				No structure

Table A3-1 (2) Conditions of Track (2)

No.	Location (km)	Rail Condition																																Bridge and Culvert				
		Rail								Sleeper									Spacing (m)	Ballast					Fastening					Fishplate				Remarks	Type	Size	Damage			Remarks
		Type (kg/m)			Condition					Type			Condition							Type		Condition																
		30	37.5	40	good	fair	poor		lost	steel	wooden	concrete	good	fair	poor			lost	0.7	measured value	stone	earth	good	fair	fouled	Bolt	Pandol	good	fair	poor		good	fair	poor				good	fair	poor	
							bending	defect							decay	bending	defect													defect	lost								
T- 51	25.80	x							x									x		n/a	n/a				n/a	x					x				No railway	No structure				
T- 52	25.85	x							x									x		n/a	n/a				n/a	x					x				No railway	No structure				
T- 53	25.95	x							x	x								x		n/a	x				x	x					x				Rail bent	Pipe culvert	1 - 0.9m dia pipe	x			
T- 54	26.55	x				x				x						x				0.80	x				x	x				x						Pipe culvert	1 - 0.9m dia pipe		x		Cracked head wall
T- 55	27.55	x				x					x				x					n/a	x				x	x			x			x				Bridge	1 - 7.2m span	x			cracked wing wall
T- 56	27.95	x				x						x					x			0.60	x				x	x			x			x				Bridge	1 - 2.1m span	x			
T- 57	28.65	x				x				x					x					0.60	x				x	x				x	x					Bridge	1 - 4.6m span		x		cracked wing wall
T- 58	30.00	x				x					x					x				0.60	x				x	x			x			x				Bridge	1 - 10.19m span	x			Water floods over the top of the bridge
T- 59	30.85	x				x				x				x						0.90	x				x	x			x			x				Pipe culvert	1 - 0.9m pipe culvert	x			Scouring LHS of culvert
T- 60	30.95	x				x				x				x						0.90	x				x	x			x			x				Pipe culvert	1 - 0.9m dia pipe			x	Head wall in poor condition
T- 61	31.30	x				x					x				x					0.70	x				x	x				x		x				Bridge	1 - 2.1m span		x		
T- 62	31.45	x				x					x				x					0.80	x				x	x			x			x				Bridge	1 - 2.1m span	x			Wing walls need repair
T- 63	31.70	x				x					x				x		x			0.70	x				x	x				x		x			Sleepers lost	Bridge	0 - 3.4m span			x	
T- 64	32.45	x				x					x									0.60	x				x	x				x		x				Bridge	1 - 3.75m span	x			Wing walls need repair
T- 65	33.10	x				x				x				x						0.80	x				x	x			x			x			Sleepers lost	Pipe culvert	1 - 0.9m dia pipe	x			
T- 66	33.50	x				x					x						x				x				x	x				x		x			Sleepers lost	Bridge	1 - 7.7m span	x			
T- 67	34.15	x				x					x							x		n/a	x				x	x				x		x			Sleepers lost	Bridge	4 - 22.5m spans	x			Main structure good; scoured downstream & apron undermined
T- 68	34.55	x				x					x							x		n/a	x				x	x				x		x			Sleepers lost	Bridge	1 - 7.7m span	x			
T- 69	35.70	x				x				x			x							0.80	x				x	x		x				x				Pipe culvert	2 - 0.9m dia pipe	x			
T- 70	36.60	x				x					x							x		n/a	x				x	x				x		x			Sleepers lost	Bridge	1 - 4.8m span	x			
T- 71	37.20	x				x					x				x					0.70	x				x	x			x			x				Bridge	4 - 22.5m spans	x			
T- 72	37.80	x				x				x								x		n/a	x				x	x				x		x			Bush over structure and rail	Pipe culvert	1 - 0.6m dia pipe	x			Apron needs attention
T- 73	38.45	x				x				x								x		n/a	x				x	x				x		x			Sleepers lost	Pipe culvert	1 - 0.9m dia pipe	x			
T- 74	39.15	x				x					x				x					0.80	x				x	x				x		x			Sleepers lost	Bridge	1 - 4.12m span	x			
T- 75	39.65	x				x					x				x					0.70	x				x	x				x				x	Fishplates lost	Bridge	3 -15.3m Span	x			Apron needs attention
T- 76	40.10	x				x					x							x		n/a	x				x	x				x				x	Sleepers & Fishplates lost	Bridge	1 - 5.75m span	x			
T- 77	40.70	x				x				x			x							0.80	x				x	x		x				x				Pipe culvert	1 - 0.9m dia pipe	x			
T- 78	41.10	x				x					x							x		n/a	x				x	x				x		x			Sleepers & fasteners lost	Bridge	1 - 7.0m span	x			
T- 79	41.30	x				x					x							x		n/a	x				x	x				x		x			Bridge & rail in bush	Bridge	2 - 7.0m spans	x			
T- 80	41.60	x				x				x			x							0.70	x				x	x		x				x			Railway overgrown with bushes	Pipe culvert	2 - 0.9m dia pipe	x			Size not checked; culvert all silted
T- 81	41.65	x				x				x			x					x		0.70	x				x	x		x				x			Railway overgrown with bushes	Pipe culvert	2 - 0.9m dia pipe	x			Silted
T- 82	42.00	x				x					x							x		n/a	x				x	x				x		x			Railway overgrown with bushes	Bridge	1 - 7.0m span	x			
T- 83	43.70	x				x				x								x		n/a	x				x	x				x		x			sleepers lost	Bridge	2- 15.2	x			scoured approach requiring new structure of 7.0m span
T- 84	44.00	x				x				x			x							0.70	x				x	x		x				x				Pipe culvert	2 - 0.9m dia pipe	x			
T- 85	44.30	x				x					x				x					0.80	x				x	x			x			x				Bridge	1 - 3.5m span	x			
T- 86	44.50	x				x				x			x							0.70	x			x		x		x				x				Pipe culvert	1 - 0.9m dia pipe	x			minor cracking on head wall
T- 87	44.75	x				x					x							x		n/a	x				x	x				x		x			Sleepers lost	Bridge	1 - 7.0m span	x			
T- 88	45.51	x				x					x							x		n/a	x				x	x				x		x				Bridge	1 - 4.0m span	x			
T- 89	46.20	x				x				x					x					0.80	x				x	x			x			x				Pipe culvert	2 - 0.9m dia pipe	x			50% silted
T- 90	46.65	x				x				x					x					0.80	x				x	x				x		x			40% sleepers lost	Pipe culvert	1 - 0.9m dia pipe	x			40% silted
T- 91	47.05	x				x					x							x		n/a	x				x	x				x		x			short wood sleeper type	Bridge	1 - 3.25m span	x			
T- 92	47.80	x				x					x				x					0.80	x				x	x			x			x				Bridge	4 - 4.65m spans and 1-10.4m totalling 29.0m	x			wing wall to abutments to be extended
T- 93	48.20	x				x					x							x		n/a	x				x	x				x		x			composite sleepers(both steel and wooden)	bridge	1 - 7.2m span	x			
T- 94	48.70	x				x					x							x		n/a	x				x	x				x		x			Bolts to fishplate lost, short wood (block type of sleeper) and steel beam flange bent	Bridge	1 - 3.25m span	x			
T- 95	48.90	x				x				x			x							0.80	x			x		x		x				x				Pipe culvert	1 - 0.6m dia pipe	x			
T- 96	49.45	x				x					x				x					0.70	x				x	x			x			x			70% fastening good	Bridge	3- 19.8m (19.8m i s total for all the three spans)	x			
T- 97	50.15	x				x				x				x						0.70	x				x	x			x			x				Pipe culvert	1-0.9m dia pipe	x			50% silted
T- 98	50.45	x				x				x				x						0.70	x				x	x			x			x				Pipe culvert	1-0.6m dia pipe		x		
T- 99	50.65	x				x					x				x					1.00	x				x	x			x				x			Bridge	1-4.24		x		
T- 100	51.25	x				x				x				x						0.90	x				x	x			x			x				Pipe culvert	1 - 0.6m dia pipe		x		
T- 101	51.80	x					x			x								x		0.90	x				x	x			x				x			Bridge	1 - 3.33m span		x		
T- 102	52.07	x				x					x							x		n/a	x				x	x			x			x			All sleeper lost	Bridge	1 - 3.25m span	x			wing walls sliding off
T- 103	52.45																																							No structure at this location
T- 104	53.05	x			x						x							x		n/a	x				x	x			x			x			All sleeper lost	Bridge	1 - 7.2m span	x			
T- 105	53.65	x			x					x				x						0.55	x				x	x		x				x			Spacing of sleepers varies	Pipe culvert	2 - 0.9m dia pipe		x		
T- 106	54.00	x			x					x							x			0.85	x			x		x		x								Pipe culvert	1- 0.9m dia pipe				
T- 107	54.05	x			x					x							x			0.85	x			x		x		x								Bridge	1 - 3.90m span		x		
T- 108	54.50	x			x						x						x			n/a	x			x	x				x			x			All sleepers vandalised	Pipe culvert	1 - 0.9m span	x			Head wall cracked at centre
T- 109	54.70	x			x					x			x					x		0.90	x			x		x						x				Pipe culvert	1 - 0.9m dia pipe	x			
T- 110	55.10	x					x				x							x		0.56	x			x		x							x				Bridge	3 - 19.6m spans		x		

Table A3-1 (3) Conditions of Track (3)

No.	Location (km)	Rail Condition																																		Bridge and Culvert				
		Rail								Sleeper										Ballast					Fastening						Fishplate							Damage			
		Type (kg/m)			Condition					Type			Condition						Spacing (m)	Type		Condition			Type		Condition				Condition				Remarks	Type	Size				Remarks
		30	37.5	40	good	fair	poor			steel	wooden	concrete	good	fair	poor				0.7	measured value	stone	earth	good	fair	fouled	Bolt	Pandol	good	fair	poor		good	fair	poor					good	fair	poor	
							bending	defect	lost						decay	bending	defect	lost												defect	lost										
T- 111	55.95	x			x						x							x		n/a	x				x	x					x				Bolts for fish plates missing	Bridge	1 - 5.68m span	x			
T- 112	56.50	x			x					x			x							0.75	x			x		x		x								Pipe culvert	1 - 0.9m dia pipe			x	Headwall cracked
T- 113	56.80	x			x						x							x		0.50	x			x		x					x				Sleepers vandalised	Bridge	1 - 10.45m span	x			Wing walls require masonry
T- 114	57.10	x			x					x			x							0.80	x			x		x		x								Pipe culvert	1 - 0.9m dia pipe		x		Headwall cracked
T- 115	57.50	x			x						x				x					0.60	x				x	x		x							Sleepers vandalised	Bridge	1 - 4.9m span	x			
T- 116	58.00	x			x						x				x						x					x			x							Bridge	3 - 19.6m spans	x			Scour & erosion threat; requires
T- 117	58.60	x			x					x						x				0.80	x				x	x		x								Pipe culvert	1 - 0.9m dia pipe		x		Headwall cracked
T- 118	59.30	x				x					x							x		1.00	x				x		x		x			x			Bolts for fish plates missing	Bridge	2 - 14.35m spans	x			Structure in fair condition
T- 119	60.10	x			x				x		x							x		n/a	x				x	x					x				All sleepers removed	Bridge	4 - 18.45m spans			x	
T- 120	60.50	x			x				x		x							x		n/a	x				x	x					x				All sleepers removed	Bridge	1 - 7.05m span		x		
T- 121	61.10	x			x		x					x					x				x				x	x		x							All sleepers removed	Bridge	1 - 2.35m span		x		One pier collapsed
T- 122	61.30	x			x						x				x					1.40	x				x	x		x							All sleepers removed	Bridge	1 - 2.45m span		x		Wing wall scoured
T- 123	61.55	x			x					x			x							0.70	x				x	x		x							All sleepers removed	Bridge	1 - 2.43m span		x		
T- 124	61.95	x			x						x				x					0.80	x				x	x					x				All sleepers removed	Bridge	2 - 7.35m spans			x	Pier sunk
T- 125	62.15	x			x				x		x							x		0.50	x				x	x					x				All sleepers removed	Bridge	2 - 20.88m spans	x			Railway Survey - Pictures\MOV00902.jpg
T- 126	62.35	x			x						x							x		n/a	x				x	x		x							All sleepers removed	Bridge	1 - 2.8m span	x			
T- 127	62.40	x			x					x								x		0.80	x			x		x		x								Sleepers removed	Pipe culvert	2 - 0.6m dia pipe		x		Cracked head wall
T- 128	62.85	x			x					x								x		n/a	x				x	x					x					Pipe culvert	2 - 0.6m dia pipe		x		
T- 129	63.15	x			x					x										0.80	x				x	x		x							Sleepers vandalised 200m	Pipe culvert	1 - 0.6m dia pipe		x		Culvert silted
T- 130	63.40	x			x						x		x					x		n/a	x				x	x					x					Bridge	1 - 3.68m span	x			
T- 131	63.50	x			x						x							x		n/a	x				x	x					x					Bridge	1 - 2.86m span	x			Apron scoured
T- 132	64.10	x			x						x							x		n/a	x				x		x				x					Bridge	1 - 4.4m span	x			
T- 133	64.30	x			x					x										0.80	x				x	x		x								Pipe culvert	1 - 0.9m dia pipe		x		
T- 134	65.50	x			x						x							x		n/a	x				x	x		x								Bridge	1 - 7.6m span			x	
T- 135	66.15	x			x						x				x					n/a	x				x	x				x						Bridge	1 - 3.84m span		x		
T- 136	66.50	x			x					x							x			0.70	x				x	x				x					Sleepers lost	Bridge	1 - 7.6m span	x			
T- 137	67.70	x			x					x							x			0.70	x				x	x					x					Bridge	1 - 7.6m span	x			Wing wall scoured
T- 138	68.20	x			x					x							x			0.70	x				x	x										Bridge	1 - 7.6m span	x			Abutment cracked
T- 139	68.40	x			x						x						x			0.70	x				x		x				x					Bridge	1 - 4.5m span			x	
T- 140	69.05	x			x						x					x				0.60	x				x	x					x				Sleepers lost	Bridge	1 - 3.68m span		x		Wing wall scoured
T- 141	69.40	x			x						x					x				0.80	x			x		x					x					Bridge	1 - 4.0m span	x			Apron washed away
T- 142	69.85	x			x						x						x			n/a	x				x	x					x				Embankment scoured	Bridge	1 - 3.0m span	x			
T- 143	70.25	x			x					x							x			n/a	x				x	x					x					Pipe culvert	1 - 0.6m dia pipe	x			
T- 144	70.55	x			x						x					x				0.80	x				x	x		x								Bridge	1 - 3.30m span	x			
T- 145	71.15	x			x					x							x			0.80	x				x	x					x				All sleepers lost	Pipe culvert	1 - 1.22m dia pipe	x			
T- 146	71.85	x			x					x							x			0.80	x				x	x					x					Pipe culvert	1 - 0.3m dia pipe			x	Culvert destroyed
T- 147	72.20	x			x					x				x						0.80	x				x	x		x								Pipe culvert	1 - 0.99m dia pipe		x		Apron washed away
T- 148	73.15	x			x					x							x			0.80		x			x	x					x				Some sleepers removed	Pipe culvert	6 - 2.0m dia pipe			x	Installed in 1989
T- 149	75.95	x			x					x				x						0.70					x		x	x							Chiromo bridge	Bridge	1 - 49.91m span 1 - 79.52m span 1 - 49.91m span		x		Chiromo Bridge
	81.00 Makhanga	x																																						

Table A3-2 (1) Conditions of Embankment and Cutting Slope (1)

No.	Section		Type			Condition									Remarks
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Slope protection			Collapse			
									Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
														Classified in SOW	
	Marka														
E- 1	0.000	0.200		x		0.50	3.30	6.60		x			x		
E- 2	0.200	0.500		x		1.20	4.60	3.83		x			x		
E- 3	0.500	0.800		x		1.00	7.00	7.00		x			x		
E- 4	0.800	1.050	x					n/a		x			x		
E- 5	1.050	1.130			x	0.70	3.00	4.29		x			x		
E- 6	1.130	1.240		x		0.70	3.20	4.57		x			x		
E- 7	1.240	1.330		x		1.10	3.30	3.00		x			x		
E- 8	1.330	1.450	x					n/a		x			x		
E- 9	1.450	1.600		x		0.50	1.60	3.20		x			x		
E- 10	1.600	1.620	x					n/a		x			x		
E- 11	1.620	1.690			x	0.65	3.50	5.38		x			x		
E- 12	1.690	1.800	x					n/a		x			x		
E- 13	1.800	2.000		x		0.85	4.00	4.71		x			x		
E- 14	2.000	2.020	x					n/a		x			x		
E- 15	2.020	2.040	x					n/a		x		x		1-2	embankment collapse, surface failure type. Provide structure for 2.5m opening.
E- 16	2.040	2.065	x					n/a		x		x		1-4	embankment collapse, wash away type. Provide new bridge structure or 0.9m pipe
E- 17	2.040	2.300	x					n/a		x			x		rail partly burried
E- 18	2.065	2.080	x					n/a		x			x		
E- 19	2.080	2.160		x		0.60	3.50	n/a		x			x		
E- 20	2.160	2.300		x		0.70	2.80	4.00		x			x		
E- 21	2.300	2.305		x		0.70	2.10	3.00		x		x		1-4	wash away, new structure required
E- 22	2.305	2.480		x		0.60	1.40	2.33		x			x		
E- 23	2.480	2.630		x		0.50	1.30	2.60		x			x		
E- 24	2.630	2.750			x	0.70	3.50	5.00		x			x		
E- 25	2.750	2.820	x					n/a		x			x		
E- 26	2.820	2.900		x		0.65	2.10	3.23		x			x		
E- 27	2.900	3.000		x		0.50	1.80	3.60		x			x		
E- 28	3.000	3.270		x		0.80	2.30	2.88		x			x		
E- 29	3.270	3.370			x	0.60	3.40	5.67		x			x		
E- 30	3.370	3.710		x		0.80	3.80	4.75		x			x		
E- 31	3.710	4.000	x					n/a		x			x		
E- 32	4.000	4.300		x		0.80	3.50	4.38		x			x		
E- 33	4.300	4.691		x		0.30	1.30	4.33		x			x		embankment collapsed. Its a water crossing point
E- 34	4.691	4.835	x					n/a		x			x		
E- 35	4.835	5.000		x		0.40	1.80	4.50		x			x		
E- 36	5.000	5.280		x		0.60	2.60	4.33		x			x		
E- 37	5.280	5.300	x					n/a		x			x		
E- 38	5.300	5.380	x					n/a		x		x		1-2	Loacalised wash away i.e just at a point
E- 39	5.380	5.400	x					n/a		x			x		
E- 40	5.400	5.440	x					n/a		x			x		
E- 41	5.440	5.510	x					n/a		x			x		
E- 42	5.510	5.520	x					n/a		x		x		1-2	
E- 43	5.520	5.600		x		0.60	1.80	3.00		x			x		
E- 44	5.600	6.000		x		0.50	1.70	3.40		x			x		
E- 45	6.000	6.160		x		0.50	1.80	3.60		x			x		

Table A3-2 (2) Conditions of Embankment and Cutting Slope (2)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E- 46	6.160	6.300	x					n/a		x			x		
E- 47	6.300	6.450	x					n/a		x			x		
E- 48	6.450	6.585		x		0.50	1.50	3.00		x			x		
E- 49	6.585	6.660		x		0.50	1.50	3.00		x			x		
E- 50	6.660	6.800		x		0.60	2.00	3.33		x			x		
E- 51	6.800	7.000		x		1.60	5.80	3.63		x			x		
E- 52	7.000	7.300		x		1.30	5.00	3.85		x			x		
E- 53	7.300	7.400		x		2.70	7.00	2.59		x			x		
E- 54	7.400	7.700		x		2.10	5.50	2.62		x			x		
E- 55	7.700	8.000		x		0.90	4.60	5.11		x			x		
E- 56	8.000	8.300		x		0.90	4.60	5.11		x			x		
E- 57	8.300	8.350		x		0.90	4.20	4.67		x			x		
E- 58	8.350	8.410		x		0.90	4.20	4.67		x		x		1-2	
E- 59	8.410	8.505		x		0.80	3.90	4.88		x		x		1-4	
E- 60	8.505	8.512		x		0.37	3.60	9.73		x		x		1-2	
E- 61	8.512	8.620		x		0.40	3.80	9.50		x			x		
E- 62	8.620	8.670		x		0.37	3.60	9.73		x			x		
E- 63	8.670	8.673		x		0.40	3.60	9.00		x			x		
E- 64	8.673	9.000		x		0.70	4.20	6.00		x		x		1-2	
E- 65	9.000	9.300		x		0.70	5.00	7.14		x			x		
E- 66	9.300	9.600		x		0.40	2.00	5.00		x			x		
E- 67	9.600	10.000		x		0.20	3.00	15.00		x			x		
E- 68	10.000	10.300		x		0.50	3.80	7.60		x			x		
E- 69	10.300	10.600		x		2.50	4.50	1.80		x			x		
E- 70	10.600	11.000	x					n/a		x			x		
E- 71	11.000	11.300		x		0.50	2.80	5.60		x			x		
E- 72	11.300	11.420		x		1.30	4.40	3.38		x			x		
E- 73	11.420	11.600	x					n/a		x			x		
E- 74	11.600	12.000		x		0.60	3.00	n/a		x			x		
E- 75	12.000	12.140	x					n/a		x			x		
E- 76	12.140	12.315		x		0.50	1.50	3.00		x			x		
E- 77	12.315	12.500	x					n/a		x			x		
E- 78	12.500	12.600		x		0.50	1.50	3.00		x			x		
E- 79	12.600	12.800		x		0.50	1.50	3.00		x			x		
E- 80	12.800	13.000		x		0.50	2.00	4.00		x			x		
E- 81	13.000	13.300		x		0.30	2.00	6.67		x			x		
E- 82	13.300	13.600		x		1.00	5.00	5.00		x			x		
E- 83	13.600	14.000		x		1.80	4.00	2.22		x			x		
E- 84	14.000	14.300		x		2.20	6.50	2.95		x			x		
E- 85	14.300	14.600		x		1.10	4.00	3.64		x			x		
E- 86	14.600	14.880		x		0.30	1.40	4.67		x			x		
E- 87	14.880	15.000	x					n/a		x			x		
E- 88	15.000	15.020	x					n/a		x			x		rail buried
E- 89	15.020	15.060	x					n/a		x		x		1-4	embankment collapse, wash away type
E- 90	15.060	15.120	x					n/a		x			x		rail buried
E- 91	15.120	15.160	x					n/a		x		x		1-4	embankment collapse, wash away type
E- 92	15.160	15.240	x					n/a		x			x		
E- 93	15.240	15.320	x					n/a		x		x		1-4	embankment collapse, wash away type
E- 94	15.320	15.350		x		0.80	2.00	2.50		x		x		1-2	embankment collapse, surface failure
E- 95	15.350	15.500	x					n/a		x			x		

Table A3-2 (3) Conditions of Embankment and Cutting Slope (3)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E- 96	15.500	15.509		x		0.75	4.70	6.27		x			x		
E- 97	15.509	15.580	x					n/a		x		x		1-4	embankment collapse, wash away type. New structure required
E- 98	15.580	15.583	x					n/a		x		x		1-4	embankment collapse, wash away type.
E- 99	15.583	16.000	x					n/a		x			x		
E- 100	16.000	16.300		x		0.70	2.70	3.86		x			x		
E- 101	16.300	16.400		x		1.00	4.50	4.50		x			x		
E- 102	16.400	16.404	x					n/a		x		x		1-2	Embankment collapse, surface failure type. New structure required for 4m opening
E- 103	16.404	16.600		x		0.40	1.50	3.75		x			x		
E- 104	16.600	17.000	x					n/a		x			x		
E- 105	17.000	17.200	x					n/a		x			x		
E- 106	17.200	17.400	x					n/a		x			x		
E- 107	17.400	17.600	x					n/a		x			x		
E- 108	17.600	17.720	x					n/a		x			x		
E- 109	17.720	17.725	x					n/a		x			x		
E- 110	17.725	18.000	x					n/a		x			x		
E- 111	18.000	18.050		x		0.40	2.50	6.25		x			x		
E- 112	18.050	18.200	x					n/a		x			x		
E- 113	18.200	18.400		x		0.60	3.00	5.00		x			x		
E- 114	18.400	18.550		x		0.55	3.40	6.18		x			x		
E- 115	18.550	18.632		x		0.55	3.40	6.18		x			x		
E- 116	18.632	18.780	x					n/a		x			x		
E- 117	18.780	18.850	x					n/a		x			x		
E- 118	18.850	18.870		x		0.50	1.00	2.00		x			x		
E- 119	18.870	19.000		x		0.50	1.80	3.60		x			x		
E- 120	19.000	19.200		x		0.30	1.00	3.33		x			x		
E- 121	19.200	19.400		x		0.60	2.40	4.00		x			x		
E- 122	19.400	19.600		x		0.60	2.40	4.00		x			x		
E- 123	19.600	19.800	x					n/a		x			x		
E- 124	19.800	19.860	x					n/a		x			x		
E- 125	19.860	20.070	x					n/a		x			x		
E- 126	20.070	20.200	x					n/a		x			x		
E- 127	20.200	20.202	x					n/a		x			x		
E- 128	20.202	20.400	x					n/a		x			x		
E- 129	20.400	20.600		x		0.40	2.50	6.25		x			x		
E- 130	20.600	20.800		x		0.50	2.00	4.00		x			x		
E- 131	20.800	21.000		x		0.40	3.00	7.50		x			x		
E- 132	21.000	21.200		x		0.50	2.30	4.60		x			x		
E- 133	21.200	21.400		x		0.50	2.00	4.00		x			x		
E- 134	21.400	21.600		x		0.30	1.20	4.00		x			x		
E- 135	21.600	21.800		x		0.70	1.00	1.43		x			x		
E- 136	21.800	22.000		x		0.50	1.60	3.20		x			x		
E- 137	22.000	22.150		x		0.50	1.90	3.80		x			x		rail in bush
E- 138	22.150	22.300		x		0.80	2.40	3.00		x			x		rail in bush
E- 139	22.300	22.850		x		1.10	3.40	3.09		x			x		
E- 140	22.850	23.000		x		1.60	3.40	2.13		x			x		rail in thick bush
E- 141	23.000	23.300		x		1.30	5.00	3.85		x			x		
E- 142	23.300	23.400		x		0.70	3.40	4.86		x			x		
E- 143	23.400	23.490		x		0.90	4.00	4.44		x			x		
E- 144	23.490	23.700	x					n/a		x			x		
E- 145	23.700	24.200		x		0.50	1.50	3.00		x			x		

Table A3-2 (4) Conditions of Embankment and Cutting Slope (4)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E-146	24.200	24.280	x					n/a		x			x		
E-147	24.280	24.850		x		0.30	1.30	4.33		x			x		
E-148	24.850	25.110	x					n/a		x		x		1-2	
E-149	25.110	25.290	x					n/a		x			x		rail in bushes
E-150	25.387	25.538	x					n/a		x			x		
E-151	25.538	25.890	x					n/a		x		x		1-4	352m of wash away near Nsanje in-land port
E-152	25.890	25.980	x					n/a		x			x		
E-153	25.980	26.500	x					n/a		x			x		
E-154	26.500	26.760		x		0.55	2.50	4.55		x			x		
E-155	26.760	26.860	x					n/a		x		x		1-2	
E-156	26.860	27.080		x		0.20	1.30	6.50		x			x		
E-157	27.080	27.400		x		0.20	0.60	3.00		x		x		1-2	Embankment collapsed
E-158	27.400	27.600		x		0.50	1.00	2.00		x		x		1-2	Embankment collapsed
E-159	27.600	27.800		x		0.70	1.50	2.14		x			x		
E-160	27.800	28.000		x		0.20	1.25	6.25		x			x		
E-161	28.000	28.200		x		0.30	1.00	3.33		x			x		
E-162	28.200	28.400	x					n/a		x			x		
E-163	28.400	28.590		x		0.30	1.00	3.33		x			x		
E-164	28.590	28.800		x		0.50	1.70	3.40		x			x		
E-165	28.800	29.000		x		0.50	1.30	2.60		x		x		1-2	Embankment collapsed
E-166	29.000	29.200		x		0.45	1.20	2.67		x			x		
E-167	29.200	29.400		x		0.20	1.40	7.00		x			x		
E-168	29.400	29.600		x		0.30	1.00	3.33		x			x		
E-169	29.600	29.800		x		0.30	0.70	2.33		x			x		
E-170	29.800	30.200		x		1.20	4.30	3.58		x		x		1-2	Embankment collapsed
E-171	30.200	30.400		x		0.45	1.90	4.22		x			x		
E-172	30.400	30.600		x		0.40	1.30	3.25		x		x		1-2	Embankment collapsed
E-173	30.600	30.740		x		0.30	0.90	3.00		x			x		
E-174	30.740	30.920		x		0.30	1.80	6.00		x			x		
E-175	30.920	31.000		x		0.30	1.81	6.03		x		x		1-2	embankment collapse
E-176	31.000	31.045	x							x			x		
E-177	31.045	31.050	x							x			x		Sleepers lost
E-178	31.050	31.200	x							x			x		
E-179	31.200	31.405		x		0.30	1.40	4.67		x			x		
E-180	31.400	31.405		x		1.00	3.40	3.40		x			x		
E-181	31.405	31.443	x					n/a		x			x		
E-182	31.443	31.450	x					n/a		x			x		sleepers lost
E-183	31.450	31.510	x					n/a		x			x		
E-184	31.510	31.600	x					n/a		x			x		
E-185	31.600	31.800		x		0.70	3.30	4.71		x			x		
E-186	31.800	32.000		x		0.90	6.00	6.67		x			x		
E-187	32.000	32.085		x		0.50	4.20	8.40		x			x		
E-188	32.085	32.090		x		0.50	4.20	8.40		x		x		1-2	
E-189	32.090	32.100	x					n/a		x			x		
E-190	32.100	32.167		x		0.40	1.40	3.50		x			x		
E-191	32.167	32.173		x		0.50	1.70	3.40		x		x		1-2	embankment collapse and loss of sleepers
E-192	32.173	32.200	x					n/a		x			x		
E-193	32.200	32.500		x		0.50	1.00	2.00		x			x		
E-194	32.500	32.595		x		0.50	4.00	8.00		x		x		1-2	embankment collapse
E-195	32.595	32.605	x					n/a		x			x		

Table A3-2 (5) Conditions of Embankment and Cutting Slope (5)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E-196	32.605	32.740	x					n/a		x			x		
E-197	32.740	32.760	x					n/a		x		x		1-4	embankment collapse, wash away. 2.5m opening requiring new structure. Wash away induced by road culvert outlet
E-198	32.760	32.900	x					n/a		x			x		
E-199	32.900	32.915	x					n/a		x		x		1-2	embankment collapse, surface failure type
E-200	32.915	32.926	x					n/a		x			x		
E-201	32.926	32.930	x					n/a		x			x		signs of embankment collapse imminent
E-202	32.930	32.976	x					n/a		x			x		
E-203	32.976	33.000	x					n/a		x		x		1-2	new structure required for 2m opening.
E-204	33.000	33.200		x		0.70	4.40	6.29		x			x		
E-205	33.200	33.400		x		1.00	4.00	4.00		x			x		
E-206	33.400	33.404	x					n/a		x		x		1-2	embankment collapse, surface failure type
E-207	33.404	33.600		x		1.10	4.00	3.64		x			x		
E-208	33.600	33.800		x		0.80	4.00	5.00		x			x		
E-209	33.800	33.820		x		0.50	1.20	2.40		x			x		
E-210	33.820	34.000	x					n/a		x			x		
E-211	34.000	34.200		x		0.70	4.70	6.71		x		x		1-2	loss of embankment encouraged by loss of sleepers
E-212	34.200	34.400		x		0.85	4.70	5.53		x			x		
E-213	34.400	34.600		x		1.00	3.50	3.50		x			x		
E-214	34.600	34.800		x		0.60	2.10	3.50		x			x		
E-215	34.800	35.000	x					n/a		x			x		
E-216	35.000	35.200		x		1.00	5.50	5.50		x			x		
E-217	35.200	35.400			x	0.40	1.40	3.50		x			x		
E-218	35.400	35.592				0.50	1.60	3.20		x			x		
E-219	35.592	35.617				0.70	1.80	2.57		x		x		1-2	embnakment collapse, surface failure type. New structure for 2.5m opening required
E-220	35.617	35.800		x		0.80	2.00	2.50		x			x		
E-221	35.800	36.000		x		1.00	4.00	4.00		x			x		
E-222	36.000	36.200	x					n/a		x			x		
E-223	36.200	36.220				0.80	5.40	6.75		x			x		
E-224	36.220	36.400	x					n/a		x			x		
E-225	36.400	36.800	x					n/a		x			x		
E-226	36.800	36.820		x		1.10	5.20	4.73		x			x		
E-227	36.820	36.970	x					n/a		x			x		
E-228	36.970	37.000	x					n/a		x			x		
E-229	37.000	37.050	x					n/a		x			x		
E-230	37.050	37.120			x	0.50	7.70	15.40		x			x		
E-231	37.120	37.130			x	0.80	7.20	9.00		x			x		
E-232	37.130	37.220		x		1.50	7.50	5.00		x			x		
E-233	37.220	37.400		x		0.95	4.60	4.84		x			x		
E-234	37.400	37.450		x		0.40	1.70	4.25		x			x		
E-235	37.450	37.600	x					n/a		x			x		
E-236	37.600	37.670		x		0.20	3.20	16.00		x			x		
E-237	37.670	37.770		x		0.40	2.00	5.00		x			x		
E-238	37.770	37.990	x					n/a		x			x		
E-239	37.990	38.020	x					n/a		x			x		
E-240	38.020	38.204	x					n/a		x			x		
E-241	38.204	38.400	x					n/a		x			x		
E-242	38.400	38.600		x		0.80	4.00	5.00		x			x		
E-243	38.600	38.700	x					n/a		x			x		
E-244	38.700	39.000		x		0.20	1.00	5.00		x			x		
E-245	39.000	39.200		x		0.50	3.30	6.60		x			x		

Table A3-2 (6) Conditions of Embankment and Cutting Slope (6)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E-246	39.200	39.252	x					n/a		x			x		
E-247	39.252	39.330			x	0.60	4.00	6.67		x			x		
E-248	39.330	39.400	x					n/a		x			x		
E-249	39.400	39.484	x					n/a		x			x		
E-250	39.484	39.600	x					n/a		x			x		sleepers and fishplate lost hence rail line offf position i.e can not be held together
E-251	39.600	39.690		x		0.60	3.20	5.33		x			x		
E-252	39.690	39.693	x					n/a		x			x		
E-253	39.693	39.776	x					n/a		x			x		
E-254	39.776	39.800	x					n/a		x			x		
E-255	39.800	39.825	x					n/a		x			x		
E-256	39.825	39.850	x					n/a		x			x		
E-257	39.850	40.000	x					n/a		x			x		
E-258	40.000	40.085	x					n/a		x			x		
E-259	40.085	40.180	x					n/a		x			x		
E-260	40.180	40.200	x					n/a		x			x		
E-261	40.200	40.300		x		0.20	1.00	5.00		x			x		
E-262	40.300	40.395		x		0.20	1.00	5.00		x		x		1-4	embankment failure, wash away type.
E-263	40.395	40.550			x	0.40	3.60	9.00		x			x		
E-264	40.550	40.600			x	0.30	3.50	11.67		x			x		
E-265	40.600	40.750		x		0.30	3.50	11.67		x			x		
E-266	40.750	40.760	x					n/a		x			x		
E-267	40.760	40.800	x					n/a		x			x		
E-268	40.800	40.835		x		1.40	5.00	3.57		x			x		
E-269	40.835	40.840	x					n/a		x			x		
E-270	40.840	40.940	x					n/a		x			x		
E-271	40.940	40.950	x					n/a		x			x		
E-272	40.950	41.000		x		1.40	4.80	3.43		x			x		
E-273	41.000	41.040		x		1.40	4.80	3.43		x			x		
E-274	41.040	41.050		x		1.30	5.00	3.85		x			x		
E-275	41.050	41.070		x		1.30	5.00	3.85		x			x		
E-276	41.070	41.080		x		1.30	5.00	3.85		x			x		
E-277	41.080	41.154		x		1.33	4.95	3.74		x			x		
E-278	41.154	41.176		x		1.31	4.99	3.82		x			x		
E-279	41.176	41.200		x		1.31	4.98	3.81		x			x		
E-280	41.200	41.215		x		1.30	5.00	3.85		x			x		
E-281	41.215	41.400		x		2.00	1.00	0.50		x			x		
E-282	41.400	41.600		x		2.00	5.00	2.50		x			x		
E-283	41.600	41.676		x		1.00	5.80	5.80		x			x		
E-284	41.676	41.700		x		1.00	5.80	5.80		x			x		
E-285	41.700	41.800		x		1.00	5.80	5.80		x			x		Localised surface failure; culverts/bridges required
E-286	41.800	42.200		x		0.30	3.00	10.00		x			x		
E-287	42.200	42.353		x		1.40	5.00	3.57		x			x		Sleepers lost
E-288	42.353	42.400		x		1.10	3.20	2.91		x			x		Sleepers lost
E-289	42.400	42.600		x		1.10	3.20	2.91		x			x		
E-290	42.600	42.700		x		0.35	1.30	3.71		x			x		sleepers lost
E-291	42.700	42.800	x					n/a		x			x		
E-292	42.800	43.000	x					n/a		x			x		
E-293	43.000	43.185	x					n/a		x			x		
E-294	43.185	43.190		x		1.20	5.90	4.92		x			x		
E-295	43.190	43.200		x		1.50	7.20	4.80		x			x		

Table A3-2 (7) Conditions of Embankment and Cutting Slope (7)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E-296	43.200	43.400	x					n/a		x			x		
E-297	43.400	43.600		x		0.30	2.50	8.33		x			x		
E-298	43.600	43.850		x		0.80	4.80	6.00		x			x		
E-299	43.850	43.960		x		0.85	4.60	5.41		x		x		1-2	Embankment collapse, surface failure type & loss of sleepers noted as well
E-300	43.960	44.000		x		0.90	3.50	3.89		x			x		
E-301	44.000	44.080		x		1.10	3.40	3.09		x		x		1-2	
E-302	44.080	44.090		x		1.10	3.30	3.00		x			x		
E-303	44.090	44.135	x					n/a		x			x		
E-304	44.135	44.200		x		1.80	5.50	3.06		x			x		
E-305	44.200	44.290		x		1.25	4.65	3.72		x			x		
E-306	44.290	44.370		x		0.70	3.80	5.43		x			x		
E-307	44.370	44.400		x		0.50	3.30	6.60		x			x		
E-308	44.400	44.600		x		0.90	4.20	4.67		x			x		
E-309	44.600	44.640	x					n/a		x			x		
E-310	44.640	44.800		x		2.00	5.00	2.50		x			x		
E-311	44.800	45.000		x		2.00	5.00	2.50		x			x		
E-312	45.000	45.200		x		0.90	4.50	5.00		x			x		
E-313	45.200	45.400		x		0.70	3.40	4.86		x			x		
E-314	45.400	45.510		x		0.90	3.80	4.22		x			x		
E-315	45.510	45.550		x		0.85	3.80	4.47		x			x		Prone to embankment collapse by surface failure. Localised water crossing point
E-316	45.550	45.615		x		0.80	3.80	4.75		x			x		
E-317	45.615	46.000		x		0.60	2.65	4.42		x			x		
E-318	46.000	46.200		x		0.40	1.50	3.75		x			x		
E-319	46.200	46.240		x		0.80	4.50	5.63		x			x		
E-320	46.240	46.400		x		0.80	4.25	5.31		x			x		
E-321	46.400	46.600		x		0.80	4.00	5.00		x			x		
E-322	46.600	46.700		x		0.25	1.00	4.00		x			x		
E-323	46.700	46.800	x					n/a		x		x		1-2	
E-324	46.800	47.000		x		0.45	1.50	3.33		x			x		
E-325	47.000	47.125		x		0.80	4.60	5.75		x			x		
E-326	47.125	47.200		x		0.40	1.70	4.25		x			x		
E-327	47.200	47.380	x					n/a		x			x		
E-328	47.380	47.580	x					n/a		x			x		
E-329	47.580	47.600		x		0.50	3.00	6.00		x					
E-330	47.600	47.800		x		1.60	4.80	3.00		x					
E-331	47.800	47.890		x		1.00	4.20	4.20		x					
E-332	47.890	47.900	x					n/a		x					
E-333	47.900	48.000			x	0.60	3.50	5.83		x					
E-334	48.000	48.040	x					n/a		x					
E-335	48.040	48.200		x		0.80	4.00	5.00		x					
E-336	48.200	48.400		x		1.50	5.00	3.33		x					
E-337	48.400	48.435		x		0.80	5.00	6.25		x					
E-338	48.435	48.600	x					n/a		x					
E-339	48.600	48.800		x		1.00	3.50	3.50		x					
E-340	48.800	49.000		x		1.20	5.00	4.17		x					
E-341	49.000	49.200		x		1.10	4.30	3.91		x					
E-342	49.200	49.350		x		0.50	2.70	5.40		x					
E-343	49.350	49.450	x	x				n/a		x					
E-344	49.450	49.600		x		1.30	6.00	4.62		x					
E-345	49.600	50.000		x		0.80	4.00	5.00		x					

Table A3-2 (8) Conditions of Embankment and Cutting Slope (8)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E-346	50.000	50.050		x		1.40	4.70	3.36		x					
E-347	50.050	50.100		x		0.60	3.30	5.50		x					
E-348	50.100	50.200		x		0.65	3.80	5.85		x					
E-349	50.200	50.400		x		0.70	4.30	6.14		x					
E-350	50.400	50.600		x		0.50	3.50	7.00		x					
E-351	50.600	50.800		x		0.60	3.40	5.67		x					
E-352	50.800	51.000		x		0.80	3.00	3.75		x					
E-353	51.000	51.930		x		0.75	2.25	3.00		x					
E-354	51.930	54.500		x		1.50	4.35	2.90		x			x		
E-355	54.500	55.000		x		1.00	1.38	1.38		x			x		
E-356	55.000	60.750		x		1.20	3.20	2.67		x			x		
E-357	60.750	61.800	x					n/a		x			x		
E-359	61.800	62.660		x		1.25	3.75	3.00		x			x		
E-360	62.660	63.600		x		1.60	4.80	3.00		x			x		
E-361	63.600	63.770		x		0.90	2.70	3.00		x			x	1-2	Embankment collapsed
E-362	63.770	64.200		x		0.60	1.80	3.00		x		x		1-2	Embankment collapsed
E-363	64.200	64.350		x		1.30	2.60	2.00		x		x		1-2	Sleepers removed; embankment collapse 20m
E-364	64.350	65.250	x							x			x		
E-365	65.250	66.190		x		1.03	2.88	2.80		x			x		
E-366	66.190	66.200		x		1.10	3.70	3.36		x			x		
E-367	66.200	66.600		x		1.10	3.40	3.09		x			x	1-2	Embankment collapse; 30m approx
E-368	66.600	66.800		x		1.10	3.20	2.91		x			x		
E-369	66.800	66.900		x		1.10	2.80	2.55		x			x		Embankment collapse
E-370	66.900	68.180		x		0.70	1.80	2.57		x			x		Road works have destroyed part of rail
E-371	68.180	68.800		x		0.70	2.00	2.86		x			x		
E-372	68.800	69.150		x		0.60	1.70	2.83		x			x		
E-373	69.150	71.970		x		0.40	4.70	11.75		x			x		
E-374	71.970	71.200		x		1.20	3.50	2.92		x			x		
E-375	71.200			x		1.20	3.70	3.08		x			x		
E-376	71.430	71.970		x		1.13	3.38	3.00		x			x		
E-377	71.970	72.470		x		0.80	2.40	3.00		x			x		
E-378	72.470	72.490		x		1.30	3.90	3.00		x			x		
E-379	72.490	73.520		x		1.70	4.80	2.82		x			x		
E-380	73.520	73.900		x		2.80	8.20	2.93		x		x		1-3	Embankment collapse by land slide (circular slip) the rail is vertically tilted due to the circular slip. The physical survey ended at this point which is approx 150m from the open spur channel (Ntayamoyo at Bangula)
E-381	73.900	74.000		x		2.90	8.50	2.93		x			x		
E-382	74.000	74.200		x		3.40	8.00	2.35		x			x		
E-383	74.200	74.300		x		3.50	9.00	2.57		x			x		
E-384	74.300	74.400		x		3.20	8.00	2.50		x			x		
E-385	74.400	74.580		x		3.10	8.00	2.58		x			x		
E-386	74.580	74.700		x		2.80	7.50	2.68		x			x		
E-387	74.700	74.830		x		2.20	7.50	3.41		x			x		
E-388	74.830	75.000		x		2.10	7.00	3.33		x			x		
E-389	75.000	75.140		x		2.20	7.00	3.18		x			x		
E-390	75.140	75.300		x		1.90	7.00	3.68		x			x		
E-391	75.300	75.500		x		2.40	9.00	3.75		x			x		
E-392	75.500	75.560		x		2.70	7.00	2.59		x			x		
E-393	75.560	75.700		x		3.80	8.00	2.11		x			x		
E-394	75.700	75.840		x		0.80	3.70	4.63		x			x		
E-395	75.840	75.900		x		3.20	8.00	2.50		x			x	1-3	

Table A3-2 (9) Conditions of Embankment and Cutting Slope (9)

No.	Section		Type			Condition									Remarks
									Slope protection			Collapse			
	From (km)	To (km)	Level	Embankment	Cutting slope	Height (m)	Length (m)	Slope grade (1:n)	Yes	No	Type (if Yes)	Yes	No	Type (if Yes)	
E- 396	75.900	75.930	x					n/a		x			x		start of Chiromo bridge
E- 397	75.930	76.100	x					n/a		x					Chiromo Bridge
E- 398	76.100	76.400		x		3.20	5.00	1.56		x			x		
E- 399	76.400	76.700		x		1.80	5.00	2.78		x			x		
E- 400	76.700	77.400		x		0.60	1.60	2.67		x			x		
E- 401	77.400	77.500		x		2.60	5.30	2.04		x			x		
E- 402	77.500	77.590		x		3.10	5.80	1.87		x		x		1-4	Embankment collapse, wash away type. Rail suspended
E- 403	77.590	78.000		x		3.00	6.00	2.00		x		x		1-1	embankment collapse by submerged water (erosion)
E- 404	78.000	78.065		x		3.40	5.20	1.53		x		x		1-1	
E- 405	78.065	78.068		x		3.40	5.20	1.53		x		x		1-1	
E- 406	78.068	78.400		x		2.20	5.00	2.27		x			x		
E- 407	78.400	78.710		x		3.20	5.20	1.63		x			x		
E- 408	78.710	78.750		x		3.10	5.10	1.65		x		x		1-1	embankment collapse by submerged water (erosion)
E- 409	78.750	78.780		x		3.20	5.00	1.56		x		x		1-1	embankment collapse by submerged water (erosion)
E- 410	78.780	78.850		x		3.20	5.00	1.56		x		x		1-1	embankment collapse by submerged water (erosion)
E- 411	78.850	79.000		x		3.20	5.00	1.56		x		x		1-1	embankment collapse by submerged water (erosion)
E- 412	79.000	79.400		x		1.30	4.60	3.54		x					
E- 413	79.400	79.700		x		0.30	2.00	6.67		x			x		
E- 414	79.700	80.400	x					n/a		x			x		
E- 415	80.400	Makhanga													

Table A3-3 Conditions of Station

No.	Station	Location (km)	Rail sect.	No. of loops	Lmax	Loop Line Lengts (m)					Spur Lines (m)		Turnout				Remarks
						1	2	3	4	5	1	2	No. of Turnout	Condition			
														good	fair	poor	
S- 1	Border (Marka)	0.8	30kg	3	630	540	480	445			61		6				The spur turn out and one more are disconnected.
	Nyamula	38.5	30kg	1	550	550											Turn outs are off position i.e poor. 40% of loop is burried and 35% of loop has no sleepers. And 30% of main rail has no sleepers
S- 2	Nsanje	26.4	30kg	2	548	489	212						4				Turn outs are fair but the spur line to the coal fuel loading area is no longer functioning with the replacement of diesel engines for coal fuel ones. This station was not indicated on the initial survey sheet
S- 3	Tengani	50.9	30kg	1	510	510					95		3			x	Previous survey shows no spur
S- 4	Bangula	71.7	30kg	3	585	525	480	343			520		9				Spur serves WFP warewhouses
S- 5	Chiromo	77.1	30kg	1	329	329											One of the two turn outs including some length of the loop is moved off position and some rail parts are stacked nearby. The length opf the loop could therefore not be ascertained. The remaining part of the loop is 310m ie excluding the part that can not be ascertained. The 329m was noted during an earlier survey.
S- 6	Makhanga	80.4	30kg	1	505	505											station currently being used.
		Makhanga															

Table A3-4 Conditions of Level Crossing

No.	Location (km)	Width (m)	Installation of Sing Marker		Date Installed	Name of Users	Remarks(Present conditions)
			Yes	No			
	Marka						
L- 1	0.85	6.0		x	Unknown	LULWE MISSION AND MALAWI GOVT	
L- 1a	2.82	8.0		x	2006	TO KHANDE	
L- 1b	3.84	7.0		x	1998	TO CHIBULI	Road crossing on wash away area
L- 2	6.10	7.0		x	Unknown	NSANJE DISTRICT COUNCIL	Channels on either side
L- 2a	8.87	6.5		x	1995		
L- 3	12.30	9.0		x	1995	NSANJE DISTRICT COUNCIL/SAMBA	
L- 4	14.80	7.0		x	Unknown	NSANJE DISTRICT COUNCIL	
L- 4a	15.82	9.0		x	1998		
L- 5	17.30	11.0		x	as old as M1	NSANJE DISTRICT COUNCIL/MARKA	
L- 5a	19.26	8.5		x	1980	TO KHURUVI	Passable
L- 5b	21.35	7.0		x		TO MEABU	
L- 6	24.55	5.0		x		NSANJE DISTRICT COUNCIL	leads to Thole village T/A Malemia
L- 7	25.70	22.0		x		NSANJE DISTRICT COUNCIL	Rail line crossing M1 road at skew, rail line washed away
L- 8	26.30					MALAWI RAILWAYS	There is no level crossing at this point
L- 9	26.85	5.0				NSANJE CATHOLIC MISSION	
L- 10	27.05	5.0				NSANJE DISTRICT COUNCIL	
L- 11	28.50	5.0				NSANJE DISTRICT COUNCIL	
L- 12	30.67					NSANJE DISTRICT COUNCIL	There is no level crossing at this point
L- 13	32.90	9.8		x	2010	NSANJE DISTRICT COUNCIL	New road crossing due to new road realignment
L- 13a	38.30	4.5		x		NYAMULA STATION	
L- 13b	40.67	6.5		x		TO MPALA	
L- 13c	43.39	8.0		x		TO NAYAYA TRADING	NEW ACCESS ACROSS M1
L- 14	47.50	7.1	x			NSANJE DISTRICT COUNCIL/NTHONDO HOSPITAL	Road sign at 47.425 RHS need replacement
L- 14a	48.55	6.5		x		TO LUKWA VGE FP SCHOOL	NEW ACCESS ACROSS M1
L- 14b	49.72	8.2		x	2007	MPEPE SCHOOL	No signs, newly constructed crossing
L- 15	51.35	4.0		x	Unknown	MALAWI GOVT WATER SUPPLY	No signs
L- 16	56.30	5.5		x	Unknown	MALAWI GOVT WATER SUPPLY	From M1 Road to Nyamikolongo School
L- 17	57.20	6.0		x	1977	MALAWI GOVT ROADS DEPT/Nyamikolongo School	Rail buried in earth; used by vehicles; to Nyamikolongo School
L- 17a	57.30	4.7		x	Unknown	MALAWI GOVT ROADS DEPT/Nyamikolongo School	Old road now used by pedestrians and Bicycle traffic
L- 17b	57.78	8.0		x	1985	Access to refugee camp/secondary school/Hospital	Access from M1 Road to Refugee Camp
L- 17c	59.75	7.0		x	1987	Kadabwako Community Day Secondary School	Access from M1 Road to Kadabwako Community Day Secondary School
L- 18	60.70	6.5		x	Unknown	To Mphala Farm	
L- 19	63.85	6.5		x	Unknown	To Phokela	
L- 20	65.00	7.0		x	Unknown	To Phokela Hospital	
L- 21	66.68	6.0		x	2009	To Road Contractor's borrow pit	
L- 18	67.25	6.0		x	1977	MALAWI GOVT WATER SUPPLY	
L- 19	69.58	7.0		x	Unknown	To Mlonda Village & School	
L- 19	72.30	12.0				MALAWI GOVT WORKS DEPT	
L- 20	75.45				1972	MESSRS MANTAM LIMITED	This Level Crossing is Non functional. It is currently used as a temporary detour
L- 21	80.70	7.0		x	1971	MALAWI GOVT WORKS DEPT	Makhanga
	Makhanga						

Table A3-5 Conditions of Washaway Section

No.	Location		Extent (km)	Average Height of Embankment (m)	Remarks
	From (km)	To (km)			
	Marka				
W- 1	3.800	3.883	0.08	2.0	River changed course
W- 2	4.890	4.910	0.02	2.5	Embankment, railway line and 2 span bridge washed away
W- 3	7.330	7.361	0.03	2.0	bridge and approach embankment washed away
W- 4	8.420	8.676	0.26	1.5	embankment washed away
W- 5	9.700	9.713	0.01	2.0	bridge + approach embankments washed away
W- 6	15.020	15.060	0.04	1.8	embankment washed away
W- 7	15.120	15.160	0.04	1.5	embankment washed away
W- 8	15.510	15.520	0.01	2.0	embankment washed away
W- 9	25.290	25.360	0.07		rail washed away
W- 10	25.360	25.387	0.03		new road drain outlet trench excavation
W- 11	25.387	25.538	0.15		rail washed away
W- 12	25.538	25.781	0.24		There is no rail at this location. The rail was removed by contractor working on land reclamation for Nsanje port
W- 13	73.517	73.900	0.383	2.1	Embankment height taken on the edge. Distance measured from end of rail (Makhanga side) and end of rail (bangula side)
W- 14	77.550	77.590	0.04	3.1	Between Makhanga Station and Chiromo Station
		Makhanga			

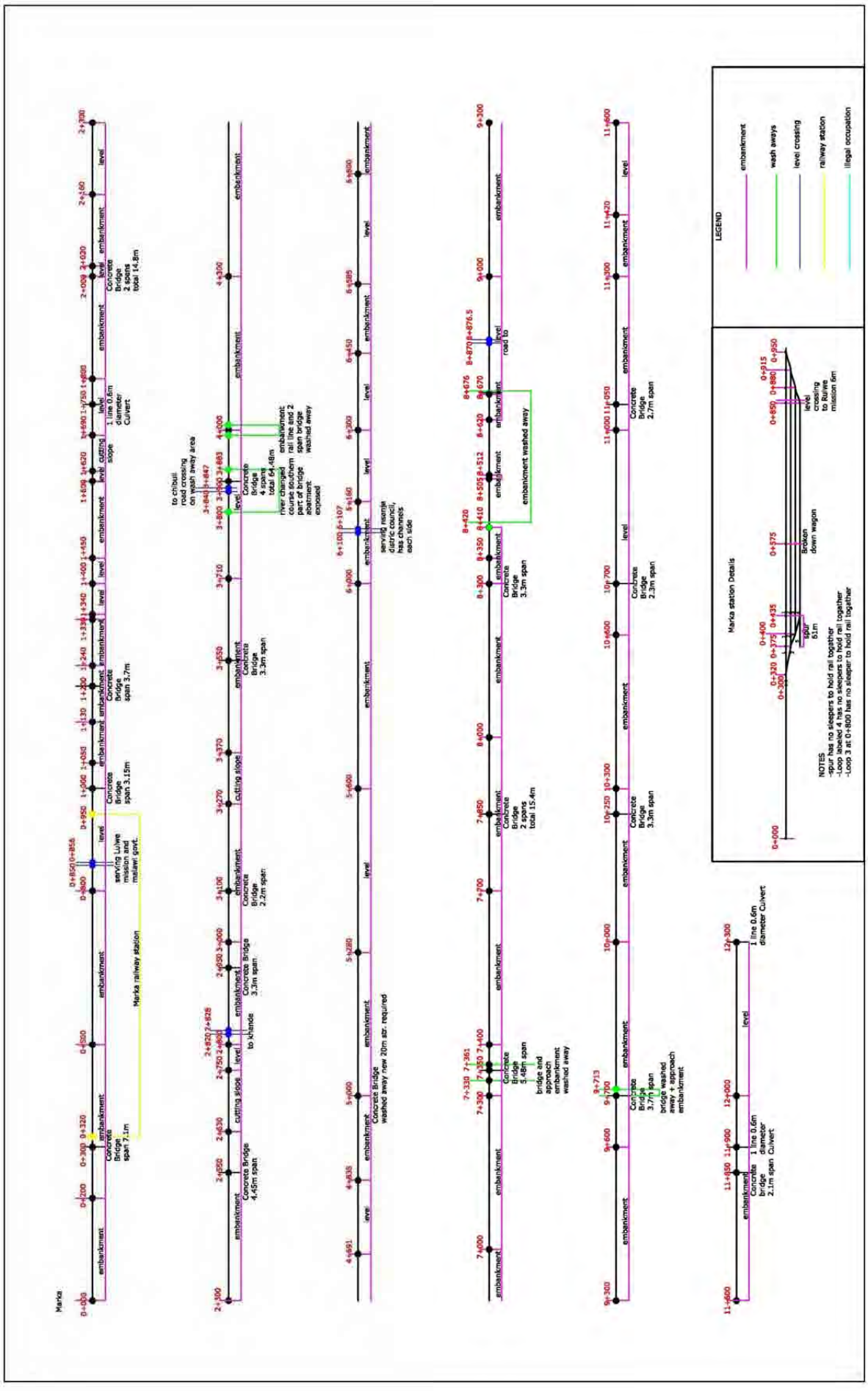


Figure A3-1 (1) Station Diagram (1)

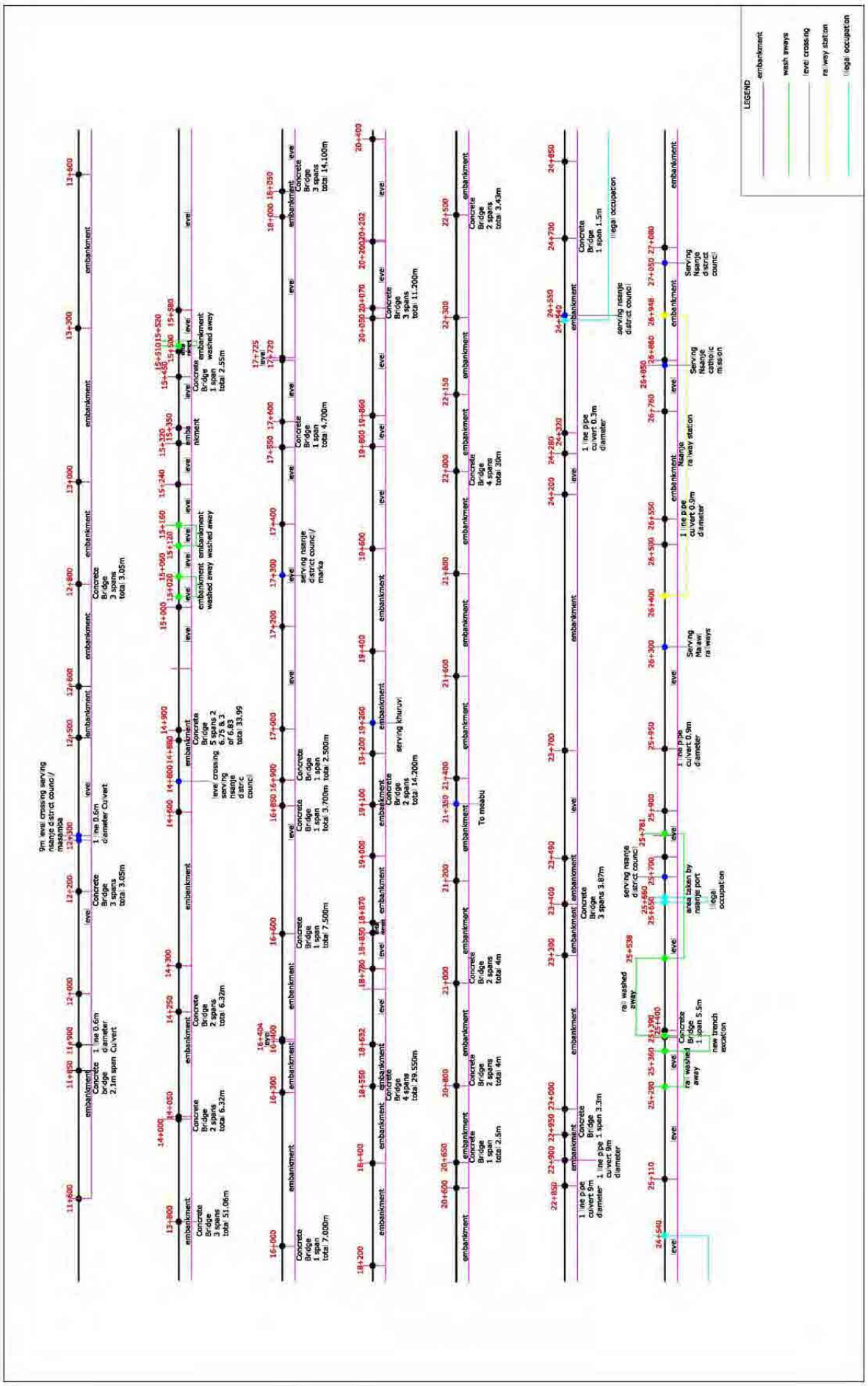


Figure A3-1 (2) Station Diagram (2)

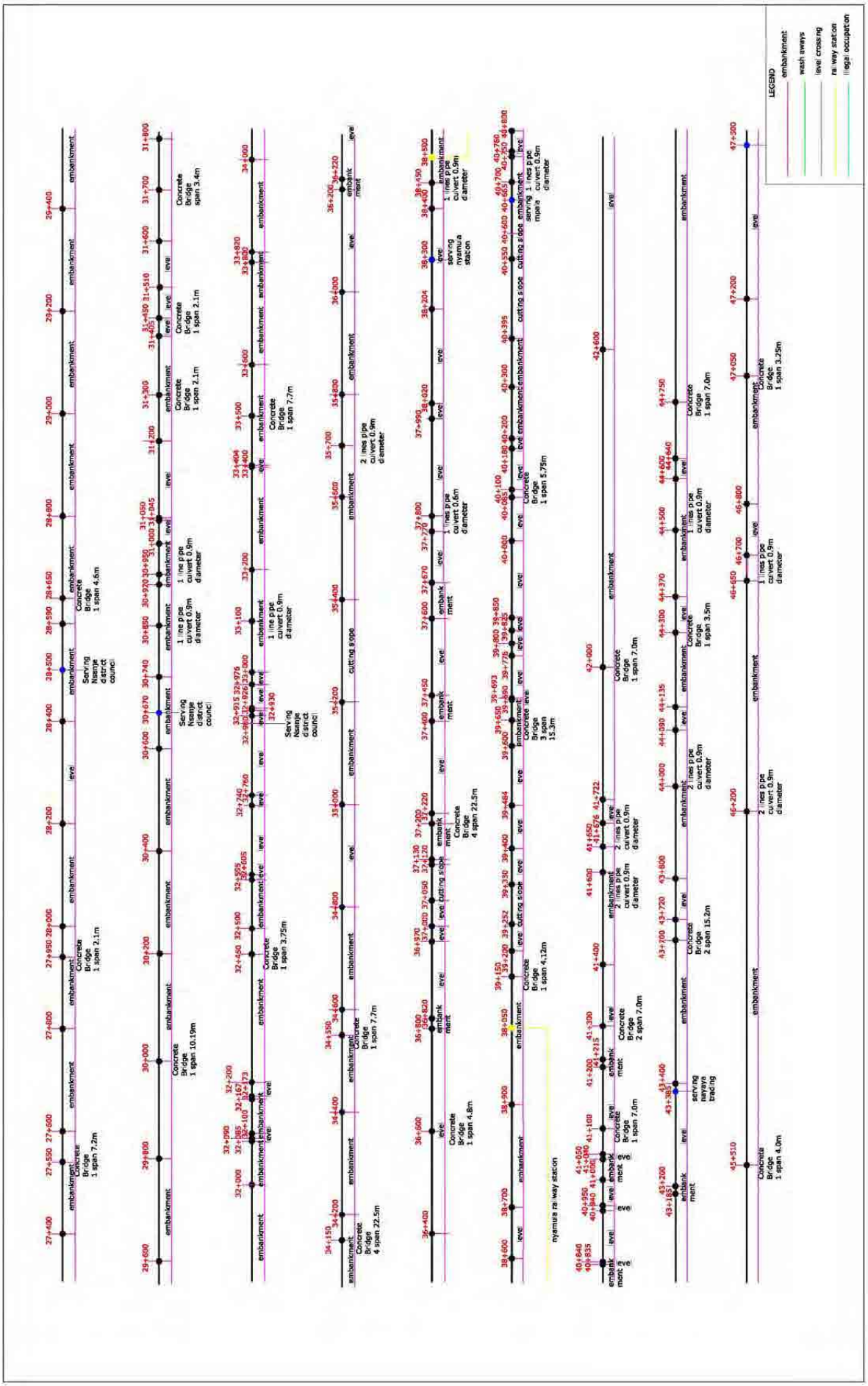


Figure A3-1 (3) Station Diagram (3)

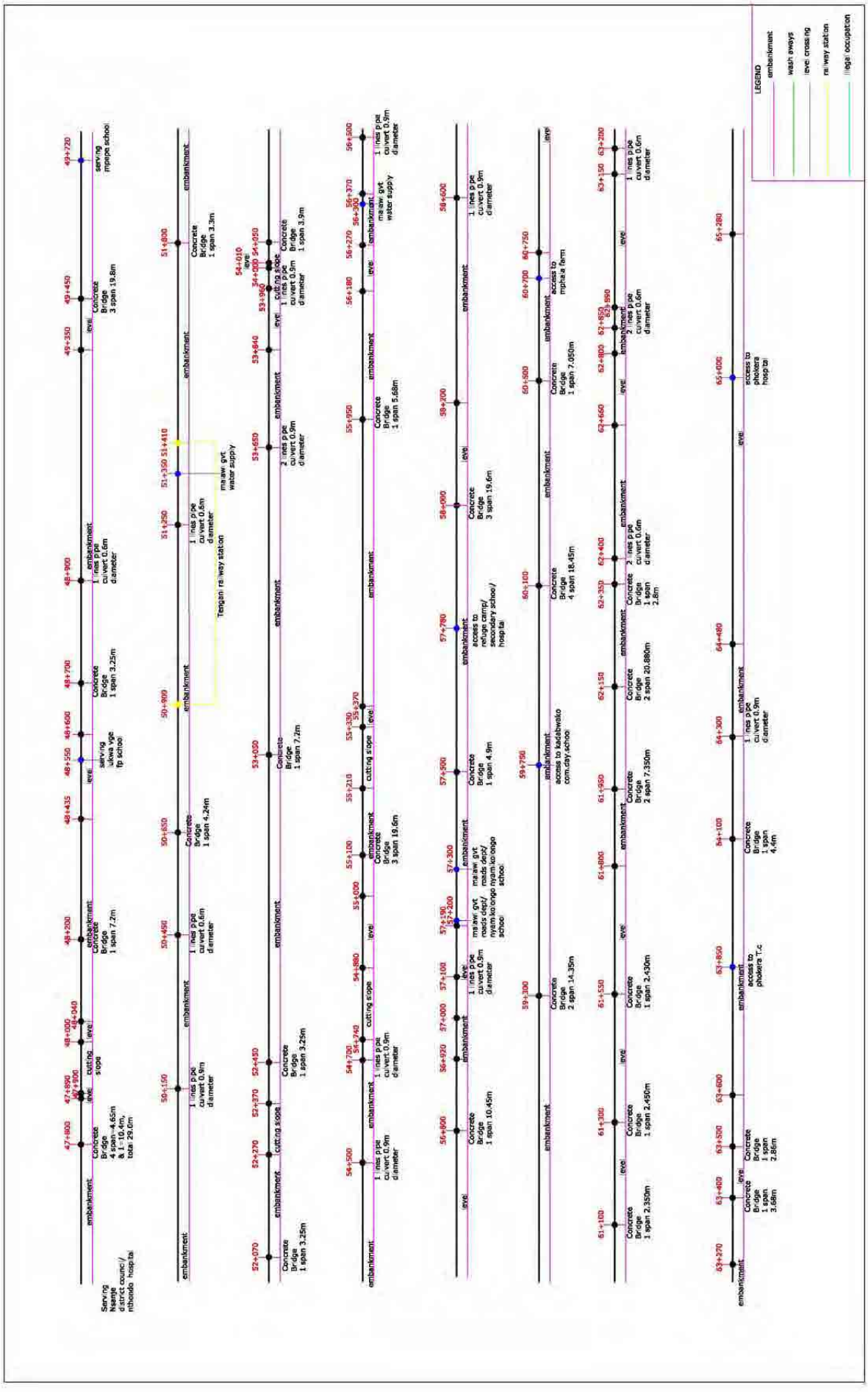


Figure A3-1 (4) Station Diagram (4)

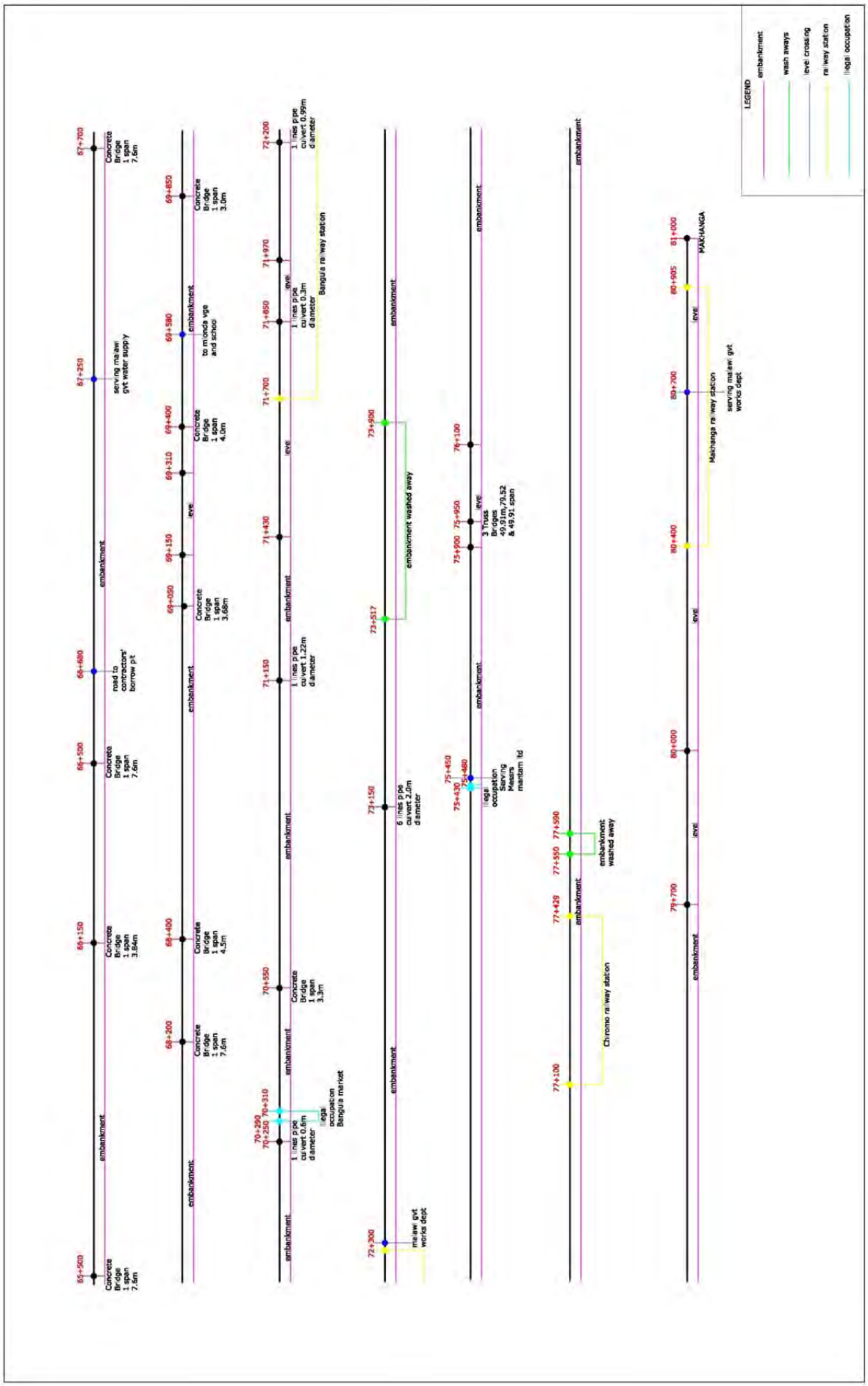


Figure A3-1 (5) Station Diagram (5)

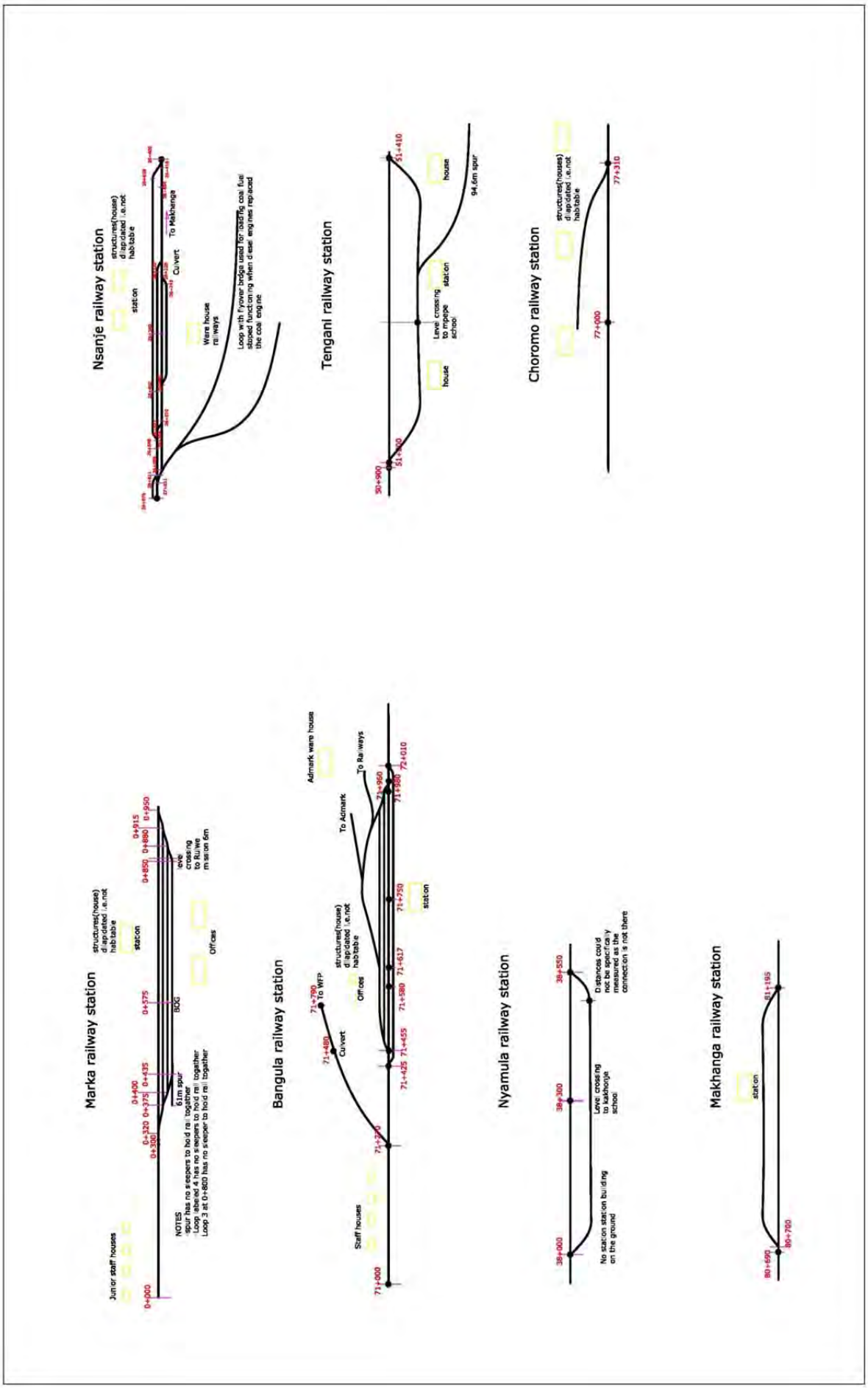


Figure A3-1 (6) Station Diagram (6)

Appendix-4 Comparison of Railway Rehabilitation Costs

Regarding the rehabilitation cost of the railway, the preliminary cost estimates by the Study Team and GOPA conducted in "Malawi Beneficiary Framework Contract Lot 2 - Transport and Infrastructures Technical Assistance to Rail Sector Development, May 2009 (hereafter, GOPA Report)" are compared as follows.

1. Target Section for Rehabilitation

The target section and route length for rehabilitation are shown in Table A4-1.

Table A4-1 Target Section for Rehabilitation

Section	Route Length (km)	
	GOPA*[1]	Study Team*[2]
Limbe – Bangula	130.05	129.30
Bangula – Border	69.96	71.00
Total	200.01	200.30

Source: GOPA Report Annex 4.3.2 and Study Team

Note: *[1] The route lengths are calculated from the rehabilitation cost and unit cost described in GOPA Report Annex 4.3.2, while in Annex 4.2.1, the route length of Limbe – Bangula section is indicated as 128,943 m and the Bangula – Border section as 69,954 m. The route lengths are not consistent in the GOPA Report.

*[2] The route lengths are based on the track inventory by CEAR.

2. Scope of Rehabilitation

The type and quantity of structures to be rehabilitated are shown in Tables A4-2 and A4-3.

Table A4-2 Scope of Rehabilitation (Limbe – Bangula Section)

Type of Structure	Quantity	
	GOPA	Study Team
Track (Rail, concrete sleeper, rail fastening)	all tracks	all tracks
Turnout	all turnouts	all turnouts
Embankment	not specified	identified by the visual check conducted on November 2010
Culvert	not specified	
Bridge beam (with span of less than 5 m)	all bridge beams	
Bridge beam (with span of over 5 m)	all bridge beams	
Existing Kamuzu Truss Bridge	not specified	not included
New Chiromo Railway Bridge at the washaway	not specified	Included

Table A4-3 Scope of Rehabilitation (Bangula – Border Section)

Type of Structure	Quantity	
	GOPA	Study Team
Track (Rail, concrete sleeper, rail fastening)	all tracks	all tracks
Turnout	all turnouts	all turnouts
Embankment	not specified	identified by the inventory survey conducted on November 2010
Culvert	not specified	
Bridge beam (with span of less than 5 m)	all bridge beams	
Bridge beam (with span of over 5 m)	all bridge beams	
New bridges at the washaway at wadi	not specified	included (rehabilitation by PC and RC girders)

Source: GOPA Report Annex 4.3.2 and Study Team

3. Unit Cost of Rehabilitation

The unit costs of GOPA and the Study Team are shown in Tables A4-4 and A４-5. The exchange rate is set at US$1.00 = ¥82.45 in the unit costs of the Study Team.

Table A4-4 Unit Cost of Rehabilitation by GOPA

Category		Item	Unit	Unit Cost (US$)	Remarks
Track	Material cost	Concrete sleeper (PC), fastening	m	92	
		Rail (UIC54)	m	106	
		Ballast (300 mm)	m	90	
		Rail welding	m	94	
		Subtotal	m	382	
	Construction cost	Removal of old track	m	12	
		Substructure works	m	15	
		Track laying	m	19	
		Ballast cleaning	m	29	
		Subtotal	m	75	
	Total		m	457	
Turnout	Material cost	Turnout (UIC54-300-1:12)	unit	80,000	
		Ballast for turnout	unit	5,000	
	Construction cost		unit	12,000	
	Total		unit	97,000	
Bridge beam	Material cost	Bridge beam	piece	240	This bridge beam is assumed to be I-beam or through-girder type.
	Construction cost		piece	175	
	Total		piece	415	
Rail frame replacement			unit	21,000	
Steel bridge renewal			m	130,000	

Source: GOPA Report Annex 4.3.0

Table A4-5 Unit Cost of Rehabilitation by the Study Team

Category		Item	Unit	Unit Cost (US$)	Remarks
Track	Material Cost	Concrete sleeper (PC), fastening	m		
		Rail (50 kg/m Rail) including rail welding	m		
		Ballast (300 mm)	m		
	Construction Cost	Removal of old track	m		
		Substructure works	m		
		Track laying	m		
		Ballast laying	m		Including turnout sections
	Subtotal		m	461	
Turnout	Material Cost	Turnout (#12)	set	80,000	
	Construction Cost		set	12,000	
	Sub-total		set	92,000	
Earth Works		Typical section	m3	26	Repair work
		Chiromo Washaway section	m3	15	New embankment
Bridge Works		PC Girder (20 to 30m)	m	41,300	
		RC Girder (10 to 20m)	m	40,500	
		RC Slab Bridge (5 to 10m)	m	12,200	
		RC Box Culvert (less 5m)	m	27,900	
		Pipe Culvert (φ1m, L=10m)	set	10,400	
		Steel Truss Bridge (80m)	set	15,350,000	
		Steel Truss Bridge (50+80+50m)	set	17,940,000	

Source: Study Team

4. Comparison of Rehabilitation Cost

The rehabilitation costs by GOPA and the Study Team are compared in Tables A4-6 to 4-12. Tables A4-9 and A4-12 show the case in which all bridges are to be replaced. All costs do not include contingency cost (10%).

Table A4-6 Track Rehabilitation Cost by GOPA

Section	Track			Turnout			Total (US$ million)
	Route Length (km)	Unit Cost (US$/m)	Cost (US$ million)	No.	Unit Cost (US$/unit)	Cost (US$ million)	
Limbe – Bangula	130.05	457.31	59.474	31	97,000.00	3.007	62.481
Bangula – Border	69.96	457.31	31.994	9	97,000.00	0.873	32.867
Total	200.01		91.468	40		3.880	95.348

Source: GOPA Report Annex 4.3.2

Table A4-7 Track Rehabilitation Cost by the Study Team

Section	Route Length *1 (km)	Average Unit Cost (US$/m)	Cost *2 (US$ million)
Limbe – Bangula	133.3	519	71.297
Bangula – Border	73.5	514	38.889
Total	206.8	517	110.186

Note: *1 Route length includes sidings.
*2 Cost includes repair cost of embankment, construction cost of turnout and engineering cost (10%).
Source: Study Team.

Table A4-8 Bridge Cost by GOPA

Section	Bridge Beam			Rail Frame			Girder, Truss Bridge			Total (US$ million)
	Qty. (no.)	Unit Cost (US$/no.)	Cost (US$ million)	Qty. (no.)	Unit Cost (US$/no.)	Cost (US$ million)	Qty. (m)	Unit Cost (US$/m)	Cost (US$ million)	
Limbe – Bangula	1,479	415	0.614	55	21,000	1.155	1,109	130,000	144.127	145.896
Bangula – Border	844	415	0.350	35	21,000	0.735	482	130,000	62.717	63.802
Total	2,323		0.964	90		1.890	1,591		206.844	209.698

Source: GOPA Report Annex 4.3.3

Table A4-9 Bridge Cost by the Study Team
Case 1: Replacement of Degraded Bridges

Section	Other Bridges			Truss Bridge			Total (US$ million)
	Qty. (m)	Unit Cost (US$/m)	Cost (US$ million)	Qty. (m)	Unit Cost (US$/m)	Cost (US$ million)	
Limbe – Bangula	309	37,440	11.569	230	73,413	16.885	28.454
Bangula – Border	356	45,458	16.183	0	0	0	16.183
Total	665	41,732	27.752	230	73,413	16.885	44.637

Source: Study Team.

Table A4-10 Bridge Cost by the Study Team
Case 2: Replacement of All Bridges

Section	Other Bridges			Truss Bridge			Total (US$ million)
	Qty. (m)	Unit Cost (US$/m)	Cost (US$ million)	Qty. (m)	Unit Cost (US$/m)	Cost (US$ million)	
Limbe – Bangula	1,191	45,110	53.726	410	89,324	36.623	90.349
Bangula – Border	1,480	39,471	58.417	0	0	0	58.417
Total	2,671	41,985	112.143	410	89,324	36.623	148.766

Source: Study Team.

Table A4-11 Summary of Rehabilitation
Case 1: Replacement of degraded bridges

Section	GOPA			Study Team		
	Track Cost (US$ million)	Bridge Cost (US$ million)	Total (US$ million)	Track Cost (US$ million)	Bridge Cost (US$ million)	Total (US$ million)
Limbe – Bangula	62.481	145.896	208.377	71.297 (114.1%)	28.454 (19.5%)	99.751 (47.9%)
Bangula – Border	32.867	63.802	96.669	38.889 (118.3%)	16.183 (25.4%)	55.072 (57.0%)
Total	95.348	209.698	305.046	110.186 (115.6%)	44.637 (21.3%)	154.823 (50.8%)

Note: Figure in parentheses indicate percentage of rehabilitation cost of the Study Team compared with GOPA Report.
Source: GOPA Report Annex 4.3.2 and Study Team

Table A4-12 Summary of Rehabilitation
Case 2: Replacement of all bridges

Section	GOPA			Study Team		
	Track Cost (US$ million)	Bridge Cost (US$ million)	Total (US$ million)	Track Cost (US$ million)	Bridge Cost (US$ million)	Total (US$ million)
Limbe – Bangula	62.481	145.896	208.377	71.297 (114.1%)	90.349 (61.9%)	161.646 (77.6%)
Bangula – Border	32.867	63.802	96.669	38.889 (118.3%)	58.417 (91.6%)	97.306 (100.7%)
Total	95.348	209.698	305.046	110.186 (115.6%)	148.766 (70.9%)	258.952 (84.9%)

Note: Figure in parentheses indicate percentage of rehabilitation cost of the Study Team compared with GOPA Report.
Source: GOPA Report Annex 4.3.2 and Study Team

5. Findings

The total rehabilitation costs by GOPA are found to be more expensive than those by the Study Team. The costs could be reduced to 50.8% or 84.9% of those by GOPA.

Matters concerning the cost estimate by GOPA are summarised as follows:

- The unit costs for plate girder and steel truss bridge use the same value of US$130,000/m.
- The repair cost of embankments is not clear. These would be included in substructure works in the track construction cost.
- The repair cost of culverts is not clear. These would be included in the bridge beam cost.
- The rehabilitation cost for the washaway at Chiromo is not clear. It should be included.

Appendix-5 Results of Socio-Economic Survey

1. Outline of Socio-Economic Survey

As part of the Initial Environmental Evaluation (IEE) for the pre-Environmental Impact Assessment for the proposed priority projects, the socio-economic survey was conducted as follows:

(1) Survey period:

25th November, 2nd December and 7th December, 2011

(2) Survey Area:

Bangula, Makhanga and Chiromo (See Figure A5-1); the survey focus on the section between Makhanga and Bangula, in which both road and railway projects are proposed.

(3) Sample: 16 Households;

The survey focuses on 1) members of the boat association and bicycle taxi association at the disconnection, 2) farmers and irrigation schemes in Chiromo, 3) vendors at the disconnection and Makhanga, and 4) flood damage. The survey samples are 3 boat owners, 2 boat operators, 2 vendors at the disconnection, 1 bicycle taxi driver, 1 vendor/businessman at Makhanga Market, and 7 farmers (including 6 irrigation scheme participants).

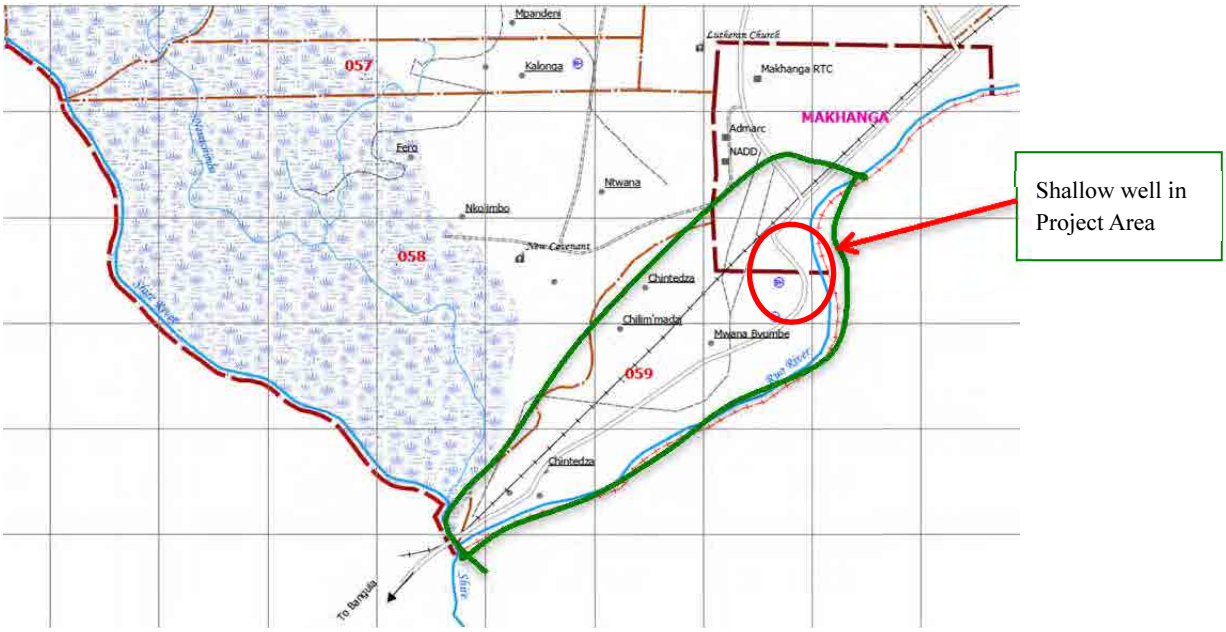
(4) Questionnaire

The questionnaire includes 6 sections, namely, 1) General information, 2) Farmer's information, 3) Fisherman's information, 4) Boat association and bicycle taxi association, 5) Vendor's information, and 6) Flood damage.

In addition to the questionnaire survey, demographic data, GIS data from the Population and Housing Census 2008, agricultural data, and land use information were collected from the field. The results of questionnaire survey and field investigation are described in the following sections.

2. Project Area and Affected Population

The project area in Makhanga and Chiromo is shown in Figure A5-1 (green lined area). In this area, there are around 373 households (1,639 people). Table A5-1 provides statistical data on population and households in the affected area in Makhanga and Chiromo. There are two boreholes near the road (marked red in Figure A5-1). One shallow well is situated around 20 m from the centre line of the road (Photo A5-1). The road is very close to the Ruo River near the borehole, around 30 m from the Ruo River. The Ruo River in this section has been moving toward the Malawian side recently.



Source: National Statistical Office and Study Team

Figure A5-1 Project Area in Makhanga and Chiromo

Table A5-1 Population in the Project Area

EA	Location	Village/Infrastructure	No. of Households	Population
Makhanga-Chiromo				
EA 059	Chiromo	Chintedza, Chilim'madzi, Mwana Bvumbe,	127	614
EA 802	Makhanga TPA	Mwana Bvumbe, Makhanga Trading Centre	246	1,025
Sub-Total			373	1,639
EA 058	Elephant Marsh	Fero, Nkolimbo, Ntwana	315	1421
EA 801	Makhanga TPA	EPA, Maie Mill, RTC	85	342
EA 803	Makhanga TPA	Railway House, Mwana Bvumbe	313	1,533
EA 804	Makhanga TPA	Health Centre	230	1,156
EA 805	Makhanga TPA	Primary School	153	649
Makhanga Total			1,469	6,740
Bangula				
EA 019	Elephant Marsh	Chikanzi, Mpisamanja	67	332
EA810	Bangula TPA	Kampila, Blaiton, Sabola, Chapsasuka	205	1,013
EA 809	Bangula TPA	Mwanabowa, Filling Station, Old Market	259	1157
EA807	Bangula TPA	Kalenso, Railway Station, Great Lakes Cotton Ginnery	197	929
Bangula Total			728	3,431
Grand Total			2,197	10,171

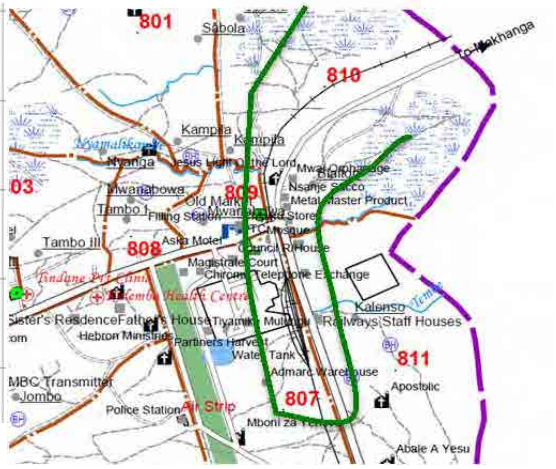
Source: Data from National Statistical Office

Notes: EA means enumeration area, i.e., the area of statistical boundary, not the village boundary. TPA means Town Planning Area, and there are Makhanga TPA and Bangula TPA in the Project area.

Photo by Study Team, December 2011

Picture A1-1 Shallow well near the Road in Makhanga

On the Bangula side, the project area is shown in Figures A5-2 and A5-3 (green-marked line). The section of road project is up to the crossing of the M1 in Bangula, while the section of railway project between Bangula and Makhanga is up to Bangula Station. Except the area near the railway crossing and old market, there are few houses situated near the road and railway line.



Source: National Statistical Office and Study Team

Figure A5-2 Project Area in Bangula **Figure A5-3 Project Area in Bangula TPA**

In Bangula, the market is situated near the railway crossing and the roundabout between the M1 and S151. In Bangula Station, there is a ginnery of Great Lakes Cotton, who rent warehouses from the GoM (one warehouse was granted from the GoJ in 1991) and the Illovo (Photo A5-2). The station is not used since 1997, and there are some unused sidings connect to those warehouses (Photo A5-3).

Photo A5-2 Cotton Warehouse and Water Tank

Photo A5-3 Railway Siding to Great Lake Cotton Warehouse

Photo by Study Team, November 2011

3. Results of Interview

(1) Boat Association

a) Organization

A boat association (or boat group) at the disconnection was originated from the former fishing group and started to operate after the washaway in 1997. It was told that most members are former fishermen, but in the survey, they had various previous occupations, such as bicycle taxi drivers, day labourers, farmers, and fishermen. There are currently about 68 members in the association, and boat owners employ an oarsman to operate a boat. Most boat owners have 2-3 boats, and around 10 boats are operating in shifts at the Chiromo washaway There is a Chairman in the boat association, and a Committee comprising 2 secretaries, 1 treasurer and 5 members. A regular meeting is held once a week to discuss issues at stake, and run the business. The treasurer keeps money raised from the boat business in a bank. The oarsmen hold a meeting every month on hygiene issues. There is a small meeting place for the boat association (Photo A5-4) and at a boat landing place (Photo A5-5) of the Chiromo washway.

The membership fee is MWK1,000 for boat owners when they join the association, while an oarsman need to pay MWK20/day to the association. In addition to the fee for the association, boat owners need to pay MWK3,000/year to the Marine Department. Oarsmen earn MWK50 per pass, and the rest of the money goes to the boat owners. Boat owners are entitled to work for 5 to 8 days per month in shifts, while oarsmen normally work 3 days a week. The association charges MWK100 for business people to cross the Chiromo washaway, while MWK10 and MWK50 are charged for farmers and one sack of agricultural products, respectively.

b) Income from Boat Operation

Due to the limited sample, it is not possible to calculate the average income of boat owners and oarsmen. However, the survey found that boat owners earn around MWK1,000/day (or MWK116,000/year). Oarsmen earn MWK400-800/day (or MWK86,400/year). An oarsman crosses by 8-10 times per day at the Chiromo washway, and carries 48 passengers, 21 bicycles,

20 sacks of agricultural products, and 13 drums of fuel per day on average. From the Makhanga side, food crops(maize, rice, potato, mango, banana, cassava, pineapple, avocado, orange, and paw -paw) and cotton are normally carried, while grocery, fuel, fish (chambo and solmon fish) are usually carried from the Bangula side.

c) Future Occupation

The survey asked both boat owners and boat operators about their preferred future occupation if Chiromo washway is connected. Boat owners answered that they preferred to do another business such as selling fish and agricultural crops and running a minibus business by using a driving license, while oarsmen prefer to work in their previous and current jobs, i.e., farmers and fishermen.

Photo A5-4 Meeting Place for Boat Association

Photo A5-5 Boat and Landing Place on Bangula Side of the Chiromo Washway

Photo by Study Team, November 2011.

(2) Agricultural Production and Land Use in Makhanga

The Study Team collected data on agricultural production and irrigation schemes from the Makhanga Extension Planning Area (EPA), which is equivalent to the area of TA Mlolo. Makhanga EPA is answerable to the District Agriculture Development Officer (DADO), who is answerable to the Sector Manager of the Agriculture Development Division (ADD) in Ngabu. The area of Makhanga EPA is 36,082 ha, of which arable land is 21,500 ha. Currently, 8,494 ha are cultivated (Table A5-2). Thus, arable land that is not cultivated are around 13,006 ha. Major food crops are maize, sorghum, millet, and cassava, while major cash crops are cotton, pigeon pea, rice, groundnut, and cow peas.

In the survey area in Makhanga and Chiromo, most residential areas are situated upland from the railway line and near the Makhanga Trading Centre (TC). It was reported that some households near Chiromo moved to the upland due to the increase of floods in Chiromo. Most agricultural land is situtated near the Ruo River and near the March area. Some agricultural land is irrigated with water from the Ruo River, the Shire River, Elephant Marsh, and groundwater, using a treadle irrigation pedal and a pumping engine.

Table A5-2 Description of Makhanga EPA

Area of EPA	36,082 ha
Arable Land	21,500 ha
Cultivated land	8,494 ha
Arable Land not cultivated	13,006 ha
Average holding size	0.4 ha
Marsh	12,000 ha
Masenjere forest	1,100 ha
Area not used	14,488 ha
Major Crops: Food Crops	Maize, Sorghum, Millet, Cassava
Major Crops: Cash Crops	Cotton, Pigeon pea, Rice, Groundnut, Cow pea,
Fruit	Mango, Orange, Banana, Paw-paw,Tankerint, Lemon, Avocado
Vegetable	Cabbage, Tomato, Onion, Rape, Mustard

Sources: Data from Makhanga EPA

The main agricultural crops in this area are maize, sweet potato, beans, and cotton. The average agricultural land among the surveyed farmers is 1.1 ha (0.4 ha on average in the Makhanga EPA area). About half of the farmers surveyed sell maize to local markets, but maize is the main food crop and mostly consumed by households. The price of maize ranges from MWK25/kg to MWK50 /kg. The average yield of maize in this area is estimated at 1,527 kg/ha in 2011/10 (See Table A5-3), which is lower than the national average of 1,709 kg/ha (National Census of Agricultural Livestock 2006).

Table A5-3 Agricultural Production Estimate: Makhanga EPA

Crop	2010/2011			2008/2009		
	Area (ha)	Yield/ha (kg)	Production (tonne)	Area (ha)	Yield/ha (kg)	Production (tonne)
Irrigated Rice	192	4,167	800	192	4,167	800
Local Rice	56	1,086	61	68	1,230	84
Improved Rice	492			1,646	1,892	1,222
Groudnuts	152	842	128	255	741	189
Sweet potato	1,034	1,270	12,532	780	1,270	9,984
Cassava	256	10,224	2,517	212	11,391	2,415
Cotton	1,451	739	1,072	1,768	1,106	1,955
Cow pea	1,021	426	435	958	476	456
Pigeon Pea	624	500	202	629	540	340
Maize	9,346	1,527	14,923	8,749	1,053	9,211
Sorghum	692	500	346	323	836	270
Tomato	180	18,000	324	17	19,500	332
Cow Pea Leaves	188	780	147	185	780	144

Sources: Data from Makhanga EPA

The main cash crops in this area are cotton, cowpea, and rice. The prices of cash crops are MWK120-200/kg for cotton, MWK40 for rice, and MWK60-80 for cowpea respectively. Cotton is the main cash crop produced in TA Mlolo and TA Mbenje. The estimated annual incomes from cash crops among the surveyed samples are MWK72,000-140,000 from cotton, MWK10,000 from rice, MWK4,500-120,000 from cowpea respectively. The price of cotton on the market increased last year from MWK35/kg to MWK200/kg, which motivated many

farmers to increase the land dedicated to growing cotton in the Lower Shire Valley. The land for growing cotton went up from 10,000 ha in 2008 to 29,000 ha last year, and up to 82,000 ha this year in the Lower Shire Valley of Chikwawa and Nsanje districts[4]. The GoM has a plan to increase the number of cotton farmers by 300% in the 2011/2012 growing season.

6 out of 10 farmers surveyed, participated in irrigation schemes. There is the Chiromo 1 irrigation scheme (19 ha), Chiromo 2 irrigation scheme (8 ha), and Chitsukwa irrigation scheme (350 ha) near the project area (Table A5-4). The Chiromo 1 irrigation scheme is situated between the Ruo River and the road, using a pumping engine to take water from the Ruo River (Figure A5-4, Photos A5-6, A5-7). In the survey, 2 surveyed farmers participated in the Chiromo 1 irrigation scheme and produced 500-600kg of maize this year. However, the pumping engine had frequent breakdowns and the current shortage of diesel affected the operation of the pumping engine. The Chiromo 2 irrigation scheme started 5 years ago and is situated between the former Chiromo Station and Elephant Marsh. Two farmers surveyed participated in the Chiromo 2 irrigation scheme, in which treadle-pumping pedals are utilised to pump up water from groundwater. A canal is also used to take water from Elephant Marsh (Photos A5-8, A5-9).

Table A5-4 Irrigation Scheme in Makhanga EPA

No.	Name of Sites	Crops	Area (ha)	Beneficiaries			Irrigation System	Location
				Household Headed by Men	Household Headed by Women	Total Households		
1	Chitsukwa	Maize	350	841	1,159	2,000	Treadle Pump	3 km from Makhanga
2	Mlewa	Maize	162	912	708	1620	Treadle Pump	
3	Njale	Maize	22	107	69	176	Treadle Pump	
4	Nyank'ona	Maize	21	109	104	213	Treadle Pump	
5	Chiromo 1	Maize	19	16	10	26	Engine	Between the Ruo River and the Road in Chiromo
6	Chiromo 2	Maize	8	40	26	66	Treadle Pump	Between the Marsh and Chiromo Station
7	Makhapha	Maize	18	57	69	124	Treadle Pump	
8	Makombe A	Maize	11	39	26	65	Treadle Pump	
9	Chinekwe	Maize	11	55	45	100	Treadle Pump	
10	Jokonia	Maize	10	25	35	60	Treadle Pump	
11	Chinyanje	Maize	15	63	79	142	Treadle Pump	
12	Ruo	Maize	18	96	89	185	Treadle Pump	
13	Muona	Rice	250	1,473	222	1,695	Gravity	
14	Masenjere	Rice	125	220	247	467	Gravity	
15	Nmodzi	Maize	6	28	21	49	Treadle Pump	
16	Mbwazi	Maize	1.2	9	4	13	Treadle Pump	
17	Moloseni	Maize	6.7	35	22	57	Treadle Pump	

Sources: Data from Makhanga EPA and Study Team

Note: Yellow-marked schemes are situated near the project area.

Two harvests of maize during the dry season were made available for participant farmers,

[4] Sunday Times, 11 December 2011

which significantly improved food security and the livelihoods of participating farmers during the dry season. The first harvest starts from April to July, and the second from July to October. However, there is a shortage of food during the rainy season, due to the flood damage. The Dowa irrigation scheme was not listed in Table A5-4, but started last year, and is situated along the Ruo River and near the EPA office. A farmer uses a treadle-pumping pedal to pump up water from the Ruo River during the season between September and November. Cotton is harvested during the rainy season and there is no irrigation scheme to produce cotton. However, the GoM has been reviewing the possibility of cultivating cotton through irrigation during the dry season under the green belt initiative. AfDB will finance four irrigation schemes in Nsanje District, including the Chitsukwa irrigation scheme (interview with ADD in Ngabu). According to an interview with ADD in Ngabu and EPA in Makhanga, the project area has a huge potential to expand irrigation using water from the Ruo River, Shire River, and Elephant Marsh.

Photo A5-6 Chiromo 1 Irrigation: Canal

Photo A5-7 Chiromo 1 Irrigation: Engine Pumping

Photo A5-8 Chiromo 2 Irrigation: Well to Take Water for Irrigation

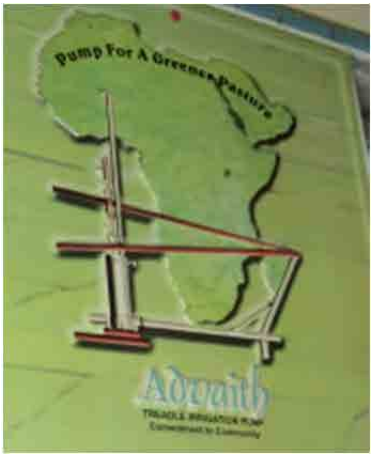
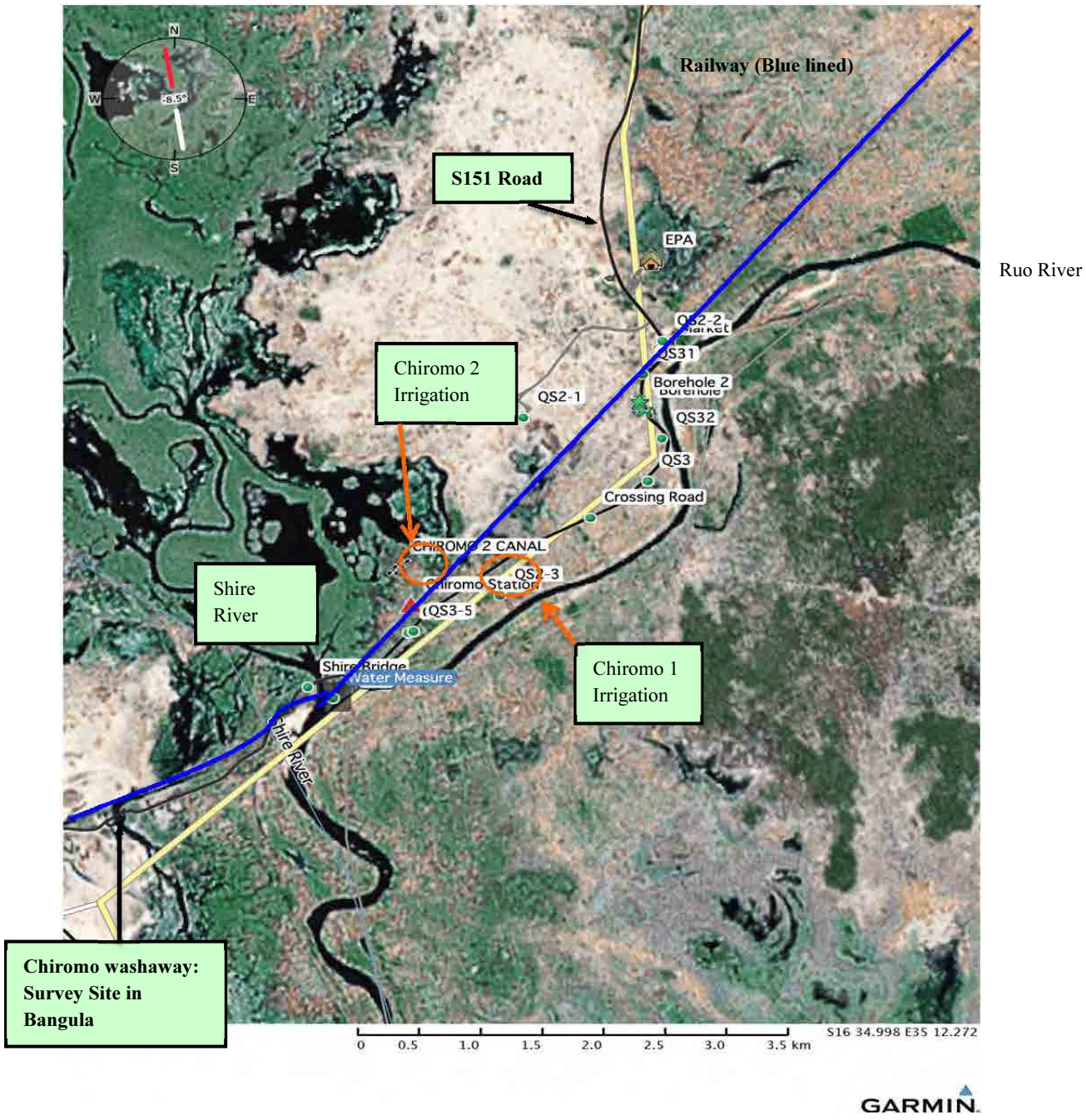


Photo A5-9 Drawing of Treadle Irrigation Pedal

Photo by Study Team, December 2011.



Source: Study Team

Figure A5-4 Surveyed Area

Most farmers surveyed use a bicycle to transport their agricultural crops, while around half of them use an oxcart. Before the Chiromo washaway, 3 out of 10 farmers used to transport their crops by train. In Makhanga, most farmers cannot transport their crops all year round, and they are forced to use a boat, mostly rented by a boat owner, to transport their crops during the rainy season (January, February, and March). The main problems in farming among the farmers surveyed are 1) the shortage of diesel to pump up water for irrigation and frequent breakdown of engines, 2) the availability of inputs such as seeds, fertilizers, and treadle irrigation pedals, 3) droughts and floods, and 4) damage by insects and hippos.

(3) Bicycle Taxi Association

As in the case of the boat association, a bicycle association has been formed at the Chiromo washaway. There is a Chairman and a Committee to run the bicycle taxi business and help the members in case of a funeral. There is a meeting once a week in Bangula Market. There are about 200 members in the bicycle taxi association. The membership fee is MWK3,000, and the member is given a number plate after joining. Bicycle taxi pedaler normally take a customer from the Chiromo washway to Bangula Market, hospital in Mission, and so on. A bicycle pedaler surveyed in Bangula works every day and earns MWK1,000 per day. The fee is MWK50 for one drive, but he charges MWK850 for a ride to the hospital in Mission. The annual estimated income is around MWK336,000. He carries 10 passengers and 5 sacks of agricultural crops such as maize, rice, cotton, dry fish, and mango per day on average. He stated that he would like to continue to work as a bicycle taxi driver if Chiromo washway is connected. It is expected that the number of customers for bicycle taxi pedaler may decrease to some extent after reconstruction of road and railway between Bangula and Makhanga, due to the improved transport access. It is expected that the impact of the reconstruction between Bangula and Makhanga on bicycle taxi drivers may not be significant.

(4) Vendors

The survey interviewed 7 vendors who sell products at the Chiromo washaway (the Bangula side), at Makhanga Market, and at the Kamuzu Truss Bridge, and at Muara beach[5]. The number of vendors at the disconnection, at Makhanga Market, at the Kamuzu Truss Bridge, and at Muara beach is about 4, 50, 2, and 12 respectively. There is no association among vendors, except for vendors at the Kamuzu Truss Bridge. One vendor at Makhanga Market is also a businessman, selling various items in a shop and transporting goods from Blantyre. His income is extremely high compared to other samples, so his figure was excluded when calculating the average income. The average daily income of vendors surveyed is MWK2,100, ranging from MWK600 to MWK2,500. Vendors at the disconnection and the Kamuzu Truss Bridge sell drinks, tobacco, and foods for local residences. A vendor at the Kamuzu Truss Bridge used to sell agricultural products at the market near the former Chiromo Station. This previous market in Chiromo was very active and a hub of regional economic activities in this area. But after the Chiromo washaway in 1997, he moved to the Kamuzu Truss Bridge to sell his product since this his shop is located between Makhanga and Bangula. He also used to use a train to sell his products at Limbe. At Makhanga Market, vendors are required to pay MWK40/day to Nsanje District Assembly.

(5) Fishermen

It is reported that the number of fishes has decreased by around 50 %, compared to 10 years ago. There is no fish farm around the project area and no plan to introduce a fish farm in the project area. Fishermen need to pay MWK350/year for a fishing license. One fisherman earns

[5] According to the interview, the beach is a place to sell fish between the river and river bank.

MWK6,000 per month from the Shire River, while other earns MWK4,500 per day.

(6) Flood Damage

Table A5-5 shows data on flood damage at the houses and farms surveyed. Figure A5-4 shows a location of one house surveyed. There are several floods every year in the Makhanga-Chiromo area. The most significant floods in the Chiromo area occurred in 1976, 1989, 1997, and 2009, which indicates that major floods return almost every 10 years. The house between the railway and the road near the Chiromo Station (QS3-4) was totally destroyed by backwater mainly from the Shire River, with an inundation of about 2 m in 1997. On the other hand, the house between the road and the Ruo River (QS3-5) near Chiromo Station was normally damaged by flood from the Ruo River. Photo A5-10 shows a house near Chiromo Station, which was damaged by floods from the Ruo River. Due to the frequent floods, some people raised a platform to protect their house from flood damage (Photo A5-11). The house shown in Photo A5-11 escaped inundation from the 2009 flood, although his potato garden near his house, which is lowland along the Ruo River, was totally disappeared under 2 m of flood water (Photo A5-12). In the Makhanga area, floods were reported in various years, especially after 2000 (1989, 1997, 2001, 2002, 2004, 2007, 2009). In this area, the inundated water level is about 50 cm to 1 m at the house.

Table A5-5 Flood Damages

Samples	Flood Damage: House				Flood Damage: Farm			
	Damage	Inundation (cm)	Location	Year	Damage	Inundation (cm)	Location	Year
QS2-2	Partially inundated	100	Market	2006				
EPA	Partially inundated	150	0.9 km from Ruo	1989				
QS 2-1	Totally destroyed	300	Chiromo Station (former house)	1997	Totally destroyed	300	Near Chiromo Station	1997
QS 2-3					Totally destroyed	100	Chiromo 1	2009
QS 3-1	Partially destroyed	50	Makhanga	1997	Partially destroyed	100	Near EPA	1997
QS 3-2	Totally destroyed	100	Makhanga	1989	Totally destroyed	150	Near EPA	1989
QS 3-3	Partially destroyed	100	Between Chiromo /Makhanga	1999	Totally destroyed	200	Near House	1999
QS 3-4	Totally destroyed	200	Chiromo Station	1997	Totally destroyed	300	Chiromo 2	1997
QS 3-5	Totally destroyed	60	Chiromo Station	1989	Totally destroyed	200	Chiromo 2	1989

Sources: Study Team

People in the Makhanga and Chiromo area need to use a boat during the rainy season to transport agricultural crops such as maize, potato, and peas, and to buy groceries from the

Makhanga Market. A farmer near the former Chiromo Station said that he often uses a rented boat to take his children to Makhanga primary school during the rainy season. The rented boat costs MWK100/day, which is a heavy burden for local people. In addition, farmers near the former Chiromo Station often evacuated to the station platform and built a temporary hut on the railway platform. Flood water did not reach the level of the railway line, but only in 1989 and 1997, water did reach over the railway line and local people had to evacuate to Bangula.

Photo A5-10 House damaged by Flood near Chiromo Station: Mud in Brick was Removed by Flood Water

Photo A5-11 House with Raised Platform: Water Reached to Indicated Level, but House was not Inundated in 2009 Flood

Photo A1-12 Potato Farm: A Farmer shows a water level of 2 m in the 2009 flood

Photo A1-13 House near EPA in Makhanga: Water Reached in Middle of the Window in 1989

Photo by Study Team, December 2011.

(7) Limbe-Luchenza Railway Line

A field investigation was carried out to understand land use and the socio-economic situation along the railway line and to examine environmental and social considerations in this section. Table A5-6 shows a geographical location of each Station, Namiango Market, and a railway crossing at Limbe. The following are the major findings:

- There are three level crossings with paved roads. The first level crossing is located near Limbe Station with M4. A warning bell is installed, but it is not functioning. Other railway crossings are located between Nansadi Station and Makande Station, and just before Luchenza Station, with M2 but there is no facility to indicate a level crossing. There is a

relatively high level of traffic at the level crossings at Limbe with M4 and Luchenza with M2.

- There is no village and market around Malabvi market. The Station is not utilised at the moment and its building is severely ruined (Photo A5-14). Nansadi Station has no station master deployed, some passengers use the railway. Local people reside inside Makande Station, which may help keep the station building from structural damage (Photo A5-15).
- There are some small scale markets in Namiango, which is situated 4.8km from Limbe Station (Photo A5-16, Photo A5-17). There are several villages near the market. Most shops are temporary and their products are sold on the ground, but about 10 shops are built with concrete structure. These concrete structured shops are situated 8-10 m from the railway line. Many people gather in Namiango market where vendors sell drinks, tomatoes, cabbages, mangos, dry fish, etc. This market is not managed by the District Assembly, but it is informal.
- A lot of agricultural land has extended to the ROW of the railway line between Limbe and Luchenza (Photo A5-18). This extended field obstructs the operation of the railway.
- There are several houses in the suburb of Limbe along the railway line, but most houses are situated more than 5 m from the railway (Photo A5-19). One latrine near informal markets in Namiango are situated 2-3 m from the railway line (Photo A5-20). In addition, there is a cemetery near Namiango, at a distance of about 3 m from the railway line (Photo A5-21).
- Some livestock such as cows, and goats, and small animals appeared during the site survey (Photo A5-22). According to the driver, some livestock and small animals frequently appeared on the railway line in this section, and it is sometimes difficult to avoid them when driving a train.

Table A5-6 Geographical Location of Limbe-Luchenza Railway Line

From	GPS	To	Distance (km)	Up (m)	Down (m)
Limbe	S15 48.959 E35 03.723	Level Crossing in Limbe	2.1	83	31
Level Crossing in Limbe	S15 49.718 E35 04.390	Namiango Market	2.7	0	58
Namiango Market	S15 50.831 E35 04.747	Malabvi	6.4	1	110
Malabvi	S15 51.460 E35 07.133	Nansandi	12.3	9	165
Nansandi	S15 53.444 E35 12.263	Makande	10	19	94
Makande	S15 56.868 E35 15.512	Luchenza	11.2	52	82
Luchenza	S16 00.525 E35 18.378				

Source: Study Team

Photo A5-14 Malabvi Station

Photo A5-15 Makande Station

Photo A5-16 Market in Namiango 1 : About 10 Structured Shops are Situated along the Railway Line

Photo A5-17 Market in Namiango 2: Many People are Gathered in the Market

Photo A5-18 Agricultural Field Close to the Railway Line

Photo A5-19 Houses in the Suburb of Limbe Along the Railway Line

Photo by Study Team, November 2011

Photo A5-20 Latrine near Namiango Market

Photo A5-21 Cemetery between Limbe and Namiango Market: Some flowers on Grave

Photo A5-22 Cow which Appeared on the Railway Line

Photo by Study Team, November 2011

Appendix-6 Discussion Memos for the Technology Transfer Seminar

6.1 Discussion Memo for the First Technology Transfer Seminar

(1) Discussion Memo for the First Seminar in Lilongwe

The First Technology Transfer Seminar (Lilongwe)
The agenda of the seminar is given in Annex 1.

A list of participants is given in Annex 2.

Venue: Pacific Room, Pacific Hotel, Lilongwe
15th April, 2011 (Friday), 9:00 – 12:30

Items Discussed

1. Opening address by Mr. Geoffrey Magwede, Controller of Rail Transport Services, MoTPI
2. Items discussed between participants and the project team

(1) Mozambique High Commission

a) The railway between Beira Port and Moatize has already been improved and this railway line is called the "Sena Development Corridor" in Mozambique. I understand the meaning of the Sena Corridor in Malawi from a technical point of view, but the naming of the Sena Corridor could cause a conflict between the two governments from a political point of view.
b) In order to facilitate coal transportation to Nacala Port, the MoU between the GoM and Vale will be signed soon. Please consider this situation.
c) The GoMZ is currently upgrading the road section between Milange and Mocuba (150 km). When this road is improved, this route will be an alternative transport route for Malawi to an ocean port, Quelimane Port.

(Response by the Study Team)

a) Based on the understanding that the Sena Corridor is a branch line of the Sena Railway from Dona Ana to Malawi, the Study Team proposed the development of the Sena Corridor in Malawi.
b) In the Study, the Study Team considers 18 million tonnes/year of coal transportation from Moatize coal mine to Nacala Port.
c) The Study Team understands that the road between Milange and Mocuba is being improved. However, the size of Quelimane Port is small and there is a problem of shallow draft. Since main liners will call at Nacala Port and Beira Port in the future, it is considered that Quelimane Port will handle limited commodities with China and India by small feeder liner.

(Response by Mr. Magwede)

a) The GoM recognises that the railway line connecting to Malawi is a branch line of the Sena Railway in Mozambique. On the other hand, the new railway line from Moatize will connect to the Nacala Railway and will become a part of the Nacala Corridor. Hence, it is necessary to consider the impact for the whole Nacala Corridor including Zambia, which is a part of Nacala Corridor country. Regarding the naming, the same as the Nacala Railway is a part of the Nacala Development Corridor, transport modes including the Sena Railway can be considered as a part of the Sena Development Corridor.

(2) World Bank

a) Does the Study Team consider the Green Belt Initiatives supported by the World Bank and other agricultural development programmes in the poor Southern Region?
b) There are several corridor development programmes in Malawi. It is important to find projects that will contribute to development in the Southern Region based on the future traffic demand.
c) Is there any development programme for Nacala Port, since major transport operators wish to use Nacala Port and Nacala Railway?

(Response by the Study Team)

a) The Study Team has considered the Green Belt Initiatives for irrigation for cotton cultivation in Nsanje and Chikwawa Districts, which will help increase agricultural production and farmers' incomes.
b) JICA will complete its "Nacala Port Development Project" study, which considers improving general cargo and container port facilities, and the GoMZ will develop Nacala Port, since it is a natural deep-sea port and main liners will call there. The Study Team also confirmed that the port operator of Beira Port has already negotiated with several shipping companies about main liners calling there.

(3) Question by the Study Team
a) Does any private enterprise intend to use the Sena Corridor after it has been developed?
(Allied Freight Agencies)
a) Yes. Even though the Nacala Corridor is the best route, there are several problems. In parallel with the railway improvement by Vale, if the GoM rehabilitates the railway line to Lilongwe, the Sena Corridor will become one of the best options for import and we may change our import route.
(Comment from the Secretary for Local Government and Rural Development)
a) The delay or objections to the development of the Sena Corridor are mainly due to political conflicts between the GoM and GoMZ, and cooperation between the two governments has not been achieved for quite some time. This study is thus a good chance to break the deadlock.
(3) EMC Jutula Associates
a) Since I met the Ambassador of Japan in 2008, I have been involved in works related to the problem at Chiromo. I want to know what the solution is.
(Response by the Study Team)
a) The Study Team will prepare the M/P by mid July and project lists. The solution for the disconnection at Chiromo will be studied in the M/P. Then, the pre-F/S of high-priority projects will be carried out.
(4) Allied Freight Agencies
a) What is the Study Team's view about Nsanje Port?
(Response by the Study Team)
a) The Study Team has considered Nsanje Port and the projected freight demand between Nsanje Port and Beira Port. However, there is only one logistics route, the M1, at present. An alternative transport route between Blantyre and Nsanje will be studied in the next stage.
(5) Henderson & Partners
a) Does mineral development have realistic potential in Malawi?
b) How about the development of niobium?
(Response by the Study Team and Mr. Magwede)
a) Exploitation of uranium has already started, while there are potential deposits of other minerals. The Study Team has considered the potential of other mineral deposits in line with the EU-financed Multi Modal Transport Study.
b) The GoM recognises the high potential of niobium development.
(6) Marine Department
a) How does the Study consider the negative impacts caused by improving the roads and railways?
(Response by the Study Team)
a) Environmental considerations will be studied after the selection of priority projects and mitigation measures will be proposed if required.
(7) Mozambique High Commission
a) When I visited Tete, most of the trucks queuing were from Malawi. If the railway line is developed, the transportation cost to Beira Port will be cheaper than by truck, which will contribute to the environment and health of people. The development of the Sena Corridor requires the political involvement of both governments, and it is necessary to accelerate the project with friendly relations between both governments.
(Response by Mr. Magwede)
a) For the transport system, it is necessary not only for the region but also from multimodal transport considerations. Also, it is necessary to consider developing the railway system when road traffic increases. Since transit freight of coal from Mozambique and copper from Zambia will pass through Malawi, competition as well as cooperation between countries will be necessary from a regional point of view.
(8) Henderson & Partners
a) For the development of the transport system, it is important to provide transport operators with a choice of mode. A problem for businesses in Malawi is the transport constraint. Fuel is transported by road not for economical reasons. It is necessary to provide choices for transport operators by developing the railway system.
(9) Allied Freight Agencies
a) A major problem for Malawi is the high cost of railway transport. For example, the transport cost between Lilongwe and Nacala by railway is higher than that between Lilongwe and Beira by road. When Vale rehabilitates railway facilities in Malawi, I suppose its standard for railway facilities will be different from Malawi's standard. What is the GoM's view on the rehabilitation of the railway

between Lilongwe and Lowonde?

b) How about the shortage of rolling stock? Only weekly operation of freight trains is a big problem for transport operators.

(Response by Mr. Magwede)

a) According to the study carried out by 2009, the investment needed for rehabilitating the railway system was estimated at about US$ 8 million. After rehabilitating the railway line, it is planned to upgrade the axle load of the tracks. According to the plan, the railway track between Blantyre and Nsanje will be upgraded from 15 tonnes to 18 tonnes axle load. On the other hand, Vale plans to upgrade the railway track to 26 tonnes axle load. The GoM has been negotiating with Vale for the rehabilitation programme of the whole railway network of Malawi.

b) Procurement of new rolling stock is closely related to the contents of the MoU with Vale. We expect Vale to take action when they become the main shareholder of CEAR.

3. Closing address by Mr. Magwede

Annex 1

Agenda of the Seminar

9:00 – 9:10
Opening Address
9:10 – 9:40
(1) Topic 1: Outline and Progress of the Study
(2) Topic 2: Basic Concept for the Development of the Sena Corridor
9:40 – 10:00
Questions and Answers
10:00 – 10:15
Coffee Break
10:15 – 11:35
(3) Topic 3: Present Situation of Road Network in the Study Area
(4) Topic 4: From the Perspective of Railways
(5) Topic 5: Transport Corridor Development in Neighbouring Countries
(6) Topic 6: Results of Traffic Demand Forecast
11:35 – 12:00
Questions and Answers
12:10 – 13:00
Luncheon

Annex 2

List of Participants

Persons Present

1	The Secretary for Local Government and Rural Development	Mr. H. Njaka
2	The Secretary for Agriculture and Food Security	Mr. George Zimalirana
3	Marine Department	Mr. Joseph Bauda
4	The World Bank	Mr. James Markland
5	Mozambique High Commission	Mr. Fernando Chomar
6	Henderson & Partners	Mr. Henderson MJ Fukiza
7	EMC JATULA ASSOCIATES	Mr. Rodney M.Kumsinda
8	Mphizi Consulting Engineer	Mr. Alex Msuku
9	Allied Freight Agencies	Mr. Ackim Mwale
10	Mota-Engil Engenharia e Construcao SA (Malawi)	Ms. Florence Banda
11	JICA Malawi Office	Mr. Hoshino Akihiki
12	JICA Malawi Office	Mr. Sano Akihira
13	JICA Malawi Office	Mr. Malewezi Michael

MoTPI Counterpart
Mr. Geoffrey Magwede, Controller of Rail Transport Services
Mr. Kelvin Mphonda, Civil Engineer of Roads Department

JICA Study Team
Mr. Hikaru Nishimura, Team Leader
Mr. Shigeru Ando, Road Planning/Road Design

(2) Discussion Memo for the First Seminar in Blantyre

The First Technology Transfer Seminar (Blantyre)
The agenda of the seminar is given in Annex 1.

The list of participants is given in Annex 2.

Venue: Malawi Sun Hotel, Blantyre
18th April, 2011 (Monday), 9:00 – 12:00

Items Discussed

1. Opening address by Mr. Geoffrey Magwede, Controller of Rail Transport Services, MoTPI
2. Items discussed between participants and the project team

(1) Nsanje District
a) Which data did you use for the poverty ratio shown in the material? I think the poverty ratio in Nsanje has improved according to the survey carried out last year.
b) What is the meaning of "potential labour force" within the development potential in the Study Area?
c) Which scenario will the Study Team select?

(Response by the Study Team)
a) The Study Team referred to the Integrated Household Survey 2005 results, because the results of HIS 2010 have not been disclosed yet.
b) Even though there are not many skilled labourers in Malawi, there are many labourers who can do simple tasks such cutting sugarcane, and we consider those labourers as having future development potential.
c) The Study Team has been carrying out traffic demand projections based on scenarios. The Study team considers not only the road but also the railway for the transport network between Blantyre and Nsanje, and a choice of modes within scenarios.

(2) Chikwawa District
a) In slide 12, Lilongwe is written as a Political Centre, but it should be an Administrative Centre.
b) I think not only Blantyre but also Lilongwe is a commercial centre.

(Response by the Study Team)
a) The Study Team will amend the error.
b) Since agricultural processing such as for tea and tobacco is carried out in Blantyre and Limbe, we consider Blantyre as a Commercial Centre.

(3) SDV
a) I agree with the development of the Sena Corridor because of its advantage of a shorter distance to a port by railway. What do you think about the development of the railway line from Moatize, which is of strategic national importance?
b) The priority might shift to Beira Port when the dredging work is completed and main liners call at Beira Port. Nacala Port will also be a good option when the problem of rolling stock of the railway company has been solved. Also, the effect of coal transportation by Vale and the large quantity of sugar transportation by Illovo are important points.

(Response by the Study Team)
a) In the Master Plan stage, the Study Team will present the overall plan of the transport network.
b) The Study Team already obtained information about the expansion and improvement programmes of Beira Port. In addition, the development study of Nacala Port being carried out by JICA is at the stage of submission of the Draft Final Report.

(4) CEAR
a) Vale's intention is very important for Malawi. Has the Study Team considered the use of Beira Port by not only Malawi but also other countries?

(Response by the Study Team)
a) The concessionaire of Beira Port, Conelder, considers that Malawi is one of the main customers, and container freight from neighbouring countries will increase in the future. According to Conelder, Beira Port will not compete with Nacala Port but the two ports will compete with Durban Port.

(5) Mulanje District
a) Is the line from Milange and Mocuba a road or a railway?

(Response by the Study Team)
a) It is a road; it is currently under construction by Mota Engil and is due to be completed within 36 months.

(6) Petroleum Importers Ltd.
a) We received a questionnaire for this study. It is a very good initiative because we are also interested in the development of the Sena Corridor. We have travelled from Blantyre to Caja via Mutarara. At this stage, what is the progress of coordination with the Government of Mozambique regarding the development of the Sena Corridor?

(Response by the Study Team)
a) When the Study Team interviewed CFM and CCFB at Maputo and Beira in Mozambique, they were positive about connecting the railway with Malawi. However, they were also concerned about the conditions of infrastructure in Malawi. The Councillor of the Mozambique High Commission mentioned at the seminar in Lilongwe that his government intended to develop the international corridor according to the SADC Treaty with friendly relations between countries.

(Response by Mr. Magwede, MoTPI)
a) There was the Eastern Region Corridor Cluster Meeting within SADC members one month ago. We discussed issues related to international corridors, including Nacala and Beira Corridors, and agreed constructive coordination with Mozambique. Also, the GoM has approved the proposal of the JICA Study Team. We consider that it is important to have a target of a multi-modal concept. This means that the three transport modes of road, railway and inland waterway will complement each other, not compete against one another, to form a multimodal transport system. The concept used in Japan of "redundancy", which means a possible choice of another transport mode or route if any incident happens on one transport mode", should be secured for the transport system in Malawi.

(7) Question from the Study Team to private companies
a) If the Sena Corridor is developed, do you intend to use that corridor?

(Response from participants of private companies)
a) SDV: We are interested in using the new corridor because of the much shorter distance.
b) Nali: Yes
c) Petroleum Importers: We are highly interested.

(8) Question from JICA
a) I would like to ask in detail why you intend to use the Sena Corridor even though it is not functioning at present.

(Response from participants of private companies)
a) SDV: The transport volume of cotton from Chikwawa is about 1000 tonnes. Major commodities transported by us are cotton and sugar. We transport about 100 containers to Nacala Port, but there are problems of shortages of rolling stock and infrastructure. We would like to shift to the Sena Corridor, which will be a big business chance for us. It is very important to choose the cheapest transport route. For example, the competitiveness of pigeon peas produced in the Southern Region depends entirely on the transport cost. It is possible to provide statistical data to the Study Team.
b) Nsanje District: Projects in the Lower Shire Valley may improve the productivity of maize in these regions if demand increases. Development of the Sena Corridor is beneficial for local people.
c) Nali: Our major export products are pigeon peas and chilis and we use Durban and Beira Port. Durban Port is very far, while Beira Port is near. Since the distance through the Sena Corridor is much shorter, it will be able to offer competitive prices.
d) Petroleum Importers: If routes considering redundancy are adopted, Malawi will become not a land-locked country, but a land-reach country. The present shares of use of ports are 65% in Beira, 25% in Dal es Salaam, and 10% in Nacala. We consider that desirable shares are 50% in Beira, 30% in Dal es Salaam and 20% in Nacala from an economic point of view in the future.

(9) Question from the Study Team to CEAR
a) Do you intend to transport petrol when the railway track is improved?

(Response from participants)
a) CEAR: We are interested in the Sena Corridor. Before the destruction of the railway in Mozambique, both petrol and diesel were transported by railway. Special tankers are necessary to transport petrol. Even though there are some problems of tankers for diesel oil and

infrastructure, we consider that there will be a good chance to transport diesel oil in the near future. The GoM has other viewpoints, but transporting diesel has generated profit for us, whereas transporting petrol is dangerous and difficult.

b) Petroleum Importers: It is desirable to transport diesel oil and petrol from Nacala Port by railway at present, however, petrol is also transported by road because of the safety risks. However, if the railway and fuel transportation from Beira Port is restored as it was before, we will use it.

(Response from the Study Team)

b) The Study Team considered the transportation of both petrol and diesel oil from Beira Port under Scenario 3.

(10) Question from JICA

a) We consider that the development of the Sena Corridor and support for private enterprises at the district level is important. Do you have any initiative or action plan?

(Response from participants)

a) Nsanje District: Improvement of the railway is economically important for Malawi and the district level, and the connection of Chiromo is considered to be very beneficial for local people. Since the central government has already started to develop Nsanje District, we will follow that plan; an individual development and investment plan is not necessary.

(11) Comment from Mr. Magwede

a) Mr. Magwede: The railway operator is responsible for rolling stock and the GoM is responsible for railway infrastructure as a government asset. It is necessary to set up a mechanism to check each other's railway system. The GoM requires US$8 million for rehabilitating a part of the railway infrastructure. Also, the MoTPI has requested MWK200 million for the maintenance and repair cost of rolling stock in the 2011/12 budget.

(Response from participants)

a) SDV: The GoM does not have the right to control the operation of the railway. Therefore, as a logistics company we are anxious about how the Malawi side can be involved in the operation of Nacala Railway, when Vale starts transporting coal.

b) Mr. Magwede: The GoM and Vale will sign the MoU at 14:00 today. The GoM used to be responsible for the operation and regulation of railways in the past. After signing the concession agreement with CEAR in 1999, CFM of the GoMZ holds 49% of the share and SDCN of Mozambique holds 51% of the share, and the GoM is not a shareholder. Vale has acquired the 51% share from SDCN and became the largest private shareholder of CEAR. A new framework of the concession will be discussed between the GoM and Vale after signing of the MoU.

(12) Comment from CEAR

a) We have information that the rehabilitation of Tete Bridge was already completed. (slide 15)

(Response from participants)

a) That bridge written in the slide means the New Tete Bridge to bypass the centre of Tete City. Construction of this new bridge started last year.

3. Closing address by Mr. Magwede

Annex 1

Agenda of the Seminar

9:00 – 9:10
Opening Address
9:10 – 9:40
(1) Topic 1: Outline and Progress of the Study
(2) Topic 2: Basic Concept for the Development of the Sena Corridor
9:40 – 10:00
Questions and Answers
10:00 – 10:15
Coffee Break
10:15 – 11:35
(3) Topic 3: Present Situation of Road Network in the Study Area
(4) Topic 4: From the Perspective of Railways
(5) Topic 5: Transport Corridor Development in Neighbouring Countries
(6) Topic 6: Results of Traffic Demand Forecast
11:35 – 12:00
Questions and Answers
12:10 – 13:00
Luncheon

Annex 2

List of Participants

Persons Present

1	CEAR	Mr. Hendry Chimwaza, Managing Director
2	District Assembly of Blantyre	Mr. M.N. Namalweso, Director of Administrator
3	District Assembly of Thyolo	Mr. J. Ziba, UNV-Planner
4	District Assembly of Chikwawa	Mr. Kelvin Harawa, Director of Planning & Development
5	District Assembly of Nsanje	Mr. Rodney Simwaka, Director of Administrator
6	District Assembly of Mulanje	Mr. Nwoawembe, Director of Administrator
7	District Assembly of Mwanza	Mr. Gwedemula, Director of Administrator
8	Nali Ltd	Mr. Khonyongwa, Assistant Finance & Administration
9	Petroleum Importers Ltd	Mr. Michael Ngwira, Logistics Manager
10	Dulux Ltd	Mr. Matthews Chikankheni, CEO
11	SDV Malawi Ltd.	Mr. Chavula, Commercial Manager
12	JICA Malawi Office	Mr. Sano Akihira, Project Formulation Advisor
13	JICA Malawi Office	Mr. Malewezi Michael, Programme Officer

MoTPI Counterpart
Mr. Geoffrey Magwede, Controller of Rail Transport Services
Mr. Kelvin Mphonda, Civil Engineer of Roads Department
Mr. Chimwemwe W. Kaunda, Transport Economist

JICA Study Team
Mr. Hikaru Nishimura, Team Leader
Mr. Shigeru Ando, Road Planning/Road Design

6.2 Discussion Memo for the Second Technology Transfer Seminar

(1) Discussion Memo for the Second Seminar in Lilongwe

The Second Technology Transfer Seminar (Lilongwe)
The agenda of the seminar is attached in Annex 1.

The list of participants is attached in Annex 2.

Venue: Pacific Room, Pacific Hotel, Lilongwe
26th October, 2011 (Wednesday), 9:00 – 12:30

Items Discussed

1. Opening address by Mr. Geoffrey Magwede, Controller of Rail Transport Services, MoTPI

2. Among the topics of the Seminar, Topics 4, 5 and 6 were presented by the counterparts of the Study, Mr. Kelvin Mphonda (Civil Engineer of Road Dept., MoTPI), Mr. Geoffrey Magwede (MoTPI) and Mr. Peter Makwinda (Environmental Specialist, Road Authority), respectively.

3. Items discussed between participants and the project team

(1) Mr. Ogawa, First Secretary, Embassy of Japan
Slide No. 9 of Topic 2: How are sugar and pigeon peas transported to Nacala Port?

(Response by the Study Team)
a) Sugar is transported from Nchalo Sugar Factory to Blantyre by trucks, placed into containers by a freight forwarder, and transported to Nacala Port by the existing railway line via Liwonde and Nayuchi.
b) Pigeon peas are transported from cultivation areas on the eastern side of Blantyre to Blantyre by trucks, placed into containers the same as sugar, and transported to Nacala Port by railway.

(2) Mr. Markland, Senior Transport Specialist, World Bank
Regarding the statistics shown in the report, did the Study Team collect the data by itself or use existing information?

(Response by the Study Team)
a) The Study Team collected export and import data from the Malawi Revenue Authority last year.
b) The Study Team also carried out the logistics survey, and information on the export and import transport costs
was obtained from this survey.
c) The Study Team used both types of statistics in the report, i.e., directly collected in the Study and from existing materials.

(3) Mr. Antonmarco Zorzi, Managing Director, Mota Engil
What kind of study has been carried out for the Shire-Zambezi Inland Waterway Transportation? I want to know the future of Nsanje International Port.

(Response by the Study Team)
a) According to the information from MoTPI, the SADC Secretariat is now in the process of selecting a consultant who will carry out the feasibility study, and AfDB is going to finance the study.
b) It will take about 2 years for the study after selection of a consultant, and waterway transportation may commence operation in 2014/2015 depending on the result of the study. The facility plan for Nsanje Port, such as installation of a gantry crane, will be included in the study.

(Response by Mr. Magwede)
a) The Shire-Zambezi Waterway Project will generate benefits for not only Malawi but also for the region. Therefore, the SADC Secretariat has the initiative, since Malawi, Mozambique and Zambia are member countries of SADC.
b) The feasibility study will take 2 years after commencement.

(4) Mr. Fernando Chomar, Counselor, Mozambique High Commission
Vale and MoTC (Mozambique) and MoTPI signed a Memorandum of Understanding (MoU) for developing the railway line between Moatize and Nacala via Malawi, including construction of 138 km of new railway line. This is a high-priority project in Mozambique and GoMZ is coordinating with

GoM. I have got information that the Study Team and a representative of GoM will visit Mozambique next week to briefly explain the contents of the Master Plan for related agencies in Mozambique. I want to know what level of related agencies this mission will contact in Mozambique. I do not know whether those contact points will be at the political level or private level such as port and railway. It is better for GoM to appeal to a counterpart in Mozambique if GoM is considering actualizing the Sena Corridor. Then, it is necessary to start discussion, and for further action to be taken based on the results of the discussion. As a personal idea, I propose that GoM make official contact with related agencies in GoMZ.

(Response by the Study Team)

a) The Study Team, together with PS2 of MoTPI, will visit Mozambique to briefly explain the contents of M/P to related agencies in an unofficial capacity and from an engineering point of view.
b) We plan to meet with engineering related officials of MoTC, CFM-HQs, ANE, CFM-Centro and Cornelder prior to the official dialogue between GoM and GoMZ.
c) We are considering providing technical information to related agencies in GoM at the first stage, followed by political dialogue as the next step.

(Further comment from Mr. Fernando Chomar)

I understand that approach. But, prior works related to political consensus and urgency are necessary for the project to construct 138 km of new railway by Vale. In this sense, I would like to advise GoM to start dialogue at the political level in order to avoid wasted effort in the development of the Sena Corridor.

(Response by Mr. Magwede)

GoM sincerely accepts your advice and will make efforts to create such opportunities. Also, we expect that the stance of GoMZ will become clear by visiting Mozambique this time. Based on these facts, your advice will be considered for further actions.

(5) Mr. Siwande, Roads Authority

The comprehensive programme for the transport sector is TSIP, while the RSP (Road Sector Programme) covers only the road sub-sector. Hence, it is necessary to combine TSIP and RSP in the presentation materials. Also, RSP should be included in TSIP in order to finalize TSIP, which indicates the policy and guideline for the selection and ranking of projects. GOM determined the national budget every year in the past. However, after preparing the mid-term investment programme for five years, GOM has decided to estimate the budget for the next three years starting from this year. As a result, it is necessary to consider projects within the period of the mid-term investment programme.

(6) Mr. Markland, Senior Transport Specialist, World Bank

Did the Study Team consider the priority of projects from an EIRR point of view? How did the Study Team prepare the implementation programme based on prioritization without a Pre-F/S?

(Response by the Study Team)

The Study Team defined projects for the short, medium and long term in the M/P by considering the urgency and necessity of projects, and the investment environment for development partners. Since GoM has selected two projects, road and railway, for the Pre-F/S, the Study Team will carry out the Pre-F/S from now on. For example, the Study Team will analyse the EIRR and FIRR for the railway project. The Study Team will present the results of the Pre-F/S in the next seminar.

4. Closing address by Mr. Magwede

Annex 1

Agenda of the Seminar

9:00 – 9:10
Opening Address
9:10 – 9:40
(1) Topic 1: Outline and Progress of the Study
(2) Topic 2: Outline of the Study Area and Present Situation of Transport Network
9:40 – 10:00
Questions and Answers
10:00 – 10:15
Coffee Break
10:15 – 11:35
(3) Topic 3: Concept and Evaluation of the Master Plan
(4) Topic 4: Roads Projects for the Master Plan
(5) Topic 5: From a perspective of Railways
(6) Topic6: Environmental and Social Consideration
11:35 – 12:00
Questions and Answers
12:10 – 13:00
Luncheon

Annex 2

List of Participants

Persons Present

1	Ministry of Finance and Development Planning	Ms. Grace Gordwe
2	European Commission	Mr. Peter Phiri
3	The World Bank, Senior Transport Specialist	Mr. James Markland
4	Mozambique High Commission, Counselor	Mr. Fernando Chomar
5	National Parks and Wildlife	Mr. C. Manda
6	National Smallholder Farmers' Association of Malawi Commercial Manager	Mr. Alexander Chikapula
7	Mota-Engil Engenharia e Construcao SA (Malawi) Managing Director	Mr. Antonmarco Zorzi
8	Embassy of Japan, First Secretary	Mr. Shinichi Ogawa
9	JICA Malawi Office	Mr. Hideki Ito
10	JICA Malawi Office	Mr. Akihira Sano
11	JICA Malawi Office	Mr. Michael Malewezi

MoTPI Counterpart

12 Mr. Geoffrey Magwede, Controller of Rail Transport Services
13 Mr. Kelvin Mphonda, Civil Engineer of Roads Department
14 Mr. Chimwemwe W. Kaunda, Transport Economist
15 Ms. Mattina Mchenga, Economist

Roads Authority Counterpart

16 Mr. Stephan Siwande, Transport Specialist
17 Mr. Peter Makwinda, Environment Specialist

JICA Study Team

18 Mr. Hikaru Nishimura, Team Leader
19 Mr. Shigeru Ando, Road Planning/Road Design
20 Mr. Jiro Nishitanaka, Construction Planning/Cost Estimation

(2) Discussion Memo for the Second Seminar in Blantyre

The Second Technology Transfer Seminar (Blantyre)
The agenda of the seminar is attached in Annex 1.

The list of participants is attached in Annex 2.

Venue: Malawi Sun Hotel, Blantyre
28th October, 2011 (Friday), 9:00 – 12:30

Items Discussed

1. Opening address by Mr. Geoffrey Magwede, Controller of Rail Transport Services, MoTPI

2. Among the topics of the Seminar, Topics 4, 5 and 6 were presented by the counterparts of the Study, Mr. Kelvin Mphonda (Civil Engineer of Road Dept., MoTPI), Mr. Geoffrey Magwede (MoTPI) and Mr. Peter Makwinda (Environmental Specialist, Road Authority), respectively.

3. Items discussed between participants and the project team
(1) Mr. Gmwnlca, Nsanje District Council
Regarding Slide 4 (Poverty Ratio in Study Area) in Topic 2, please correct the poverty ratio in Nsanje District since that figure is old.
(Response by the Study Team)
a) The Study Team used the latest available data from the National Statistical Office (NSO) and this figure is based on the result of the 2nd Integrated Household Survey (IHS2) in 2004. NSO conducted IHS3 in 2010 and are still analysing the survey results, so the Study Team cannot obtain the results.
b) When the latest results become available, the Study Team will revise the poverty ratio in the next report.
(Additional comment by Mr. Chakka, Malawi Chamber of Commerce)
Please update the poverty ratio, since it is a very important indicator.
(Response by the Study Team)
The Study Team will update the poverty ratio and analyse the comparison with the national average.

(2) Mr. E. Viola, Road Transport Operators Association, RTOA
Please clarify whether the distance between Blantyre and Nsanje shown in Slide 4 of Topic 2 is by road or railway. Measurement by a vehicle trip meter shows the actual distance is 184 km.
(Response by Mr. Peter Makwinda, RA)
RA will provide the latest figure for the distance to the Study Team.

(3) Mr. Chavula, Commercial Manager, SDV
We have high expectations for the results of the Study, since the Sena Corridor is the shortest corridor to Beira Port. I would like to know the implementation schedule for the development of the Sena Corridor.
(Response by the Study Team)
a) The Study Team will submit the Draft Final Report to GoM. Then, after completion of the Study, GoM will request development partners for financial assistance for implementing the project.
b) Regarding the 40 km of railway section in Mozambique, we expect that GoM will start dialogue with GoMZ and try to gain a consensus.
c) The Study Team will visit Mozambique next week and briefly explain the contents of M/P, including the benefits for the Mozambican side, to relevant authorities.

(4) Mr. Nguluwe, Mulanje District Council
According to Slide 6 (Present Transport Conditions) in Topic 2, the share of value is higher for the Durban Corridor, while the weight is higher for the Beira Corridor compared with other corridors. I think it is necessary to improve the usability of Beira Port in order to increase the shares of both value and weight.
(Response by the Study Team)
a) Based on the analyses of export and import commodities by both value and weight, the share of Beira Corridor is higher by volume of cargo handled but lower by value of cargo handled, because Beira Port handles cheaper import products for Malawi, such as fertilizer. On the other hand, consumer goods are

mainly imported from places such as Johannesburg in RSA via the Durban Corridor, which increases the share by value.

b) When Beira Port and Nacala Port have been improved and main liners call at these ports, the usability of these two ports for shippers and freight forwarders will be improved, and Malawi is expected to shift the share of transportation of cargoes from the Durban Corridor to both the Beira and Nacala Corridors.

(Further comment by Mr. Chavula, Commercial Manager, SDV)

Since the facilities of Durban Port are much better than those of other ports, many cargoes related to Malawi are handled by Durban Port.

(Response by the Study Team)

a) Main liners call at Durban Port only at present, hence Durban Port has much better usability than the other two ports.

b) When both Beira and Nacala Ports have been improved and main liners call at these two ports in the near future, it will be possible to directly import/export products from/to these two ports between the EU and Asian countries. As a result, the usability of these two ports is expected to be dramatically improved.

(5) Mr. Saunders, Logistics Manager, Illovo Sugar (MW) Ltd.

Regarding Slide 8 (Present and Expected Future Transport Conditions) in Topic 2, the higher transport cost of the Durban Corridor is a matter of concern due to the distant origins and large quantities of import cargoes. On the other hand, the expensive transport cost of export cargoes is due to piggyback transportation. Higher transport cost lowers the service level for customers. The insufficient transport capacity of transport routes is another problem. It is desirable that both the Beira and Nacala Corridors are functioning. However, Nacala Railway is almost not functioning and so the Durban Corridor is an alternative option.

(Response by the Study Team)

a) According to information obtained from the port operator of Beira Port, major dredging works on the approach channel, expansion of port facilities to accommodate Panamax type main liners, and negotiations with foreign shipping companies for bringing in main liners, have been carried out. The Study Team considered these facts when projecting the future transport volume of cargoes.

b) According to the result of the "Preparatory Study on Nacala Port Development Project" carried out by JICA, the future transport volume of cargoes related to Malawi is projected to be shifted from Durban Port to both Beira Port and Nacala Ports.

c) The Study Team also considered the improvement of Nacala Railway by Vale.

d) The Study Team considers that efficient transportation will be achieved after a comprehensive transport network, including the Sena Corridor, has been completed in the future.

(6) Mr. Magombo, Environmental Department Officer (EDO), Chikwawa District Council

I want to know about compensation costs and the locations for resettlement of people affected by the project. Also, how do you determine the proper value of the compensation cost for resettling people?

(Response by Mr. Peter Makwinda, RA)

a) The Study Team plans to hold a public consultation inviting stakeholders.

b) The level of compensation will be determined based on standards defined by districts and RA. In the case of this project, there are two or three houses within ROW and it will be possible to resettle those houses by the power of the government. However, there was one project financed by the WB which provided compensation for five years.

c) According to the procedure for resettling people and compensation, the compensation value can become three times more than the original value, so the resettlement will need to be considered carefully.

(7) Mr. Nokandawme, Chikwawa District Council

a) I consider that it is desirable to aggressively develop the railway sub-sector. The market development by the railway sub-sector is not active at present. Even though large investment is necessary for improving the railway sub-sector, I consider that the railway sub-sector can be more economical for least-developed countries, like Malawi.

b) We have been promoting agricultural production based on the Lower Shire Valley Development Programme. This Programme is a large-scale investment programme as a part of the Green Belt Initiative. Did the Study Team consider this Programme in the Study?

(Response by Mr. Magwede, MoTPI)
a) Answer regarding an active approach for the railway sub-sector. The first railway to start operation in Malawi was in 1908, and the present concession agreement was signed in 1999. However, since MoTPI has not monitored the management of CEAR, the railway infrastructure has rapidly deteriorated.
b) MoTPI established a Railway Unit and has allocated MWK 200 million for emergency rehabilitation within the framework of TSIP.
c) The policy of GOM is to establish a multi-modal transport system, and three options (road, railway and inland waterway) are considered for the development of the Sena Corridor.

(Response by the Study Team)
a) The Study Team projected the future freight volume in the M/P by the considering the PSIP, Economic Development Programme of each district and the Malawi Green Belt Initiative.
b) In the Lower Shire Valley, a plan to increase production by Illovo Sugar, and a programme to increase cotton production, exploration for titanium, and tourism are considered to have future development potential and the future freight volume was projected.

(8) Mr. Magombo, Environmental Department Officer (EDO), Chikwawa District Council
a) Regarding the overall evaluation results, I think the best option is connection to Beira Port both by road and railway, under the condition without evaluating the operation of Nsanje International Port, even though the 1st Option to connect to Beira Port from Malawi is most economical.
b) Regarding an environmental specialist, if either a consultant or specialist of MoTPI or RA carries out the EIA, the results may lack fairness and have some bias. I think the Ministry of Natural Resources, Energy and Environment should be involved in the EIA.

(Response by the Study Team)
a) The Study Team considers that connecting the road and railway at Chiromo and to Beira Port is the best alternative plan. Improvement of the road and railway is considered as an assumption. If the Mozambican side does not improve the railway line, connection to Beira Port will be impossible and the evaluation result will be negative. Connection of the railway will result in cheaper transport costs and generate more benefits.

(Response by Mr. Peter Makwinda, RA)
a) The EIA process of Malawi is employed in the Study.
b) The SEA is an environmental evaluation method for the M/P level and project groups are evaluated.
c) At the F/S stage, we employ an independent consultant to carry out the EIA, together with planning and designing.

(Response by Mr. Kaunda, MoTPI)
We are going to explain the contents of the project to stakeholders not only for answering questions, but also to hear such proposals.

(9) Mr. E. Viola, Road Transport Operators Association, RTOA
A private company, Vale, is going to construct a railway line via Nkaya in Mozambique. In this sense, GoM should find a private investor to improve the railway. For example, it is better to sign a concession agreement with a private investor, such as from India.

(Response by Mr. Magwede, MoTPI)
GoM has changed policy and employed the PPP approach. Zambia is also interested in using the railway, because the railway is connected from Chipata to Blantyre. GoM is going to employ the PPP approach in order to address these issues.

(10) Mr. Acunda, Road Transport Operators Association, RTOA
The railway service is planned to commence in 2030. CEAR uses diesel locomotives and these diesel locomotives are unfavourable in terms of the environment and speed. Considering the long term 2030, it may possible to introduce electric locomotives, which are faster.

(Response by Mr. Magwede, MoTPI)
In case of electrification of the railway, the biggest problem is how to solve the problem of the electricity shortage in Malawi.

(Response by the Study Team)
Modern large diesel locomotives also have large hauling capacity. For example, Vale plans to operate coal trains with 130 coal wagons (total weight of 9,000 tonnes) hauled by four diesel locomotives. For the railway, the track condition is important and we consider it is not necessary to introduce electric

locomotives.

(11) Mr. A.A. Nashano, Public Works Blantyre

a) We understand that both Beira and Nacala Corridors are good options. I want to know the present status of the Shire-Zambezi Inland Waterway project.

b) Why does Malawi use Durban Port with its long transport distance? Is there any problem with Nacala Port which involves shorter distances?

(Response by the Study Team)

a) Regarding the present status and future perspective of the Shire-Zambezi Inland Waterway project, the SADC Secretariat is working to procure a consultant to carry out the F/S and the study will take 2 years. Nsanje International Port is expected to start operation in 2014 or 2015, but it depends on the result of the F/S.

b) Since many main liners call at Durban Port, it is possible to transport cargoes directly to the EU, North America and Asia. On the other hand, only feeder vessels call at Nacala and Beira Ports. When improvement of these two ports has been completed, main liners will be able to call at these two ports.

(Response by Mr. Magwede, MoTPI)

a) Since the Shire-Zambezi Inland Waterway project will generate benefits for Malawi, Mozambique and Zambia, which are member countries of SADC, the SADC Secretariat has an initiative.

4. Closing address by Mr. Magwede

Agenda of the Seminar

9:00 – 9:10
Opening Address
9:10 – 9:40
(1) Topic 1: Outline and Progress of the Study
(2) Topic 2: Outline of the Study Area and Present Situation of Transport Network
9:40 – 10:00
Questions and Answers
10:00 – 10:15
Coffee Break
10:15 – 11:35
(3) Topic 3: Concept and Evaluation of the Master Plan
(4) Topic 4: Roads Projects for the Master Plan
(5) Topic 5: From a perspective of Railways
(6) Topic6: Environmental and Social Consideration
11:35 – 12:00
Questions and Answers
12:10 – 13:00
Luncheon

Annex 2

List of Participants

Persons Present

1	Mulanje District Council	Mr. J.A. Nguluwe
2	Ditto, Environmental Department Officer (EDO)	Mr. M. Salimu
3	Nsanje District Council	Mr. R.K. Gmwnlca
4	Ditto, EDO	Ms. Humphrey Magacasi
5	Mwanza District Council	Mr. E. Chihana
6	Ditto, EDO	Mr. Boriface Chimsaza
7	Chikwawa District Council	Mr. P. Nokandawme
8	Ditto, EDO	Mr. Peter Magombo
9	Thyolo District Council	Mr. F. Mkadawrie
10	Road Transport Operators Association (ROTA)	Mr. E. Viola
11	Ditto	Mr. Sady Acunda
12	Dtto	Ms. Chisk Fko
13	Public Works (South)	Mr. A.A. Nashano
14	Ditto	Mr. A.P. Mkandawie
15	SFFRFM	Mr. A.N. Kalinde
16	Ditto	Mr. M. Gadauia
17	Malawi Chamber of Commerce	Mr. Arpe Chakka
18	Ditto	Ms. Grace Amri
19	Illovo Sugar (MW) Ltd., Logistics Manager	Mr. Shaun Saunders
20	Nali Limited	Mr. H.C. Khongong
21	SDV Malawi Ltd., Commercial Manager	Mr. Joseph Chavula
22	JICA Malawi Office	Mr. Akihira Sano

MoTPI Counterpart

23	Mr. Geoffrey Magwede, Controller of Rail Transport Services
24	Mr. Kelvin Mphonda, Civil Engineer of Roads Department
25	Mr. Chimwemwe W. Kaunda, Transport Economist
26	Ms. Mattina Mchenga, Economist

Roads Authority Counterpart

27	Mr. Peter Makwinda, Environment Specialist

JICA Study Team

28	Mr. Hikaru Nishimura, Team Leader
29	Mr. Shigeru Ando, Road Planning/Road Design
30	Mr. Jiro Nishitanaka, Construction Planning/Cost Estimation

6.3 Discussion Memo for the Third Technology Transfer Seminar

(1) Discussion Memo for the Second Seminar in Lilongwe

Discussion Memo

The Third Technology Transfer Seminar (Lilongwe)
The agenda of the seminar is attached in Annex 1.

The list of participants is attached in Annex 2.

Venue: Pacific Room, Pacific Hotel, Lilongwe
24th January, 2012 (Tuesday), 9:00 – 12:30

Items Discussed

1. Opening address by Mr. Geoffrey Magwede, Controller of Rail Transport Services, MoTPI

2. Among the topics of the Seminar, Topics 2, 3, and 4 were presented by the counterparts of the Study, Mr. Kelvin Mphonda (Civil Engineer of Road Dept., MoTPI), Mr. Geoffrey Magwede (MoTPI) and Mr. Chimwemwe W. Kaunda (Transport Economist, MoTPI), respectively.

3. Items discussed between participants and the project team for Topic 1 and 2

(1) Mr. Markland, Senior Transport Specialist, World Bank

a) What is the traffic level of the proposed road and railway projects? Transport economics is important to justify the investment and I wonder if you could provide some idea of the traffic level.

b) There have been many researches which have shown that a low-volume sealed road is cost effective, and I wonder whether these researches were taken into account by the study team.

c) The presentation provides four bridges between Bangula and Makhanga, but has the study team considered a combined (road and railway) bridge? What is your review on this solution?

(Response by the Study Team)

a) Regarding the track volume, the section between Bangula and Makhanga is expected to have 1,600 vehicle/day by 2030 for vehicle classification. The freight volume of the railway between Limbe and Bangula is estimated to be 620,000 tonnes/year, including all traffic such as sugar, cotton, and tea.

c) The study team initially considered a combined bridge at Chiromo. However, in the M/P, the implementation plan for road and railway projects is different, i.e., the road project will be implemented in the short term, while the railway project will be implemented in the medium term. Therefore, the study team proposed two bridges at Chiromo.

(Response by Mr. Mphonda)

b) The Study considered a low volume sealed road approach, but it was found unfeasible in this section when looking at the traffic projection.

(Comments from Mr. Markland)

c) Regarding a combined bridge, I provide an example that crosses the border between Zambia and Botswana, the so-called Kazungula Bridge, which makes provisions for a railway, for the railway project in the future.

(Further response by the Study Team)

There are several combined bridges at borders, such as between Thailand and Laos, because if there are two bridges, border transactions will be complicated. In this project, the timing of construction is different, so we consider two bridges at Chiromo.

(2) Mr. Di Veroli, Head of Infrastructure Section Senior, European Union

a) Regarding the M/P, is the border cost included in this study? Most delays have occurred at borders..

b) Can I clarify the results of the economic analysis between option 1 and option 2 in the Pre F/S?

Option 1 includes the Chiromo Road Bridge while keeping the Kamuzu Truss Bridge, and this option seems to be the best way to proceed.

(Response by the Study Team)

a) The GoM is upgrading the existing border posts at present. At this moment, there is not much traffic at the Marka border post, for instance, only one vehicle/day. The GoM plans to improve the border post of Marka in a road project between Nsanje and Marka, but there is no plan to improve the border post on the Mozambican side. The study team will ask RA to confirm the issues and plans for the border post.

b) Option 1 includes everything, but Option 2 excludes the construction of the New Shire Bridge. However, the traffic volume is expected to increase after the proposed railway and road projects in future, and the Kamuzu Truss Bridge will be an obstacle for the whole network and there is a risk of collision between vehicles and trains. The proposed New Shire Bridge will secure both the capacity and safety of traffic.

(3) Mr. Mwale, Business Development Manager, Allied Freight Agencies

I heard that the Mozambican government plans to shift the movement of cargos from Beira to Tete, by developing Tete as a dry port. In this plan, containers will be transported by railway from Beira to Tete and then Malawian transporters will collect the containers in Tete in order to avoid congestion in Beira. I wonder whether this plan will affect the results of this study?

(Response by the Study Team)

Last November, the Study Team met with the Ministry of Transport, CFM, and Cornelder in Mozambique. It is true that there is a plan to construct two dry ports; one is near Beira (Dondo) at the railway junction and the other is in Tete. The reason for this plan is that all handling activities are done in the quay area in Beira Port and there is huge congestion. Another reason is that there is only one access road to Beira Port which carries a high traffic volume. The Provincial Government of Tete and a private company proposed constructing a dry port in Tete, but the detailed plan remains unknown. However, even though this dry port in Tete will be constructed, perhaps it can be used for cargos going to Lilongwe, because the direct connection between Beira and Limbe is much faster and more efficient than through a dry port in Tete.

4. Items discussed between participants and the project team for Topics 3 and 4

(1) Mr. Shimoda, Deputy Resident Representative, JICA Malawi Office

Regarding Slide 19 (Implementation schedule for the whole project) in Topic 3, I asked for clarification between the medium- and long-term railway projects in the implementation schedule.

(Response by the Study Team)

The medium-term projects include the section between Limbe and Bangula, while the long term projects cover the whole section between Limbe (Bangula) and Border.

(Further question by Mr. Shimoda)

Does the economic analysis include the medium-term projects or the long term projects?

(Response by the Study Team)

The economic analysis includes the whole package between Limbe and Border.

(Further question by Mr. Shimoda)

Why is there a time lag between the medium- and long-term projects?

(Response by the Study Team)

According to the freight volume analysis, it is considered best to connect up to Bangula by 2020. When the investment from the Mozambican side is ready by 2030, the long-term projects should be settled. However, if the investment from the Mozambican side is earlier than this, the long-term projects can be brought forward to the medium-term.

(2) Mr. Di Veroli, Head of Infrastructure Section Senior, European Union

The Study Team said the Mozambican side has standardized the railway up to the border, but is this already planned?

(Response from the Study Team)

There is no plan at all. The section between the border and Dona Ana in Mozambique is 44km. The land is flat and the track condition is not bad. The Mozambican side, i.e., CFM, considers that it is ready to rehabilitate this section at any time because the distance is short and it does not require large investment; it is just waiting for the Malawian side to invest.

(Further question from Mr. Veroli)

Is there any idea of capital from the Mozambican side?

(Response from the Study Team)

The Mozambican side has no financial problem in rehabilitating 44 km of railway, which would require an investment cost of about US$ 20 million. However, the section between the border and the Caia Bridge by road on the Mozambican side is a different story, because the distance is around 230km and the road needs to cross the Shire River with the construction of a new bridge, so the improvement cost will be high and it may take a long time to rehabilitate it.

(3) Mr. Njewa, Environmental Impact Assessment, Environmental Affairs Department (EAD)

I agree with the JICA Study Team on the environmental concerns that the presenter addressed, but we need to consider those environmental processes (Further Activities presented at the seminar) as soon as possible. This is quite a big project, which requires a full EIA to be conducted during the planning phase. Also, the issue of resettlement needs to be considered, and social issues such as HIV, i.e., the impact of contractors, need to be considered. In addition, the maintenance of borrow pits, which are often left unfilled and could be a source of mosquitoes, needs to be considered. My colleagues will continue and give you more feedback.

(Response by the Study Team)

Regarding the HIV issue, the effect of HIV is included in a scoping matrix in our report. The contractor may affect the increase of HIV and this is a negative impact.

(4) Mr. Shimoda, Deputy Resident Representative, JICA

Could you explain the amount of compensation, according to Malawian law? How much does the government normally pay as compensation, for instance, per house, per shop, or per unit?

(Response by Mr. Kaunda)

I think that is done by OPC, and is done by an assessment in liaison with a district commissioner. It is not the case that this is the price.

(Response by Mr. Fukiza, Henderson Co. Ltd.)

This is a difficult question. There is no certain price. It depends on the assessment.

(Further question from Mr. Shimoda)

What about the land?

(Response by Henderson Co. Ltd.)

Land is not normally compensated, unless it is private property such as freehold land, which needs to be compensated.

(Response by Mr. Magwede)

In terms of value, compensation is based on the value of trees and crops, but not the size of land.

(Further response by Mr. Fukiza, Henderson Co. Ltd.)

One thing that has become a key issue is that people encroach on the railway land. For instance, in Bangula, some people occupy the land of the railway, but it is not their land. They are very lucky if they

are compensated instead of being arrested.

(Further response by the Study Team)

I want to add that, according to information obtained in the S/C meeting, if they have occupied the land for more than 6 years, they are compensated, so they are very lucky.

(5) Mr. Mwale, Business Development Manager, Allied Freight Agencies

Regarding the railway presentation, Malawi needs to improve the railway infrastructure, but capacity is also an issue, and we have already been failing.

(Response by Mr. Magwede)

CEAR is having a challenge. On the 22nd of December, the GoM signed a concession agreement with Vale, which is going to construct the railway from Moatize, crossing Malawi, on the way to Nacala Port. Vale will extend the railway network and also increase the railway operations in Malawi. Vale bought a 51% share of SDCN, which means a 26% share of CEAR. Vale is going to help CEAR operate the section of 101 km between Nkaya and Nayuchi, by rehabilitating this 101 km of railway. With the presence of VALE in CEAR, we expect to see changes, which are happening now. CEAR reported that VALE has already invested some money for the rehabilitation of one locomotive and is expected to rehabilitate a second locomotive. However, it is noted that the concession agreement between the GoM and CEAR will end in 7 years and negotiations for a further concession will start in 2 years. During this time, CEAR has got sufficient time to prove a change in performance to the GoM. At the same time, the GoM is looking at passenger services such as in Japan, which has the best passenger service in the world. So passenger service could be operated by another franchise company.

(Further response from the Study Team)

Regarding the Mozambique side, there was a concession with CCFB, but because of its poor performance, the concession with CCFB was cancelled. So if CEAR continues to operate very poorly, the GoM will consider not extending their concession with CEAR. Vale is investing in CEAR and they have to encourage much better operation and management, otherwise the government will say something. This is for your information.

(Comment by Mr. Mwale, Allied Freight Agencies)

When the GoM signs a concession, there must be some rules of the game in the concession. If they break the rules, there should be some checkpoints to stop the operation, especially for the second one.

(Comment by Mr. Fukiza, Henderson Co., Ltd.)

Actually, this concession agreement should have been cancelled a long time ago. The people are not benefiting from this concession. Regarding VALE, VALE is not interested in passenger services, and the GoM needs to look for a solution.

(Response by Mr. Magwede)

There are some good rules of the game in terms of the concession with Vale. In the concession agreement with Vale, they shall operate everyday, two fleets and two flows, up to Nacala. Each train will carry up to 120 wagons and each wagon will carry 60 metric tonnes of coal, totalling 18 million tonnes per year. The general cargo carried will be 5 million tonnes per year, compared to the current volume of 250,000 tonnes in Malawi. Passenger service will be daily between Nacala and Moatize. So, there are some good rules of the game.

(Response by the Study Team)

Also for the Mozambican side, there is the same policy that at least passenger services should be secured in Mozambique. For instance, after the rehabilitation between Moatize and Beira, the transport capacity will be 6 million tonnes per year, but the GoMZ only allocates 4 million tonnes for Vale and the remaining capacity to general cargo, passenger cargo, and Riversdale. So, there is a policy that not only depends on Vale, but also has a social aspect, and the GoM also has the same policy.

(Further response by Mr. Magwede)

Tomorrow, VALE will give a presentation on social services to the government of Malawi at MoTPI. Vale will construct train stations for the new section, and construct sport facilities and markets.

(Comment by Mr. Fukiza, Henderson Co. Ltd.)

Passenger trains in Malawi are not environment friendly, especially the toilets, and the government has to rehabilitate passenger wagons technically and make them environment friendly.

(Response by the Study Team)

The new passenger coaches may have a toilet with treatment facility. But there is also a problem that many passengers throw away rubbish such as bananas and plastics from the windows. In addition, according to the proposal of Vale to MoTPI, for the time being until the completion of rehabilitation of this new railway, Vale is going to carry coal from Moatize to Liwonde by trailers using the M6 road, and then, transship coal to the train, which will start this year,

(Response by Mr. Magwede)

This issue is going to be discussed tomorrow as well. In the proposal, two trains per day go from Balaka to Nacala. These will be carried by 112 tracks, which will pass through the M6 road up to Chingeni junction in Liwonde. We will discuss this issue tomorrow, including what kind of mitigation measures are necessary.

4. Closing address by Mr. Magwede

By the end of next week, please submit any comments/observation on this study to the consultants, with copies to JICA, and MoTPI.

Agenda of the Seminar

9:00 – 9:10
Opening Address
9:10 – 10:10
(1) Topic 1: Outline of the Study and Master Plan
(2) Topic 2: Pre-Feasibility Study on Reconstruction of S151 Road between Makhanga and Bangula
10:10 – 10:25
Questions and Answers
10:25 – 10:40
Coffee Break
10:40 – 11:30
(3) Topic 3: Pre-Feasibility Study on rehabilitation/ Reconstruction of Railway between Limbe and Border (Marka)
(4) Topic 4: Initial Environmental Evaluation of Projects for Pre-Feasibility Study
11:30 – 11:55
Questions and Answers
11:55 – 12:00
Closing Remarks
12:00 – 13:00
Luncheon

List of Participants

Persons Present

1	Ministry of Development and Planning	Mr. Zex Kahpe
2	Ministry of Irrigation and Water Development	Mr. Emmanuel Chiundira
3	Environmental Affairs Department, EIA	Mr. Evans Njewa
4	European Delegation	Mr. Mauro Di Veroli
5	The World Bank	Mr. James Markland
6	Mota-Engil Engenharia	Ms. Joyce Ngwra
7	Allied Freight Agencies	Mr. Ackim Mwale
8	Henderson & Partner	Mr. H. MJ Fukiza
9	JICA Malawi Office	Mr. Toru Shimoda
10	JICA Malawi Office	Mr. Hiroki Tazawa
11	JICA Malawi Office	Mr. Michael Malewezi

MoTPI Counterpart

12 Mr. Geoffrey Magwede, Controller of Rail Transport Services
13 Mr. Kelvin Mphonda, Civil Engineer of Roads Department
14 Mr. Chimwemwe W. Kaunda, Transport Economist

JICA Study Team

15 Mr. Hikaru Nishimura, Team Leader/ Transport Planning
16 Mr. Naoki Takanashi, Railway Planning
17 Mr. Shigeru Ando, Road Planning/Road Design
18 Ms. Akiko Abe, Environmental and Social Considerations

(2) Discussion Memo for the Second Seminar in Blantyre

Discussion Memo

The Third Technology Transfer Seminar (Blantyre)
The agenda of the seminar is attached in Annex 1.

The list of participants is attached in Annex 2.

Venue: Malawi Sun Hotel, Blantyre
26th January, 2012 (Thursday), 9:00 – 12:30

Items Discussed

1. Opening address by Mr. Geoffrey Magwede, Controller of Rail Transport Services, MoTPI

2. Among the topics of the Seminar, Topics 2, 3, and 4 were presented by the counterparts of the Study, Mr. Kelvin Mphonda (Civil Engineer of Road Dept., MoTPI), Mr. Geoffrey Magwede (MoTPI) and Mr. Chimwemwe W. Kaunda (Transport Economist, MoTPI), respectively.

3. Items discussed between participants and the project team for Topics 1 and 2

(1) Mr. Chimwaza, Managing Director, CEAR

Regarding the third alternative of the road project, I understand this alternative is in order to avoid the Ruo River, but are you also considering protecting the eroding bank on the Ruo River?

(Response by Mr. Mphonda, MoTPI)

I think the Study Team considered several options for protection from the Shire River. One of these is to construct the riverbank on the Malawian side to protect the bridge. Regarding the eroding bank, this question should be addressed to the Water Board or the Ministry of Water Resources. What the MoTPI can do is to move the road away from the eroding site.

(Response by the Study Team)

In the last meeting with the MoTPI, we heard that the Ruo River has been eating the land on the Malawian side. At the beginning, the Study Team considered the existing alignment, but after the social and economic survey, we found that floods occurred every year and the Ruo River has been eating the Malawian land. Thus, we considered the alternative route to avoid the closest section to the Ruo River.

(Comments from Mr. Kaunda, MoTPI)

I think Mr. Chimwaza is trying to propose something to this Study.

(Comments from Mr. Chimwaza CEAR)

In the past, in our experience of railways, we tried to keep away from the eroded bank as much as possible, but the erosion continued and it is going to continue in future. So, we must try and find a real solution now.

(Response from the Study Team)

We consider that riverbank protection is not a railway project, but under the Ministry of Irrigation and Water Resources, or flood control projects. In addition, if you construct protection in the project area, you may have conflict with Mozambique because flooded water may flow into the Mozambican side.

(2) Ms. Chiwawa, Environmental District Officer, Nsanje District

Regarding slide 18 of Topic 2, this study considers realigning the road for the first erosion site, but are you considering the second section close to the Ruo River (near the Kamuzu Truss Bridge)? This section seems to have a risk of erosion and should be away from the Ruo River.

(Response by Mr. Magwede, MoTPI)

In the past, we first considered constructing a bridge (Kamuzu Truss Bridge) in the Marsh area. The flood water normally flowed into the area around the former Chiromo post office, but surprisingly, water did not reach the second site because this land is higher up. There are many mango trees in this

site and it is safer than the Marsh area.

(Response by the Study Team)

According to our social survey, the area near the former Chiromo station has been flooded not by the Ruo River but by backwater from the Shire River, so the mechanism of water flow is very complicated. However, this second site is high land.

(3) Mr. Mlolo, Traditional Authority (TA) in Nsanje District

It seems that the Ruo River is full of sand. So, no matter what water comes, there is flooding in this area. Coming down to the Chiromo area, to the crossing of the Shire River, there is much samd in the river. There is the same problem for the railway line. The railway from Sankhulani to Makhanga suffers from floods every year. We need to reconsider the realignment of the railway line as well. Even if the railway is moved a little, there will be floods. Is there any consideration about what to do for the sand of the river?

(Related comments from Mr. Chiumia, EAD)

This issue is very crucial. The M/P indicates that this issue is not a part of the financing of the proposed projects, and it is in a different direction from that of the Water Board, for example. However, this problem of the riverbank will affect the structures of the road and railway. For instance, if the Ruo River is eating the land, it will change the configuration of settlements, which will then affect the road and the railway.

(Further comments from Mr. Mlolo, TA)

The road project includes between Makhanga and Bangula, but there is a big hospital in Fatima. Whenever there is a flood or when the road is submerged due to a flood, people in the project area go to this hospital. However, there is a problem of going from Makhanga to Fatima during a flood. Is there any consideration for constructing the road to Fatima?

(Response by Mr. Mphonda, MoTPI)

There is another road project to construct the section between Thyolo and Makhanga, which has been committed and financed by the Arab Bank. So, the Japanese study covers the missing link of the Mkhanga-Bangula section.

(Further response by the Study Team)

The Road Authority has already made a contract to upgrade the section from Thyolo to the railway junction at Makhanga, so the section between Makhanga and Bangula is a missing link right now. Regarding the riverbank, the Study includes some parts, but the Study cannot include a comprehensive study on protection from the erosion caused by the Ruo River. In addition, the Malawian side must have dialogues with the Mozambican side because, if the Malawian side alone is protected, the floods may intensify on the Mozambican side.

(Further response by Mr. Magwede)

This study includes some points on the issue of the Ruo River, which require discussions with other ministries. TA Mlolo pointed out that the issue is about the sand, which is the main reason for flooding.

(4) Mr. Chavula, Commercial Manager, SDV

Is this a bridge that connects the railway line on the Mozambican side? Is it true that the Ministry of Transport and Communication in Mozambique intends to build a dry port at Mutarara?

(Response from the Study Team)

No. The Mozambican government plans to build a dry port in Tete, which targets containers/cargos for Malawi. However, perhaps this dry port in Tete is going to be used for cargos for Lilongwe and the northern area. The containers/cargos will be transported directly from Beira to Tete, and then all the customs will be cleared at Tete, which seems to be a good idea. For the time being, this dry port may be used even for Blantyre.

(Further question from SDV)

The Chiromo disconnection used to be an issue, but the remaining section of 44 km is also a challenging issue. Is there any strategic plan including the Mozambican side?

(Response by Mr. Mphonda)

Originally, the Study focused on the Chiromo Bridge, but when the government of Malawi requested the Japanese government to fund the construction of the Chiromo Bridge, the Japanese government suggested doing a study, which included the whole transport network to Beira. So the missing links include between Makhanga and Bangula in Malawi and on the Mozambican side.

(Response by the Study Team)

CFM in Mozambique is ready to invest in the railway up to the border. This is only 44 km and they are waiting for the Malawian side to connect it to the border.

(5) Mr. Nwoawembe, Mulanje District

Regarding the issue of floods, I wonder if the GoM could consider constructing a dam to slow down the Ruo River or a joint work with Mozambican side to solve the problem of floods?

(Further comment by Mr. Chiumia, EAD)

I think this is a good question when looking at the current management of the Ruo River. It seems to be neglected. The colour of the water along the Ruo River from satellite images is evidence of mismanagement. I think an upstream dam may help to trap the silt and, to some extent, reduce the amount of silt. Of course, a dam would not help solve the flow level, but it would be useful for trapping the silt and sustaining the flow of the Ruo River. Nevertheless, the main issue is the management of the Ruo River, the involvement of the government in the Ruo River. This does not cost the project, because in the long term, this problem (the Ruo River) will affect the infrastructure of the road and railway.

(Response by Mr. Magwede)

It is worth considering and discussing this issue. The government of Malawi appreciates the comments. This is a brain-storming section and we are identifying the issues to be raised and trying to find a solution. TA Mlolo mentioned the siltation of the river, Mulanje District asked why the country does not build a dam, and EAD commented on the colour as evidence of mismanagement. Several ministries need to work together in order to solve the problem.

(Response by the Study Team)

In the case of the Ruo River, it is not easy without good cooperation between the GoM and the GoMZ to conduct a joint study.

(Further response by Mr. Magwede)

Mozambique is our neighbour, sharing the same local languages such as Sena and Yao. The government of Malawi is going to talk to the Mozambican government. Here is JICA and here is a Japanese consultant, but beyond this, there are other development partners of substantial size, responsible for infrastructure. There is an EU expert on the water sector, who tries to find which area is causing problems for infrastructure. The government of Malawi is talking to the Mozambican government and I will go to Mozambique next week for discussions.

(Response by the Study Team)

Next week, we will go to Mozambique and I can mention this point.

4. Items discussed between participants and the project team for Topics 3 and 4

(1) Mr. Shaun Saunders, Logistic Manager, Illovo Sugar Co. Ltd.

In this presentation, the socio-economic impact has not been highlighted enough. In this area, currently the only access road into markets is through Chikwawa to Blantyre via the Kamuzu Bridge at Chikwawa, which is the sole bridge crossing the Shire River in the Lower Shire. The proposed transport

projects for bridges and railways are valuable alternatives for transporting agricultural crops.

(Response by Mr. Magwede)

The GoM reached agreement with Vale on 22nd December last year, and Vale has to upgrade the S136 road from Mwanza up to the new railway line construction site to transport equipment and materials. The GoM is requesting to also include the section in between, which includs the construction of a road from Chikwawa to the railway line construction site. So, things are moving right now.

(2) Mr. Chiumia, Principal Environmental officer, EAD

In this M/P, there are a lot of transport projects both in the short term and in the long term to integrate economic activities. However, looking at the massive investment in this particular area, a Strategic Environmental Assessment (SEA) needs to be implemented, because there may be many impacts to be addressed that might arise due to the complexity of investments. For instance, the impact of urban-rural migration might occur, which can be addressed by SEA. So, the only instrument to address this kind of broad impact is the SEA. For instance, the investment required for SEA should be covered by the mining sector.

(Response by the Study Team)

During the M/P, the Study Team conducted the SEA, according to the JICA guidelines and the Malawian guidelines. However, this SEA covers those projects considered by the Study. We did not exclude the SEA.

(Response by Mr. Magwede)

We will take into account your comments/issues and crosscheck the contents of the SEA. We will consider the transport projects holistically.

(3) Malawi Revenue Authority

Regarding Slide 6 of Topic 3, do the figures of transport volume include international cargos? If so, I would like to know if these figures are only the data on cargos or international trade?

(Response by the Study Team)

These figures of transport volume were estimated by projection of future traffic based on our logistic survey last year and data from the MRA office. Those volumes of cargos mainly consist of international cargos such as tea, sugar, cotton for export and fertilizer and fuel for import from Beira. In addition, ores such as heavy sand and bauxite are international cargos going to Beira.

(4) Mr. Chimwaza, Managing Director, CEAR

The environmental issues should be discussed in the presence of all other TAs. There is only one TA here, TA Mlolo. This study includes important issues such as realignment of the road and raising of the embankment. For instance, we do not know the impact of the road realignment, whether it is going to be economical in this area. The floods have intensified recently and, with the realignment of the road, we do not know the impact on floods. Everything should be considered holistically.

(Comments by TA Mlolo)

I also think that other TAs should have been here. The Ruo River comes from Mulanje and another river from Thyolo. Previously, floods were not like this, but things have now changed because people have cultivated on the riverbank along the river. People upstream should have been encouraged to plant trees along the river. The Ruo River can be used for irrigation as we have got a lot of irrigation schemes here. Water from the Ruo River can be diverted to construct a dam and go up to the Tangadzi River or the Shire River to reduce the volume of water from the Ruo River.

(Response by the Study Team)

TA Mbenje in Nsanje and TA Kapichi in Thyolo were also invited to this seminar but they did not come. Regarding the Ruo River, this issue cannot be covered in our study.

(Response by Mr. Magwede)

All comments have been noted, and will be used as inputs to another study done by our Ministry.

(5) Ms. Chiwawa, Environmental District Officer, Nsanje District

This study does not include the issue of HIV. In another road project from Bangula to Nsanje, there was a big problem with the spread of HIV, because workers from Mota Engil received a lot of money. This social impact should be considered. Regarding the issue of the Ruo River, I suggest that, like the Shire River Basin project, the Ruo River Basin project can be started, which involves all stakeholders to come up with a solution. I would like to support the TA's point regarding afforestation, which can be one of the solutions.

(Response by the Study Team)

The issue of HIV is included in our report as a negative impact. As to how to mitigate the impact of HIV, it depends on the Environmental Management Plan prepared by a contractor. The contractor must control the prevalence of HIV. I did not include this issue in the presentation because it is very common in many projects, but it is included in our report.

(Comments by EDO, Nsanje District)

This HIV issue should be highlighted in the Study, because it is very difficult for us to follow up in the district.

(Response by Mr. Magwede)

Your suggestion of the Ruo River Basin project sounds interesting. Several relevant ministries will consider the proposal of the Ruo River Basin project. Other areas highlighted in this seminar should be included in the F/S.

(Response by Mr. Kaunda)

I would like to add that there is an officer in charge of HIV in MoTPI.

(Comments by EDO, Nsanje District)

Even though there is an officer in MoTPI and HIV mitigation measures or whatever, the contractor never did anything and HIV is spreading. So, I would like to ask you to make sure that people (contractor) are on the ground during the project implementation.

(6) Mr. Chimwaza, Managing Director, CEAR

On the first point of negative impact, the boatmen will suddenly lose a source of income, after the Chiromo Road Bridge is constructed. This is an important source of income for them. Is there anything that can be done, trying those boatmen to be involved in the rehabilitation works so that they can do other thing. I am saying this because, once they lose their funds for living, the only way of recovering is vandalism, so is there anything concerning rehabilitation or trading so to speak? This is basically because of the poverty in this area.

(Response by the Study Team)

Actually, those boatmen used to be fishermen. Our interview asked what they will do if they lose their jobs, and some of them mentioned that they would return to doing their own business, fishing. They will go back to fishing after getting some money during construction, because some fishermen can make quite good money. I mentioned compensation to them, but according to a government regulation, there is no regulation about compensating them, unless this association is registered under the Marine Department of MoTPI. If this association does not register, there is no way to compensate them. So, we should introduce some jobs to them during the construction or let them go back to the fishing business.

(Comment form Mr. Kaunda)

Perhaps, it could be added that some training in other skills can be introduced.

(7) Mr. Chiumia, EAD

This project is quite big, and I wonder if the study analyses the impact on the energy system. Our country has a shortage of energy and I wonder if this issue is analysed in the study.

(Response by the Study Team)

During the M/P, we conducted a comparison of the fuel consumption if there is no railway operated and if everything is transported by truckss. Of course, diesel locomotives are more efficient in terms of fuel consumption, so we expect a good impact of saving some money if your government uses both the roads and the railway. The railway is also a good mode of transport.

4. Closing address by Mr. Magwede

The matter we discussed here will be added in the Final Report of this study. This document is going to be our document. The GoM would like to see the situation of its people improved. This is the Pre-F/S, and the F/S will be implemented for the construction of proposed projects.

Agenda of the Seminar

9:00 – 9:10
Opening Address
9:10 – 10:10
(1) Topic 1: Outline of the Study and Master Plan
(2) Topic 2: Pre-Feasibility Study on Reconstruction of S151 Road between Makhanga and Bangula
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Coffee Break
10:40 – 11:30
(3) Topic 3: Pre-Feasibility Study on rehabilitation/ Reconstruction of Railway between Limbe and Border (Marka)
(4) Topic 4: Initial Environmental Evaluation of Projects for Pre-Feasibility Study
11:30 – 11:55
Questions and Answers
11:55 – 12:00
Closing Remarks
12:00 – 13:00
Luncheon

List of Participants

Persons Present

1	Environmental Affairs Department (EAD)	Mr. Chris Mazuwa Chiumia, Principal Environmental Officer
2	Malawi Revenue Authority	Mr. Nelson Kayenda, Officer
3	Nsanje District Council	Ms. H. C. Simucilla, Aswo Representative DC
4	Nsanje District Council	Ms. N. E. Chacoawa, EDO
5	T/A Mlolo Representative	Mr. Master Olesi
6	Mulanje District Council	Mr. J.A. Nguluwe, Director of Administrator
7	Mulanje District Council	Ms. Hellen Nhireda, EDO
8	Central East African Rail (CEAR)	Mr. Hendry Chimwaza, Managing Director
9	Illovo Sugar Ltd.	Mr. Shaun Saunoers, Logistics Manager
10	SDV Malawi Ltd.	Mr. Joseph Chavula, Commercial Manager
11	JICA Malawi Office	Mr. Michael Malewezi, Programme Officer

* EDO: Environmental Department Officer

MoTPI Counterpart

12	Mr. Geoffrey Magwede, Controller of Rail Transport Services
13	Mr. Kelvin Mphonda, Civil Engineer of Roads Department
14	Mr. Chimwemwe W. Kaunda, Transport Economist

JICA Study Team

15	Mr. Hikaru Nishimura, Team Leader/Transport Planning
16	Mr. Naoki Takanashi, Railway Planning
17	Mr. Shigeru Ando, Road Planning/Road Design
18	Ms. Akiko Abe, Environmental and Social Considerations