

CHAPTER 9

PROJECT IMPLEMENTATION AND ORGANIZATION STRUCTURE FOR OPERATION & MAINTENANCE

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TANESCO has engaged in power business (constructing and operating generation / transmission / distribution facilities) for about 90 years since 1931 when it was established. Until recent years, hydropower was dominant. However, TANESCO constructed and operated natural gas-fired power plants after 2007.

TANESCO has experience in operating the existing gas engine and gas turbine power plants shown in Table 9-1 and the Kinyerezi II GTCC power plant. Regarding the operation of GTCC power plant, all units of Kinyerezi II started commercial operation in December 2018. In addition to these experiences, JICA Study Team believes that at the Mtwara GTCC power plant, the Project can build an organization that can fully operate power generation facilities through the support from EPC contractor, manufacturer's warranty period backup, Long Term Service Agreement (LTSA), Remote Monitoring System (RMS) and so on.

Figure 9-1 shows the TANESCO's organization chart. TANESCO has one Managing Director (MD) and four Deputy Managing Directors (DMDs) for four business divisions (Investment, Transmission, Distribution and customer services, Generation), to operate each division sufficiently.

At present, TANESCO has six natural gas-fired power plants including gas engine and Gas Turbine Simple Cycle (GTSC) in operation, as shown in Table 9-1. Furthermore, TANESCO is now operating Kinyerezi II power plant, the first GTCC in Tanzania, from December 2018.

JICA Study Team investigated the existing GTSC power plants (Ubungo II, Kinyerezi I) and the Kinyerezi II GTCC power and considered the necessary organizational system for the Mtwara GTCC power plant, which is explained in Section 9.2.

Table 9-1 TANESCO's Existing Natural Gas-fired Power Plants (Gas Engine and GTSC)

Plant	Ubungo I	Tegeta	Ubungo II	Mtwara	Kinyerezi I	Somanga
Units	12	5	3	9	4	3
Installed Capacity (MW)	102	45	105	18	158	7.5
Year Installed (Jan)	2007	2009	2012	2007	2016	2010
Gas Turbine/ Gas Engine	GE	GE	GTSC	GE	GTSC	GE
Type	W20V34SG	W20V34SG	SGT-800	G3520C	LM6000PF	W6L32SG
Manufacturer	Wärtsilä	Wärtsilä	SIEMENS	Caterpillar	GE	Wärtsilä

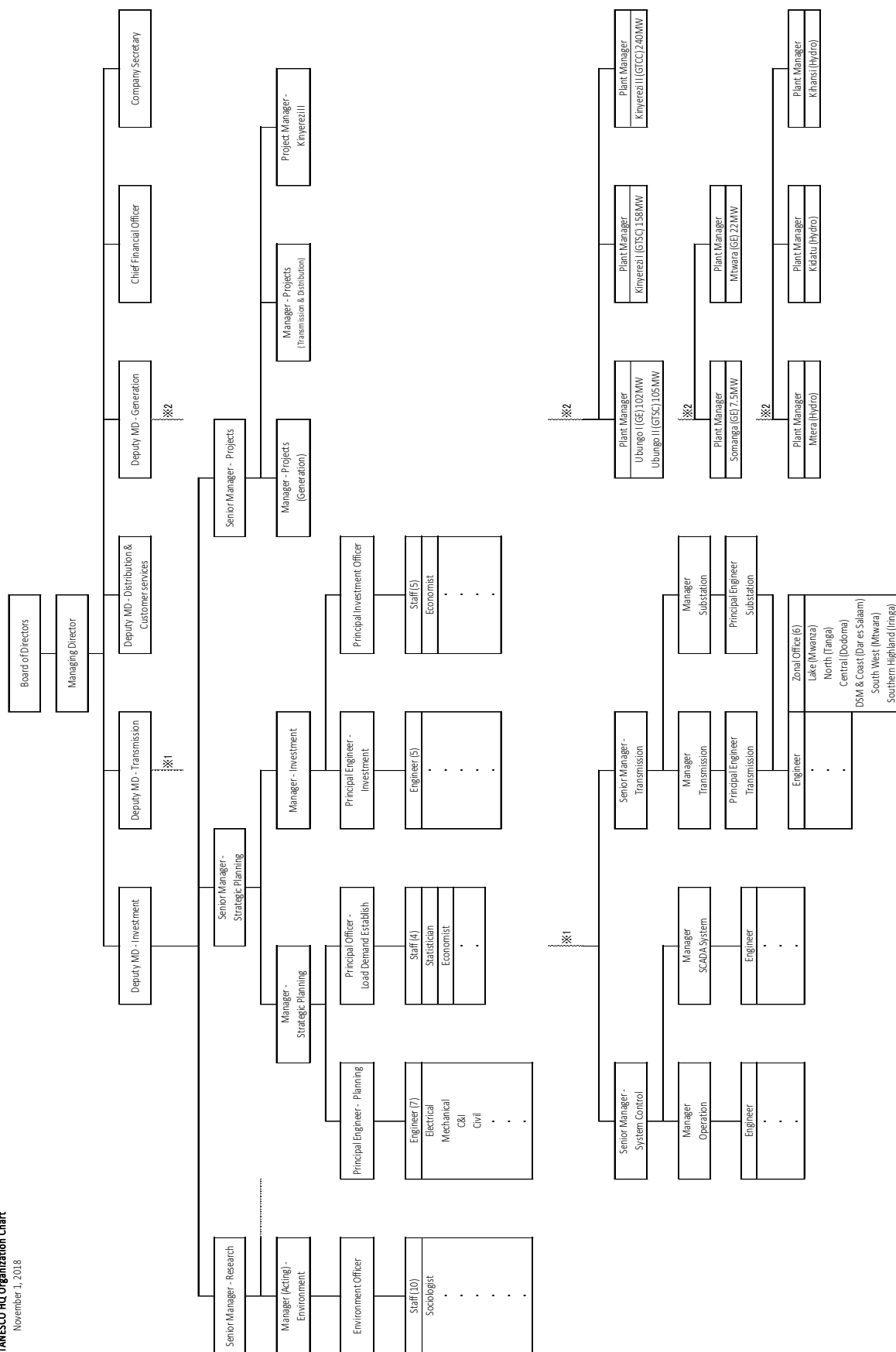
TANESCO HQ Organization Chart
November 1, 2018

Figure 9-1 TANESCO Organization Chart

9.1 FINANCIAL CONDITION OF TANESCO

JICA Study Team was furnished with TANESCO's financial statements for the years 2009-2018. On the basis of the materials collected, JICA Study Team evaluated the financial conditions of TANESCO.

9.1.1 Tariff and Revenue of TANESCO

The customer categories and their tariffs are shown in the tables below.

D1 defined as Domestic Low Usage is the category, presumably, for low income household with the lowest tariff set for the usage under 75 kWh. T1, defined as General use, is the category for relatively small customers including residential, small industries, commercial and public lighting with the highest tariff at Tsh.350 per kWh.

T2 category is for low voltage large customers and T3 (MV, HV) is for maximum demand usage and bulk customers.

As shown in the next sub-section, the sales revenue has been improving gradually, as the tariffs were raised three-fold over the last decade.

Table 9-2 Customer Categories of TANESCO

Category	Explanation
D1	Domestic Low Usage, for low consumption users
T1	General Usage, for general use of electricity including residential, small industries, commercial and public lighting
T2	Low Voltage Maximum Demand Usage, for general use at 400 Volts with average consumption greater than 7500 kWh per meter reading period
T3MV	Medium Voltage Maximum Demand Usage, for general use where power is metered at 11/33 kV
T3HV	High Voltage for general use where power is metered at 132kV and above (including bulk supply to Zanzibar)

Source: EWURA

Table 9-3 Tariffs by Customer Categories

TARIFF RATES												
VAT EXCLUSIVE												
TARIFF STEP		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015-2019
D1	Energy Charge(0-75 kWh)	38	38	40	49	49	49	60	60	60	100	100
	Above 75kWh	115	121	128	156	156	156	195	273	273	350	350
	Service charge											
T1	Energy Charge (kWh)	95	100	106	129	129	129	157	221	221	306	292
	Maximum Demand Charge											
	Service charge	1,700	1,785	1,892	2,303	2,303	2,303	2,738	3,841	3,841	5,520	0
T2	Energy Charge (kWh)	63	66	70	85	85	85	94	132	132	205	195
	Maximum Demand Charge	6,900	7,245	7,680	9,347	9,347	9,347	12,078	16,944	16,944	15,004	15,004
	Service charge	6,300	6,615	7,012	8,534	8,534	8,534	10,146	14,233	14,233	14,233	14,223
T3-MV	Energy Charge (kWh)	59	61	65	79	79	79	84	118	118	163	163
	Maximum Demand Charge	6,400	6,720	7,123	8,669	8,669	8,669	10,350	14,520	14,520	13,200	13,200
	Service charge	6,300	6,615	7,012	8,534	8,534	8,534	10,146	14,233	14,233	16,769	16,769
T3-HV	Energy Charge (kWh)	24	26	28	75	75	75	83	106	106	159	152
	Maximum Demand Charge	3,510	3,686	3,907	4,755	4,755	4,755	8,610	12,079	12,079	16,550	16,550
	Service charge	6,300	6,615	7,012	8,534	8,534	8,534	10,146	14,233	14,233	0	0

Remark: during 2015-2019 the tariff remain unchanged

Source: EWURA

In terms of sales revenues (See table below), the proportion of General use (category T1) has been growing, and accounted for 48% of total sales in 2019. Revenue from High Voltage (T3) did not show large change over the last decade and as of 2019, the proportion is 29%. Low usage domestic (D1) became considerably smaller than before and is 4 % as of 2019.

As mentioned in Chapter 2, there have been ups and downs in industries of Tanzania's economy. The mining sector (category T3) played a great role in attracting foreign investment and contributed to the economy and its growth. However, in the recent years, the business activities in this sector are getting slow, due to the stagnancy of Foreign Direct Investment (FDI). On the other hand, processing of agricultural products and production of small-scale consumer goods (mostly category T1) are growing and becoming a major part of Tanzania's industrial sector. The export of agricultural products became the major source of income through Tanzania's foreign trade.

These changes in the economy are reflected in the sales of electricity. Electricity demand has been stagnant in category T3 and its focus shifted to T1, reflecting its structural change.

Table 9-4 Proportion of Sales by Customer Category

Year	2009	2010	2011	2012	2013	2014/ 2015	2015/ 2016	2017	2018
Domestic (Tariff: D1)	11%	10%	9%	7%	6%	3%	4%	3%	2%
General use (Tariff: T1)	32%	35%	38%	41%	44%	49%	48%	48%	49%
Low - Voltage (Tariff: T2)	15%	15%	14%	14%	12%	12%	11%	11%	11%
High - Voltage (Tariff: T3)	33%	33%	27%	27%	27%	28%	29%	30%	31%

Source: TANESCO financial statement

9.1.2 Profit-and-Loss Statement

Profit and loss of TANESCO for each year over the period of 2009 – 2018 are shown in Table 9-5. Income from electricity sales has been steadily increasing because of demand growth combined with tariff raise. However, TANESCO has been mostly operating in deficit during this period.

Table 9-5 Profit and Loss of TANESCO

(Unit: Tsh. Million)

Item \ Year	2009	2010	2011	2012	2013	2014-2015	2015-2016	2017	2018
Revenues									
Total sales revenues	413,501	466,477	545,658	820,436	933,525	1,957,754	1,379,740	1,415,314	1,436,153
Total other operating revenues	166,590	106,507	279,331	299,389	338,155	374,396	91,468	140,844	202,827
Total operating revenues	580,091	572,984	824,989	1,119,825	1,271,680	2,332,150	1,471,208	1,556,158	1,638,980
Sales expenditures									
Own Generation & Transmission	109,423	120,541	230,730	401,379	359,971	686,624	564,612	456,530	545,316
Purchased electricity	195,446	211,713	346,021	527,816	824,577	613,774	483,555	369,810	272,710
Distribution expenses	95,497	107,828	121,355	160,359	160,896	337,168	256,002	288,330	271,445
Depreciation	38,758	52,170	55,291	72,883	84,252	133,776	127,599	422,367	370,450
Subsidiary-ETDCO									170
Total sales expenditures	439,124	492,252	753,397	1,162,437	1,429,696	1,771,342	1,431,768	1,537,037	1,460,091
Operating expenditures	114,396	76,851	106,277	130,956	241,422	299,697	154,451	168,672	201,028
Total operating expenditures	553,520	569,103	859,674	1,293,393	1,671,118	2,071,039	1,586,219	1,705,709	1,661,119
Operating profit or loss	26,571	3,881	-34,685	-173,568	-399,438	261,111	-115,011	-149,551	-22,139
Net finance expense/income	-63,200	-47,810	-41,526	-50,515	-68,266	-288,207	-243,476	-120,913	-96,310
Profit/ loss before tax	-36,629	-43,929	-76,211	-224,083	-467,704	-27,096	-358,487	-270,464	-118,449
Income tax/ credit	76,786	-3,383	32,784	45,629	-	-98,972	8,932	5,167	5,933
Profit/ loss after tax	40,157	-47,312	-43,427	-178,454	-467,704	-126,068	-349,555	-265,297	-112,516

Remark: Figure for 18 months in 2014 - 2015

Source: TANESCO financial statement

Fiscal year : Before the year 2014; January to December, in and after 2014; July to June

The ratios of sale expenditures to total sales revenues were calculated from the PL statements and are shown in the table below. The value mostly remained over 100% throughout the period. This implies the imbalance between production costs and tariffs.

Table 9-6 Ratio of Sales Expenditure to Total Sales Revenue

Year	2009	2010	2011	2012	2013	2014/2015	2016	2017	2018
Total Sales Expenditure / Total Sales Revenue	106%	106%	138%	142%	153%	90%	104%	109%	102%

Source: TANESCO financial statement

Among sales expenditures, the cost of purchased electricity accounted for the largest portion until 2013 (Table 9-7). After 2013, TANESCO started the operation of new power plants such as Ubungo 1 & 2 (2007 and 2012, respectively) and the proportion of purchased electricity cost gradually decreased. It shows that TANESCO has increased its generation capacity to a certain level and is sufficient to do without purchase from EPPs. Therefore, the cost of purchased electricity decreased and this helped to improve the financial conditions of TANESCO.

Table 9-7 Ratios of Costs of Purchased Electricity and Own Generation

Year	2009	2010	2011	2012	2013	2014/ 2015	2016	2017	2018
Purchased electricity / Total operating expenditure	35%	37%	40%	41%	49%	30%	30%	22%	16%

Source: TANESCO financial statement

9.1.3 Balance Sheet

The balance sheet of TANESCO is shown in Table 9-8, and the ratios of principal items are shown in Table 9-9.

“Total asset” has been increasing sharply since 2009. Especially, since 2014, the values of “Property, Plant Equipment” and “Capital work in progress” jumped up, reflecting that some of facilities to supply electricity were put in place one after another.

On the other hand, “Total liabilities” has been increasing by 30% each year.

As mentioned in Section 9.1.2, large deficit has continued, and as a result “Accumulated losses” grew since 2012 and inflated year by year

Table 9-8 Balance Sheet of TANESCO

(Unit: Tsh. Million)

Item	Year	2009	2010	2011	2012	2013	2014- 2015	2015- 2016	2017	2018
Non-current assets										
Property, plant equipment		1,828,480	1,982,451	2,035,738	2,247,081	2,662,769	2,741,150	6,136,938	6,416,160	6,260,216
Capital work in progress		66,359	189,165	396,106	435,314	427,424	1,737,992	1,367,031	1,474,090	1,833,176
Intangible asset		232	116		-	2,734	928	310	618	526
Investment property					-	725	453	272	227	181
Investments		13	13	13	1,056	1,056	2,201	1,408	1,149	1,258
Capacity charges prepayment		65,393	61,176	56,356	51,878	47,399	40,681	36,202	31,723	27,327
Restricted deposits/funds							54,551	60,382	10,404	32,499
Total non-current assets		1,960,477	2,232,921	2,488,213	2,735,329	3,142,107	4,577,956	7,602,543	7,934,371	8,155,183
Current assets										
Inventories		65,452	57,761	73,566	127,739	123,659	19,339	12,942	10,909	13,020
Assets held for sale					-	561	561	-	-	-
Trade & other receivable		250,101	169,515	209,198	224,914	260,618	334,692	218,584	239,338	234,288
Prepayments					100,650	65,663	54,431	54,410	65,827	62,551
Current income tax recoverable		5,392	2,140	2,479	2,617	3,013	3,536	2,010	2,097	356
Restricted deposits/funds							10,724	12,340	58,958	13,353
Bank balances & cash		94,470	104,256	139,891	127,591	178,241	163,686	129,509	113,702	285,263
Total current assets		415,415	333,672	425,134	583,511	631,755	586,969	429,795	490,831	608,831
Total assets		2,375,892	2,566,593	2,913,347	3,318,840	3,773,862	5,164,925	8,032,338	8,425,202	8,764,014
Capital & reserves										
Share capital		986,717	986,717	986,717	986,717	986,717	986,717	986,717	986,717	986,717
Advance towards share capital		158,406	158,635	159,943	161,913	359,909	494,316	606,751	716,713	751,518
Accumulated losses		-713,483	-760,795	-804,222	-982,676	1,450,380	1,576,446	1,926,001	2,191,306	2,303,827
Revaluation reserve		781,370	853,192	853,270	854,325	854,325	704,615	2,301,040	2,301,040	2,301,040
Total equity		1,213,010	1,237,749	1,195,708	1,020,279	750,571	609,202	1,968,507	1,813,164	1,735,448
Non-current liabilities										
Grants		249,172	406,046	629,768	816,097	1,021,181	1,788,548	2,215,613	2,574,158	2,892,213
Borrowings		466,891	402,236	377,299	237,206	1,000,543	843,755	892,526	767,623	716,895
Consumer deposits		13,865	14,431	15,329	15,895	23,048	21,165	21,272	21,245	16,429
Other employment benefits		19,273	20,028	20,275	21,396	22,482	24,119	24,252	22,847	26,404
Trade and other payables					-	34,594				
Deferred tax liability		44,216	78,380	45,629			374,993	1,080,400	1,102,846	1,102,435
Deferred income										949
Total non-current liabilities		793,417	921,121	1,088,300	1,090,594	2,101,848	3,052,580	4,234,063	4,488,719	4,755,325
Current liabilities										
Bank overdraft				36,723	126,728	-	-			
Trade & other payables		321,883	302,798	472,213	707,012	789,439	979,918	1,187,238	1,224,476	1,261,826
Borrowings		47,582	104,925	120,403	374,227	132,004	519,126	637,268	793,009	903,296
Provisions									94,695	98,035
Income tax payable							4,099	5,262	11,139	9,992
Total current liabilities		369,465	407,723	629,339	1,207,967	921,443	1,503,143	1,829,768	2,123,319	2,273,149
Total liabilities		1,162,882	1,328,844	1,717,639	2,298,561	3,023,291	4,555,723	6,063,831	6,612,038	7,028,474
Total equity & liabilities		2,375,892	2,566,593	2,913,347	3,318,840	3,773,862	5,164,925	8,032,338	8,425,202	8,763,922

Remark: Figure for 18 months in 2014 - 2015

Source: TANESCO financial statement

Fiscal year: Before the year 2014; January to December, in and after 2014; July to June

Based on the above balance sheet, the principal ratios are calculated and are shown below.

Fixed Asset-To-Equity Ratio (Total Non-Current/Total Equity) has been on the high range each year. Generally, it is desirable to have the ratio under 100%, as principal investment shall be made

within the limit of one's own equity. This shows that TANESCO has a considerable shortage of its own equity.

Debt Equity ratio reached over 100% in 2010 and rose year by year. TANESCO was not able to keep the balance by means of its own equity, and the loss has been accumulated gradually.

As a result, "Accumulated losses" affected "Capital & Reserves" and the capital ratio had shrunk to around 20% in 2018.

Table 9-9 Ratio of Principal Item in the Balance Sheet

(Unit: %)

Year	2009	2010	2011	2012	2013	2014/ 2015	2015/ 2016	2017	2018
Fixed Asset-To-Equity Ratio	162	180	208	268	419	751	386	438	470
Debt Equity Ratio	96	107	144	225	403	748	308	365	405
Capital Ratio	51	48	41	31	20	12	25	22	20

Source: TANESCO financial statement

9.1.4 Cash Flow Statement

Excerpts of key indicators from the cash flow statements of TANESCO in the years 2018 are shown in Table 9-10.

Observing the cash flow, the free cash flow ("cash generated in operations" minus "net cash used in investing activities") was Tsh. ▲ 294,526 million. It suggests that the investment cost to develop facilities has a great influence on the free cash flow. As a result, the balance of income and expenditures is not so healthy and the positive cash flow relies on borrowing to fill the deficit. This circumstance is not sustainable, and a designed investment, which is an improvement of income/expenditure balance, must be sought.

Table 9-10 Cash Flow Statements of TANESCO (Excerpt of key indicators)

(Unit: Tsh. million)

Item	2018 Jun
Cash generated in operations	313,347
Net cash used in investing activities	-607,873
Net cash generated from financial activities	466,087
Net increase in cash and cash equivalents	171,561
Cash and cash equivalent at the beginning of the year	113,703
Cash and cash equivalent at the end of year	285,264

Source: TANESCO financial statement

9.1.5 Summary of TANESCO's Financial Situation

TANESCO has been financially in deficit for most of the period JICA Study Team looked back. On the income side, the tariffs have tripled in the past decade. However, this did not help TANESCO's financial position. Now that it is currently in the phase of heavy investment, continued government support in this regard is desirable.

In the past, when TANESCO's cash flow became difficult, the GoT had borrowed Development Policy Operation (DPO), a sector loan, from World Bank (WB), and provided management support for TANESCO with the conditions as follows;

- Strengthening the country's ability to bridge the financial gap in the power sector,
- Reducing the cost of power supply and promoting private sector participation in the power sector,
- Strengthening the policy and institutional framework for the management of the country's natural gas resources.

One of the factors attributable to the persisting deficit is the large cost of power purchase which has been a great burden on TANESCO. On the sales side, the revenue from power sales has been increasing steadily and rapidly. In order to improve the imbalance of income and expenditures, it is necessary to increase the low-cost generation capacity and meet the fast-growing electricity demand. This seems to be an urgent business that TANESCO has to take on.

Regarding the tariff, there is a system to have it reviewed every year by the Energy and Water Utilities Regulatory Authority (EWURA) under the MOE. TANESCO has been investing in power supply improvement to meet increasing demand, and EWURA approved the revision of the tariff commensurate with the management condition of TANESCO in 2016. However, since the GoT's policy is strongly in favor of industrial development measures, the increase of electricity tariff was not approved by the GoT. This resulted in continued management difficulties of TANESCO.

9.2 ORGANIZATION FOR POWER PLANT CONSTRUCTION AND O&M

9.2.1 O&M Organization for Existing Power Plants

TANESCO currently has thermal power plants of several gas engines and GTSC plants. The existing large scale GTSC plants (Ubungu II and Kinyerezi I) have not experienced major maintenance after the warranty period, because the operation period is not so long. Regarding the GTCC power plant, Kinyerezi II started operating from December 2018. TANESCO will experience GTCC power plant commercial operation from now on.

(1) Existing GTSC power plant in operation: Kinyerezi I

a) Facility configuration

Kinyerezi I has four simple cycle gas turbine units with aero-derivative GT (GE's LM6000PF). Gross output is 154MW (Unit 1, 2: 42MW × 2, Unit 3, 4: 35MW × 2). Each of the units have different outputs, because only two units (Units 1 and 2) have electrical chillers (hereinafter indicated as chillers) that cool down inlet air temperature (from 33°C to around 14°C) to increase the GT output. Regarding GT units with chillers (Units 1 and 2), the GT air filter has a three-stage structure of- filter guard, pre-filter, and cylindrical type main filter. However, the other GT units without chillers (Units 3 and 4) have two-stage structure. In Units 1 and 2, the number of chillers per unit is five, and it generates condensed water of about 2 to 8 m³/hour /unit. The condensed water volume fluctuates based on season and climatic conditions. The condensed water is used for the intake cooling, and also used in the office and is stored in raw water / fire water tank (each capacity: 700 m³). Chillers are planned to be installed in the rest of the two units (Units 3 and 4), and they plan to supply the condensed water to Kinyerezi II, in addition. Currently, Kinyerezi I has not yet provided Kinyerezi II with condensed water.

Mtwara Gas is supplied as fuel gas from the nearby BVS of TPDC. In the end of 2017, when gas supply to Kinyerezi II started, permanent underground gas pipeline was installed instead of temporary gas pipeline, which is installed above the ground. Fuel gas receives Mtwara Gas of TPDC and delivers 58 bar of feed gas pressure to each GT at a reduced pressure of about 44 bar. (Gas pressure is high due to aero-derivative GT)

For emergency situation, dual type GT is adopted, which can use oil. But no oil-fired operation has been done since commercial operation in 2015. There are oil tanks. (Jet Fuel: 3,750 m³ × 2 tanks) However, there is no opportunity for using oil and no fuel oil is stored in the fuel tank. There is one fire water tank (700 m³). Construction of additional power plant (LM6000 × 4 units, same with existing power plant) as Kinyerezi I Phase 2 extension is underway.

b) O&M Organization

Figure 9-2 shows O&M organization for Kinyerezi I. Totally, 92 staffs are working there.

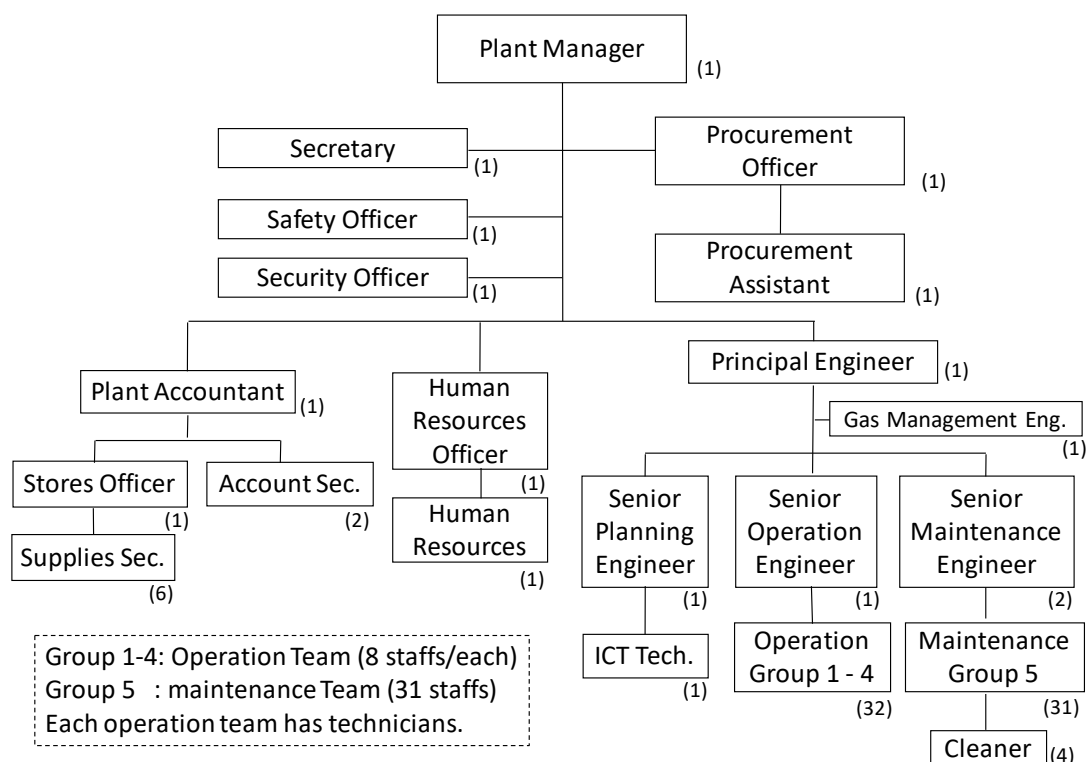


Figure 9-2 Staff Organization in Kinyerezi I

There are four groups for plant operation (Group 1-4) and they work in three shifts of eight hours. Each operation group consists of 8 staffs and technicians (technical personnel). Furthermore, there is a group engaged in daily maintenance work. Therefore, totally there are five groups. Plant maintenance group (Group 5) consists of 31 staffs. Currently, expansion work (four GTSCs, six chillers) is being carried out at Kinyerezi I. There are about 90 more staffs than at the other power plants, including staff for expansion work.

Operation orders (start / shut down) are delivered by e-mail on a monthly, weekly, and daily basis from TANESCO GCC. Currently, operators interact with the center by phone.

Maintenance of the gas turbine is carried out based on the manufacturer (GE) recommendation. Inspection is carried out every 4,000 hours of operation, and overhaul is carried out at the GE maintenance factory in the Middle East, the USA etc. at every 53,000 hours of operation time. Site inspection is carried out by TANESCO engineers under the coaching of manufacturer's instructor.

Serious troubles of main facilities, such as GT and generator, have not occurred until now. GT inlet air filter is clogged because of dust generated by Kinyerezi I and Kinyerezi II construction. Filter cleaning or change is carried out quite frequently. (once in every 2 or 3 months) The root cause of air intake trouble is supposed to be volume shortage of air intake room.

Commercial operation of GTs was commenced during October 2015 to February 2016. The power plant equipment has a two-year limited warranty, and the warranty period ended in 2018. The maintenance contract of LTSA after the warranty period was contracted. LTSA with 6 years is starting from March 2019. LTSA consists of provision of services and spare parts.

*Kinyerezi I Power Plant**Kinyerezi I Substation*

(2) Existing GTSC power plant in operation: Ubungo II

a) Facility configuration

Ubungo II has three simple cycle gas turbine units with Siemens SGT-800 (heavy-duty-type). Although gross output was originally 105MW ($35\text{MW} \times 3$), it was improved to 129 MW ($43\text{MW} \times 3$) by changing/updating the governor control program. These units have no chiller.

Until 2017, Songas supplied fuel gas. The fuel gas pressure was 58 bar and depressurized to about 29 bar for each GT. However, there were troubles in GT such as losing fire because the gas pressure was not stable. Mnazi Bay Gas of TPDC (same with Kinyerezi I) has been supplied since the end of 2017, using the new pipeline. These gas turbines are only for natural gas, and not for oil-fired.

Although there is an idea to change from simple cycle gas turbine units to GTCC, they haven't yet consulted with the manufacturer, because of constraints in site area and industrial water issue of ST. Regarding the site area, if adjacent IPP plants (owner: Symbion) would be removed, space for installation can be acquired. Regarding water issue, they are worried that it is necessary to buy expensive water from DAWASCO (Dar es Salaam Water and Sewerage Corporation) because well water contains salt and cannot be used as industrial water. One fire water tank (700 m^3) is installed.

*Ubungo II Power Plant**Ubungo II Substation*

b) O&M Organization

Figure 9-3 shows O&M organization at Ubungo II. Totally, 50 staffs are working at Ubungo II, including 37 technical staffs. There are four groups, with a total of 20 staffs for plant operation (Group 1-4). Each operation group consists of 5 staffs. Furthermore, there is a group of 9 staffs for plant maintenance, filter management, Information and Communications Technology (ICT) for daily work.

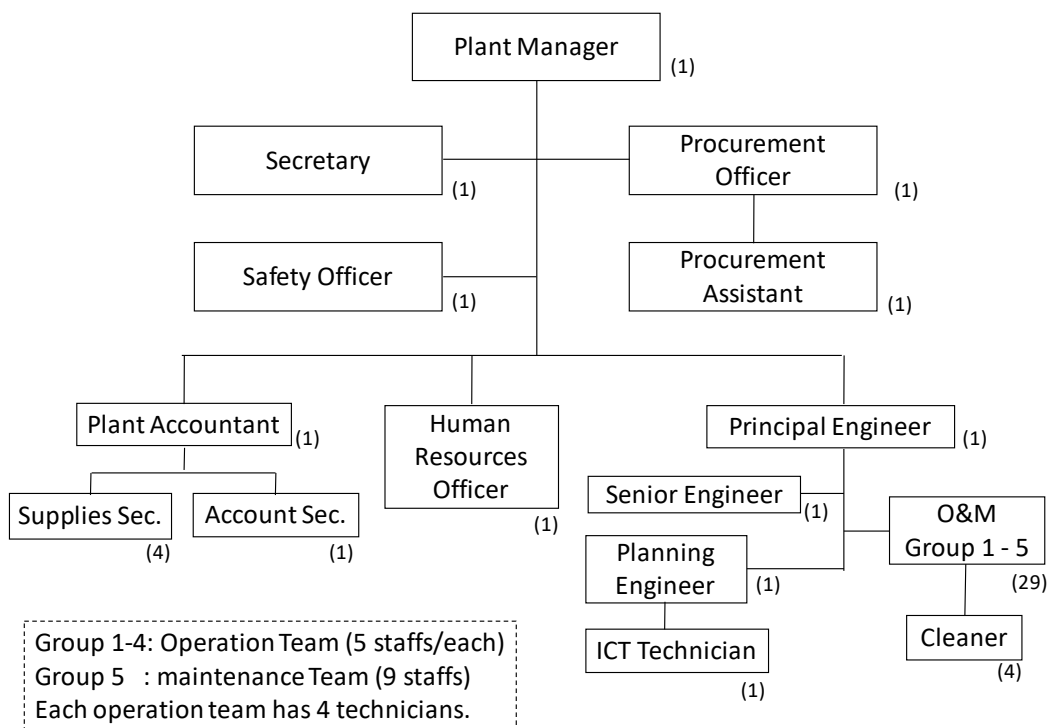


Figure 9-3 Staff Organization in Ubungo II

Shift staff operate facilities on 24 hours basis. They record daily and monthly operation data but they does not analyze, which will help to keep the performance. Remote monitoring system by GT manufacturer (Siemens) is installed but TANESCO has not contracted the remote monitoring service. Therefore, TANESCO needs to consult with GT manufacturer if troubles occur.

GT maintenance is carried out based on GT manufacturer's (Siemens) recommendation period (20,000 EOH). Six years has passed since COD. The accumulated operating hours is less than 60,000¹. Major maintenance for GT has not been conducted.

There is a workshop, but they are unable to conduct advanced repair works. And there is a warehouse. They have no spare parts for the high temperature component of gas turbines, but they have only spare parts for consumables and sensors.

In 2016, the No.5 blade of GT #3 compressor was damaged. It took more than six months to recover from the outage, as it took time to secure the maintenance budget and negotiate with the GT manufacturer and confirm whether the trouble is covered by warranty. JICA Study

¹ 60,000 hours are expected in 2021.

Team speculates that TANESCO does not have the sufficient ability to detect abnormal vibration or sound, conduct appropriate facility shutdown and analyze the root cause; and this inability made the trouble more serious. Based on this fact, root cause analysis is not performed well. Therefore, it is necessary to enhance maintenance ability. TANESCO is considering LTSA, proposed by GT manufacturer, because the power plant was stopped for more than six months.

c) Education and Training

Main O&M staff took training programs (two weeks onsite and one week at GT factories in Sweden) that was provided by the manufacturer during the construction period including the warranty period. The contents are instruction manuals from the main manufacturers and engineering companies. And then, they are teaching the other staff through On the Job Training (OJT) with user's manual. There is no systematic training text. Safety officers conducts monthly "Health & Safety Training" about the handling method of protection tools and how to work safely. The officer is in charge of Ubungo I & II and Tegeta too.

TANESCO has two training centers. One is TANESCO Training School (TTS) in Dar es Salaam, mainly for lectures. The other is TTS for transmission and distribution. TANESCO does not have TTS for thermal power. In the past, TANESCO conducted training for thermal power plants at Songas power plants (COD in 1990, LM6000PC \times 4units), next to TANESCO HQ. But TANESCO does not conduct it nowadays.

9.2.2 Construction and O&M Organizations for New Power Plant

(1) GTCC power plant just under commercial operation: Kinyerezi II

a) Facility configuration

Kinyerezi II is the first GTCC power plant that adopted "GT: H-25" of Mitsubishi Hitachi Power Systems (MHPS) and has two blocks of three GTs and one ST, totally six GTs and two STs (3-3-1 GTCC \times 2 Blocks). The total net output is 240MW (30MW \times 3 GTs, 30MW \times 1 ST, 2 Blocks). Generator Step-up Transformer (GSUT) is installed on each generator (8 units) and the specification of GT's GSUT is 230/11kV, 35MVA. The control center building has power cable room in the 1st floor, switch gear room in the 2nd floor, control facilities and central control room in the 3rd floor. The height of chimney is 45 meters.

Construction started in March 2016 and COD of GT #1 Unit 1 was in February 2018 as simple cycle GT. And COD of all GT and ST units (GTCC) was in December 2018. In the south of the site, TANESCO will install 400kV substation. The facility was changed from AIS to GIS because of lack of sufficient space. Since the 400kV substation's construction is delayed, power cables from Kinyerezi II are connected to the switch yard of Kinyerezi I expansion project.

b) Construction status

In 2012, TANESCO contracted with Sumitomo Corporation as the EPC contractor. The construction was started in March 2016 and completed in October 2018.

There were about 2,000 workers at the construction site, including 4 persons (3 Japanese) from Sumitomo Corporation and about 10 persons (10 Japanese) from Toshiba Plant System & Services Corporation (TPSC). 95% of local workers were Tanzanian and they worked well

under appropriate supervision. There were no severe accidents. Although work progress was worse in the rainy season, the impact was within the estimated schedule.



Kinyerezi II Power Plant



Kinyerezi II Substation

c) Construction Organization

As shown in Figure 9-4, the construction organization for Kinyerezi II consisted of about ten TANESCO staff, including a plant manager, electrical engineer, mechanical engineer, civil engineer, labor manager, document manager, and indirect task staff. Their main task was to approve the facility drawings submitted by EPC contractor, check the actual progress, and confirm commissioning of each facility.

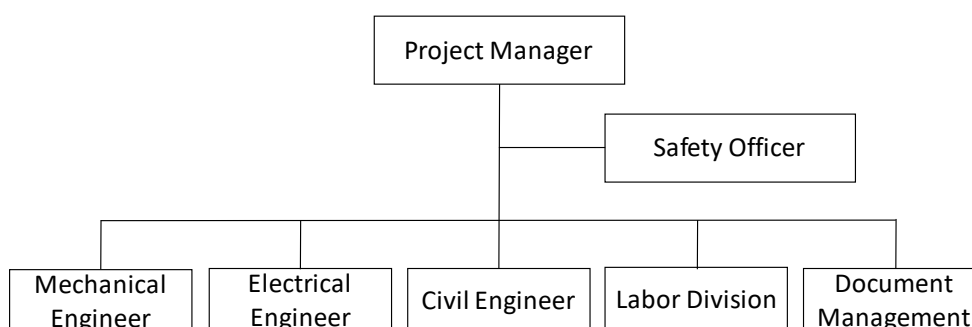


Figure 9-4 Construction Organization - Kinyerezi II

d) O&M Organization

TANESCO established the O&M organization for Kinyerezi II after COD. As shown in Figure 9-5, there are 135 total staffs, including 60 operation staffs. There are 40 operators (4 groups for 3 shift, 10 persons in a group) out of the 60 operation staffs. The 10 persons consists of a manager, four control room operators, three field operators and two water/waste water treatment operators. 8 persons out of the 60 operation staffs are laboratory technicians in charge of water/waste water managements. The new employees are trained through OJT and are expected to become core members at the Mtwara GTCC power plant in future.

Remote Monitoring System (RMS) for a warranty period of 2 years is included in the EPC contract. GT manufacturer (MHPS) monitors only GTs. And manufacturers are different for each main facility; GT from MHPS, ST from Kawasaki Heavy Industries (KHI), HRSG from

Daekyung Machinery (South Korea), GT generator from BRUSH (UK), ST generator from Toshiba Mitsubishi Electric, transformer from DAIHEN. Therefore, it is recommended that TANESCO equips itself with the capacity building program, by which Utilities² can remotely monitor the whole plant system and support the O&M of GTCC power plant. In the other GTSC power plants, such as Kinyerezi I and Ubungu II, the operation data can be remotely monitored by GT manufacturers. It is possible for TANESCO to seek advice from the manufacturers, if any trouble occurs.

TANESCO conducts major maintenances based on manufacturer's recommendations. The first GT Combustion Inspection and spare parts supply for six (6) GTs are included in the EPC contract. TANESCO expects 25 years of operation after COD, and recognizes that LTSA with GT manufacturers is necessary for stable operation and technical transfer. Therefore, TANESCO is discussing to contract LTSA before the end of warranty period.

e) Recruiting for O&M staff

Plant manager recruited the O&M staff from the other power plants and HQ of TANESCO, through direct interview. The 50 technical staff are made up of 36 current staff and 14 new employees. Some of the new employees have experience of working in other companies. Therefore, JICA Study Team considers that TANESCO is an attractive company for Tanzanian people and that it is possible to secure O&M staff for the Mtwara GTCC power plant.

f) Education and Training

Main O&M staff will undergo training programs (two weeks onsite and one week at factories) that is provided by the manufacturers during the construction period including the warranty period. The contents received are: instruction manuals from main manufacturers and engineering companies. And then, they will teach other staff through OJT.

² Utilities in this case mean foreign Electric Power Companies

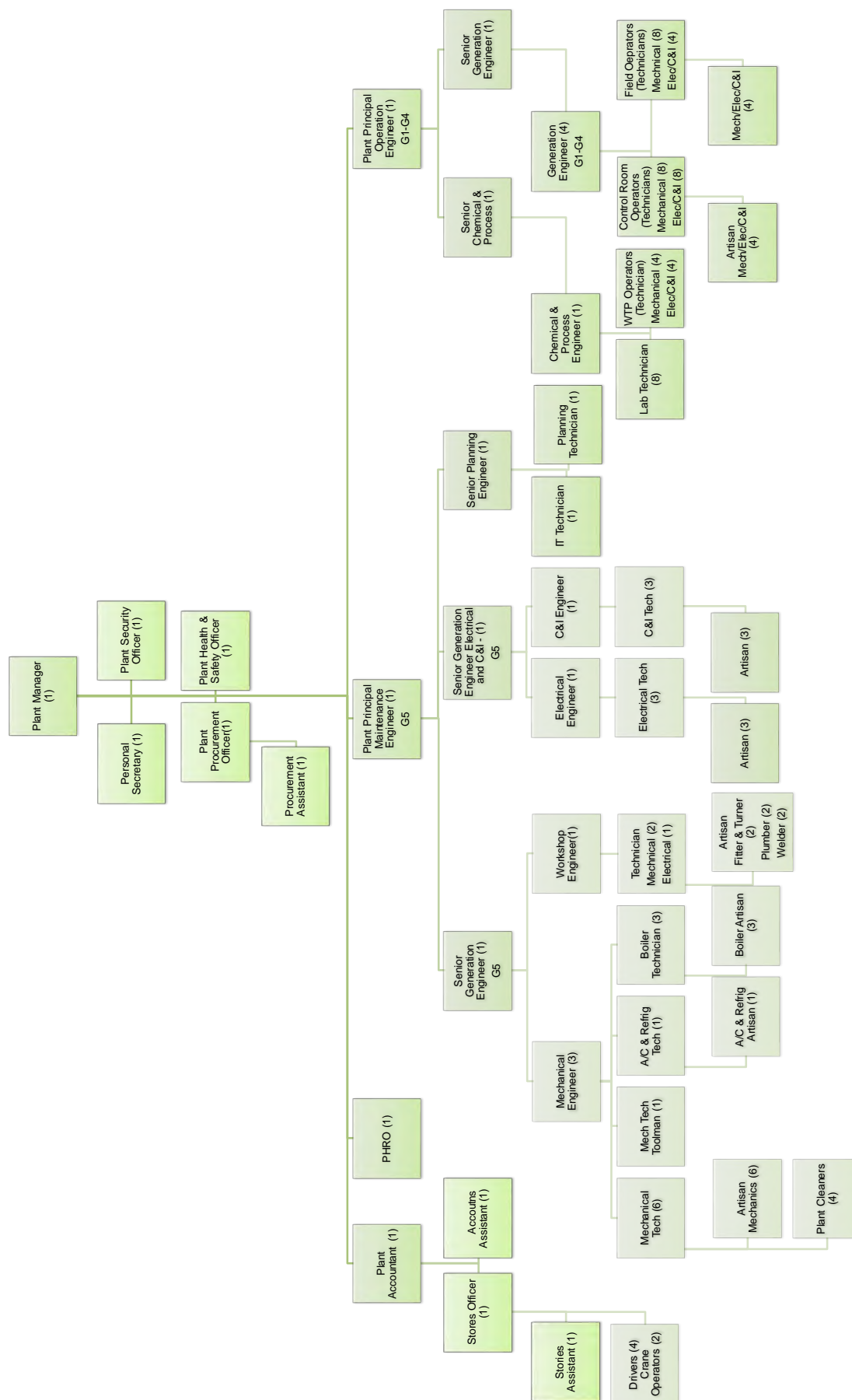


Figure 9-5 Draft O&M organization for Kinyerezi II after COD

9.2.3 Recommendation for Mtwara GTCC Power Plant

Based on discussion with TANESCO generation division and plant managers at the existing power plants about O&M organization, education / training, JICA Study Team recommends an ideal construction organization and O&M organization for safe, stable and sustainable facility operation as follows.

(1) Construction Organization for Mtwara GTCC Power Plant

TANESCO needs to prepare construction organization similar to Kinyerezi II for the Mtwara GTCC power plant. Figure 9-6 shows the positioning of the Mtwara project within TANESCO's head office. Mtwara project management unit will be established directly under the DMD (Investment department) like the Kinyerezi II project. The Kinyerezi II construction site, had limited TANESCO staff. Basically, the EPC contractor seems to have lead the construction work. However, TANESCO needs to manage the following items with consultants' advice/support to secure quality management, schedule management, safety management at construction phase. JICA Study Team considers that the EPC contractor is mainly in charge of construction management. The draft organization structure for Mtwara GTCC construction stage is as shown in Figure 9-7.

a) Quality Management

TANESCO together with the Consultant checks whether the facility design of EPC contractor satisfies TANESCO's specification and requirements and approves the same. If there is any correction, rules for document management are necessary so that both parties confirm the correction result through the document. In addition, TANESCO together with Consultant must confirm the manufacturer's shipment inspection for main facilities (GT, ST, HRSG, generator, and GSUT). And they also must request the EPC contractor to submit working manuals for onsite facility commissioning and confirm whether the entire power plant satisfies all requirements and performances for commissioning. It is important to manage these process with documents and inspection data.

b) Schedule management

TANESCO together with the Consultant must confirm whether the entire schedule is reasonable before the construction starts. Since unexpected troubles occur at construction stage, TANESCO together with Consultant must hold periodical schedule meeting with manufacturers and EPC contractor on daily, weekly, monthly basis in order to communicate smoothly. If there is any delay, it is necessary to take appropriate countermeasures.

c) Safety Management

Safety is the first priority at the construction stage. TANESCO together with Consultant must request the EPC contractor to submit work plan in advance including safety management system, and check its content, and secure daily safe working conditions. It is also important to set a health and safe committee consisting of TANESCO, Consultant, manufacturers and EPC contractor and share the information about troubles and issues.

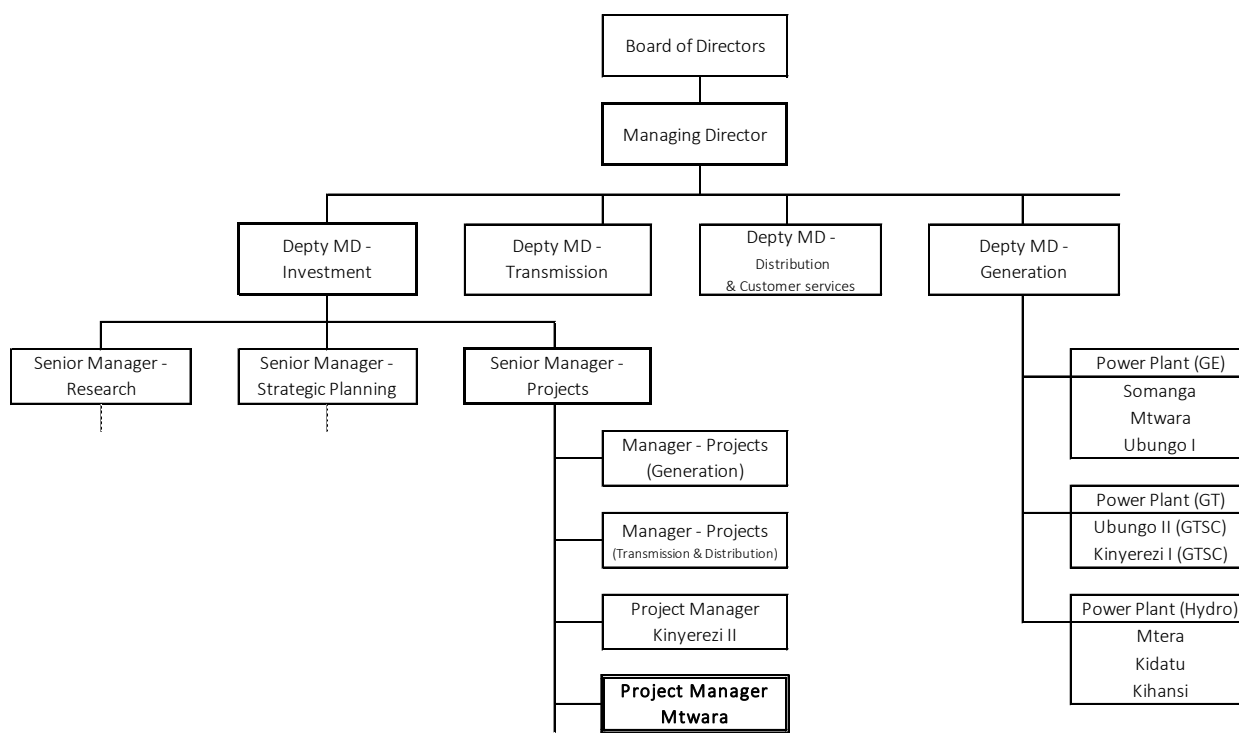


Figure 9-6 Mtwara GTCC Project in TANESCO

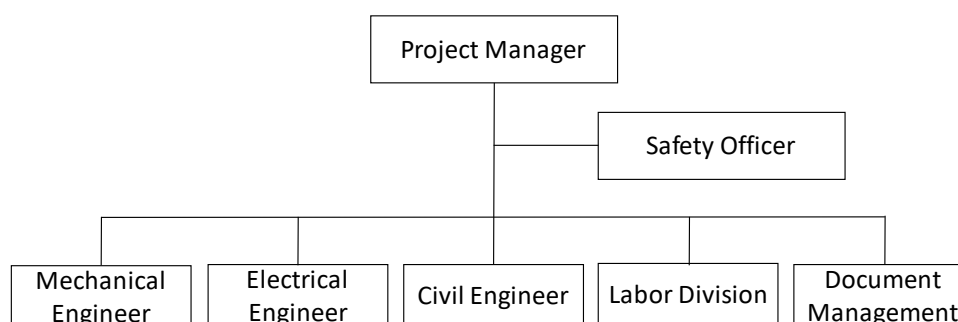


Figure 9-7 Organization Structure for Mtwara GTCC Construction Stage (Draft)

(2) O&M Organization for Mtwara GTCC Power Plant

O&M organization for the new plant will be same as the organization of that of Kinyerezi II GTCC power plant.

After COD of the Mtwara GTCC power plant, the power plant organization will be transferred to the power generation division. The draft organizational structure is shown in Figure 9-8.

The staff for the Mtwara GTCC power plant can be secured from other power plants and head offices of TANESCO, as well as Kinyerezi II. In case of staff shortage, the Project manager should recruit new or mid-career employees from outside the company.

At the existing power plants, TANESCO's operators record and confirm daily operation data but do not manage plant performance by collecting performance data periodically. After GTCC starts

operation, it is important for stable facility operation to learn how to manage facility performance periodically and detect troubles in advance.

Sea water cooling system is the technology to be introduced as first time in Tanzania. Technical support (education and training) for the system management is necessary together with the operation management for the entire power plant (periodical performance management, accumulating management for capacity factor).

Regarding maintenance, the periodical inspection is conducted based on manufacturer's recommendation for the existing GT power plants, Kinyerezi I, Ubungo II. However, TANESCO does not keep spare GT hot parts. Therefore, it takes long time to recover from troubles because TANESCO needs to purchase them from manufacturers each time. It is important to keep spare parts and secure maintenance budget for troubles. And, in order to continue stable facility operation after COD, it is necessary to incorporate the expenses for LTSA and RMS services of manufacturer in the project cost.

In June 2016, TANESCO experienced a serious trouble as the compressor blade of GT #3 was damaged at Ubungo II. The GT stopped generation for about 6 months. This incident revealed that TANESCO needs to improve O&M skill through GT manufacturer's support with LTSA and monitoring facility status. In addition, TANESCO understands that maintenance is necessary to keep facilities stable for a long term. Based on this incidental experience, TANESCO needs to plan daily and long-term maintenance, to manage maintenance records, to make facility diagnoses, to train O&M staff, and to systemize budget management.

Based on this background, for stable and efficient long-term operation, it is necessary to monitor plant facilities, manage operation data, conduct appropriate maintenance and deal with facility troubles. To enable these items, the following methods are preferable;

1) LTSA/RMS with GT manufacturer in the Project

2) Capacity building program in the next stage such as O&M support including RMS for the entire plant system³ and the training program for O&M staff by Utilities. In addition, technical support is also necessary about security, safety, quality management, and environment. An example of 2) is as shown in Figure 9-9, K-VaCS (Kansai - Value Creation Service, provided by the Kansai Electric Power Co., Inc.).

GT manufacturers provide supports/services related to the operation of GT. However, they do not provide services, which will manage the operation of the entire power plant. K-VaCS, which is based on the knowledge of electric power company, is a typical service provided to help operate and manage the entire power plant. It has already been applied at overseas power plants.

³ It is possible to transfer RMS for GT by GT manufacture to Utilities' integrated RMS for whole plant system.

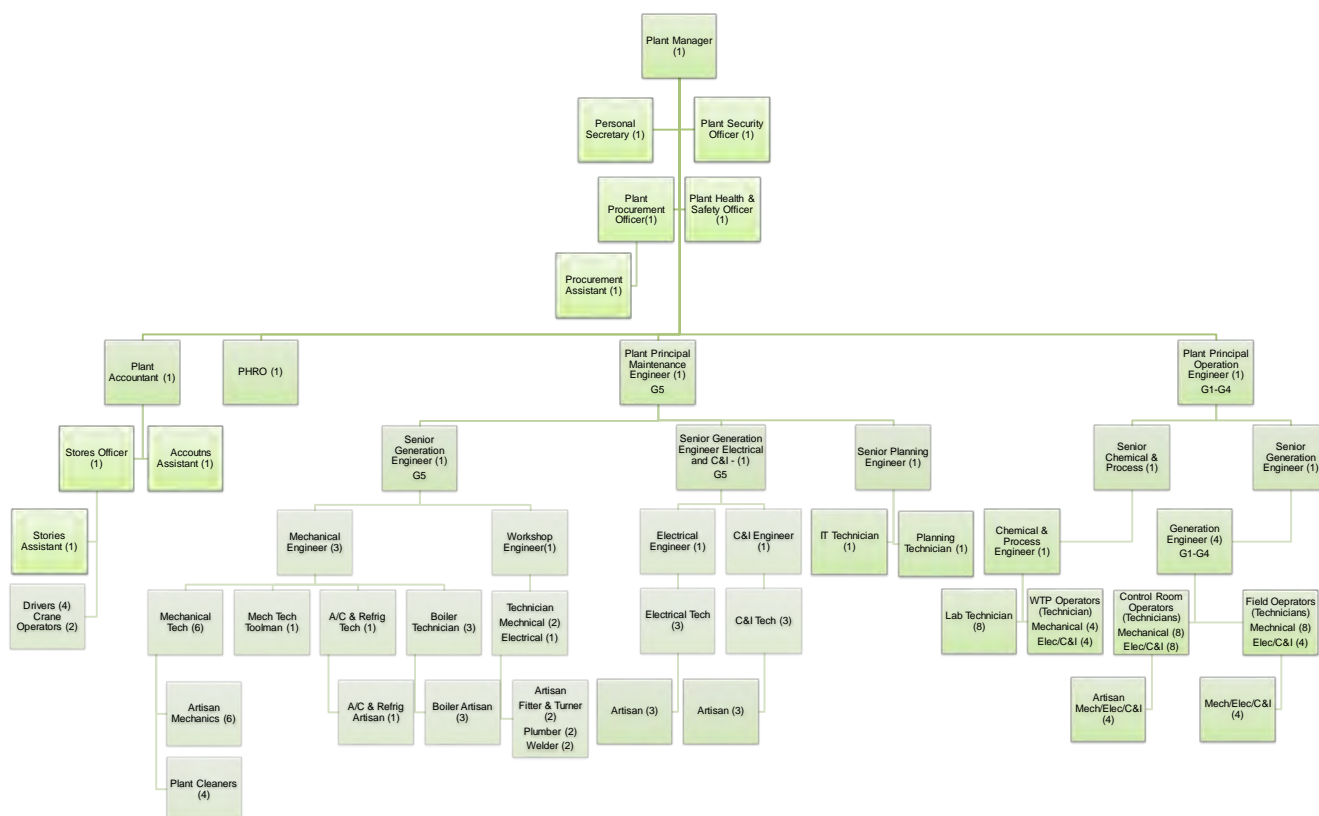


Figure 9-8 Organization Structure for Mtwara GTCC Power Plant (Draft)



Figure 9-9 Overview of K-VaCS by the Kansai Electric Power Co., Inc.

(3) Education and training for Mtwara GTCC Power Plant

Education and training are mainly provided through OJT by the EPC contractor, during the construction and test phase. The Consultant also trains and educates TANESCO's power plant construction staff, operation and maintenance staff. The trainings are provided from the period of contractor selection until the end of guarantee period. This can contribute to TANESCO's technical strength improvement.

At present, the instruction program is the major opportunity for TANESCO staff to learn O&M skills. This program is based on user's manual that the manufacturer provides during construction. The trainees, who undergo this program, impart the training to the other staff of the same power plant through OJT. TANESCO does not have any original training program to continuously build the capacity of technical staff. The instruction program by the manufacturers is not sufficient to continuously build the capacity of technical staff and enhance their technical skills.

JICA Study Team believes that, in order to stable operate the generation facilities for a long term of more than 25years, TANESCO needs the support of manufacturer through their LTSA/RMS and the support of Utilities, who have vast experiences in thermal power plant operation, through the capacity building program. TANESCO is keen to have a capacity building program for the Mtwara GTCC power plant. K-VaCS is one of the useful program for the capacity building.

JICA Study Team proposes the following items as the capacity building program after COD

- Onsite O&M support by technical engineers
- Operation support through RMS for whole plant system
- Advise on optimization of maintenance and inspection plan
- Training programs at utilities' training facilities

For the purpose of the capacity building, technical support should be provided at Kisiwa site, TANESCO's training center, and/or trainer's training center several times a year. For reference, as the training items for the seawater cooling system, as TANESCO will operate and maintain a seawater cooling system for the first time.

1. Daily O&M management
 - Monitoring of performance (conductivity of hot well etc.)
 - Detection of trouble trends
2. Planned maintenance
 - Scope and important viewpoint of maintenance
(disassembly inspection, anti-fouling paint etc.)
3. Unplanned maintenance
 - Root cause analysis (leakage from condenser tube etc.)
 - Recovery method (maintenance and operation)

9.3 ORGANIZATION FOR 400kV TRANSMISSION LINES CONSTRUCTION AND O&M

9.3.1 Construction Organization for the Transmission Lines

The organization of the transmission line construction department is managed by Manager-Projects (Transmission & Distribution) under jurisdiction of Deputy Managing Director (DMD) Transmission at the top.

As shown in Figure 9-10, the construction management system is managed by the Chief Engineer with several engineers under the Site Manager Transmission.

At the headquarters, under the Senior Manager-Projects, the Manager-Projects (Transmission & Distribution) and the Site Manager Transmission perform mainly process management, quality control, safety management, and cost control confirmation.

At the site, the Manager-Projects (Transmission & Distribution) and the Site Manager Transmission mainly perform witness works (basic lifting test, pile driving test, steel tower assembly inspection, overhead wire inspection, final inspection, etc.). In this Project, the transmission line route length is 270km and the number of steel towers is about 700. Therefore, support from the O & M team will be required.

9.3.2 O&M Organization for the Transmission Lines

As for the management system of O & M, the six zone offices shown in Figure 9-10 will be responsible for maintenance of transmission lines and substations.

O&M organization of the transmission lines is shown in Figure 9-10.

- ⊙ : Maintenance and maintenance work of the 400 kV transmission line Mtwara - Somanga will be managed by South West office.

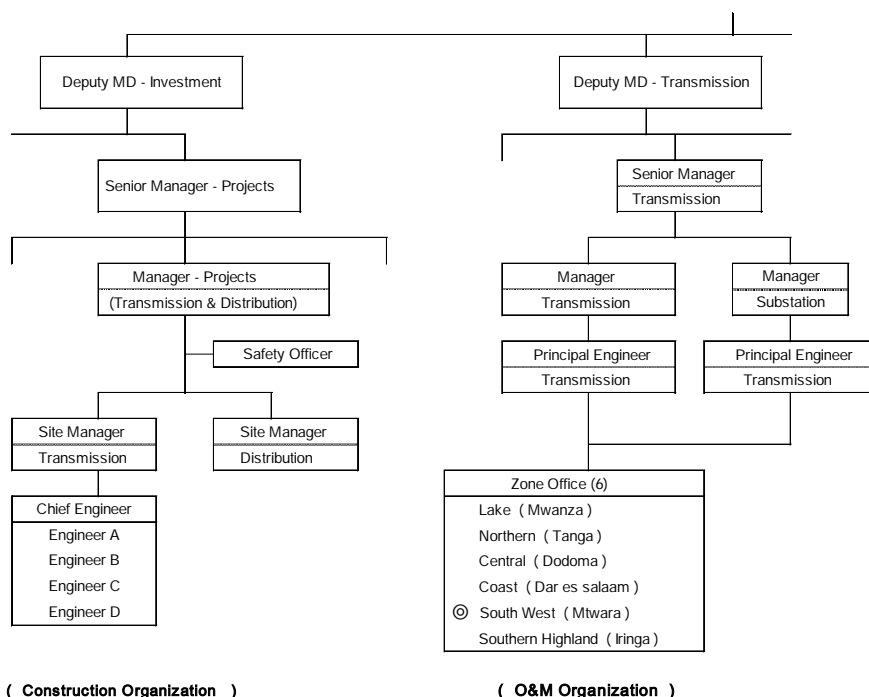


Figure 9-10 Construction and O&M Organization for Transmission Line (Draft)

9.3.3 O&M Organization for Zonal Office

The organization for the zonal office is divided into 4 departments with engineers under the principal engineer as shown in Figure 9-11. Under each engineer, there are 2 technicians, and under each technician there are about 2 artisan workers.

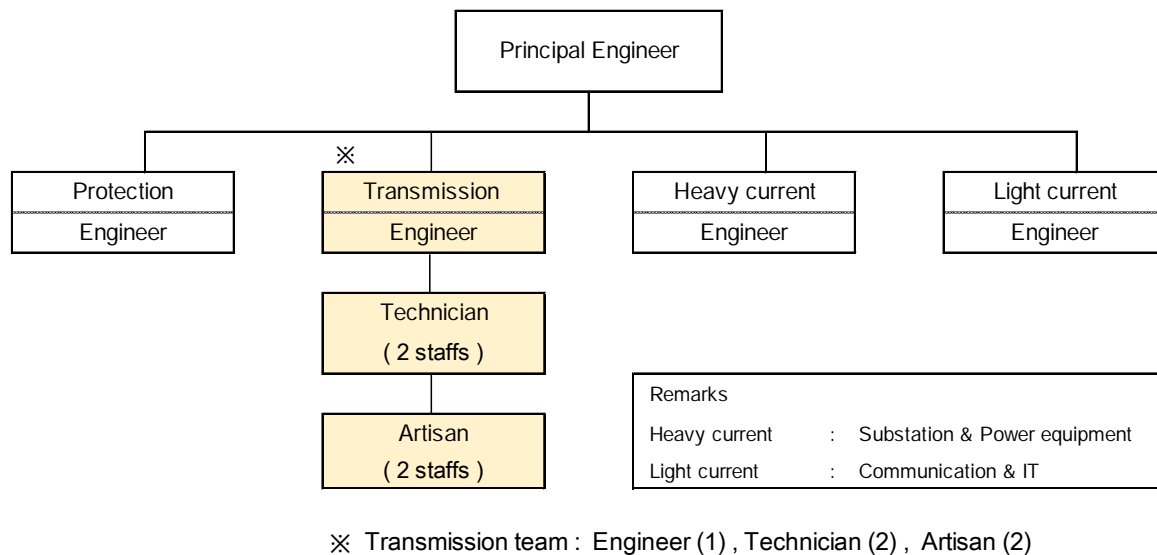


Figure 9-11 O&M Organization for Zonal Office

9.3.4 Current Operation & Management of Zonal Office

In accordance with the annual plan for operation and maintenance, the maintenance teams of the zonal office patrol the existing transmission lines for the following inspection and repair works by the transmission team as shown in Figure 9-11.

The transmission team inspects the necessary electrical clearance under the transmission line, including new obstacles such as rivers, canals, structures under construction, roads, trees, railroads, MV & LV distribution lines, telephone lines, and trees.

Especially in the rainy season, many trees are fallen down due to wind and rain, so the number of patrols for maintenance inspection will be more than the patrols in the dry season. The transmission team intensively inspects the crossing points of the railroad and the main roads, as they are important inspection points.

The current inspection organization for the transmission lines, its size and the items to be inspected are considered to be sufficient for the current situation.

This new 400kV transmission line will be the main transmission line in TANESCO, after the completion of this project, so it is necessary to increase the number of patrols and add new items for inspection during the patrol as explained in the Section 9.3.4. The new inspection items are required for the higher voltage level and bundled quad conductors.

9.3.5 Maintenance Items to be conducted in the Future

It is recommended to add the following items to the current inspection items.

- Number plates, phase plate, danger boards
- Detect missing bolt and steel members
- Detect mal condition of insulator assemblies such as split pins, cotter pins, hangers and etc.
- Detect mal condition of spacers
- Detect punctured insulator
- Detect corona and sound phenomena on conductors and vibrations
- Check tower foundation and check footing earth resistance measurement.
- Ground erosion around tower foundation.

The transmission team already has sufficient knowledge and experience for the maintenance of the transmission line, however it is necessary to increase the number of patrols and inspection, since it is the first time to conduct maintenance works for 400kV four (4) bundled conductors transmission line.

The cost of maintenance for the transmission line is estimated as below.

a) Periodic Transmission Line Patrol and Inspection

[400kV New Mtwara Substation – 400kV New Lindi Substation]

Transmission team (5people): 4 times/year 1 day/time
Engineer: 20 engineers-day/year
Vehicle: 4 vehicles-day/year

[400kV New Lindi Substation – Somanga Substation]

Transmission team (5people): 4 times/year 3 days/time
Engineer: 60 engineers-day/year
Vehicle: 12 vehicles-day/year

b) Experts Training

[400kV New Mtwara Substation - 400kV New Lindi Substation]

Transmission team (5people) + other transmission engineer (5 people):
1 time/year 3 days/time
Engineer: 30 engineers-day/year
Vehicle: 6 vehicles-day/year

[400kV New Lindi Substation - Somanga Substation]

Transmission team (5people) + other transmission engineer (5 people):
1 time/year 3 days/time
Engineer: 30 engineers-day/year
Vehicle: 6 vehicles-day/year

c) Repairing works

[400kV New Mtwara Substation - 400kV New Lindi Substation]

Transmission team (5people): 2 times/year 1 day/time
Engineer: 10 engineers-day/year
Vehicle: 4 vehicles-day/year

[400kV New Lindi Substation - Somanga Substation]

Transmission team (5people): 5 times/year 1 day/time
Engineer: 25 engineers-day/year
Vehicle: 10 vehicles-day/year

※ Depending on the work content, a construction company also participates.

9.4 ORGANIZATION FOR 400kV SUBSTATIONS CONSTRUCTION AND O&M

9.4.1 Construction Organization for Substations

In July 2017, JICA Study Team conducted a field survey of the 132kV Mahumbika substation, which is under construction. At that time, there were more than 5 staffs, including the construction manager. The construction manager was also in charge of the 132kV Mtwara substation under construction. The photos of the 132kV Mahumbika substation, which is under construction, are shown in Figure 6-5.

9.4.2 O&M Organization for Substations

JICA Study Team conducted a field survey of the 220kV Ubungo substation. The substation is located next to the Ubungo II power plant and has 220kV double bus system, 220/132kV transformers, 132kV bus system etc. Figure 9-12 shows the organization for the 220kV Ubungo substation.

There are four groups for operation (Group 1-4) and they work in three shifts of eight hours. Each operation group consists of 2 staffs. Furthermore, there is a supervisor and an engineer. Therefore, totally there are 10 staffs.

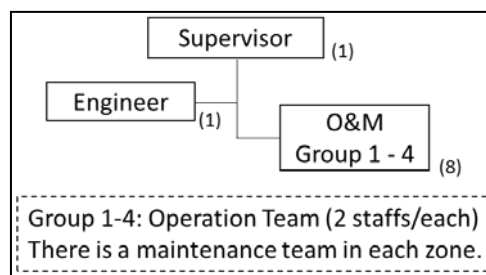


Figure 9-12 Staff Organization in 220kV Ubungo Substation

There is a maintenance team in each zone. They conduct inspection and maintenance by rotation for all substations in the assigned zone. There are main five zones other than Mtwara. 43 staffs belong to the team of Dar es Salaam. 15 staffs belong to the team of Iringa. 17 staffs belong to the team of Dodoma. 23 staffs belong to the team of Mwanza. 17 staffs belong to Tanga.

In addition, three engineers (Protection, Heavy current, and Light current) work in Mtwara area.

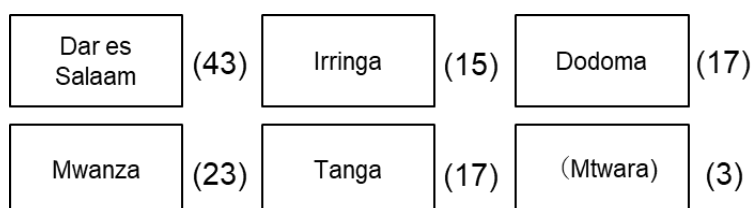


Figure 9-13 Organization Structure for Maintenance

9.4.3 Recommendation for 400 kV New Mtwara and New Lindi Substations

Based on the JICA mission on January 2020, TANESCO is planning to dispatch Project Manager and at least 4 engineers including the works for transmission line at the construction stage. On the other hand, 10 staff is under consideration for Operation.

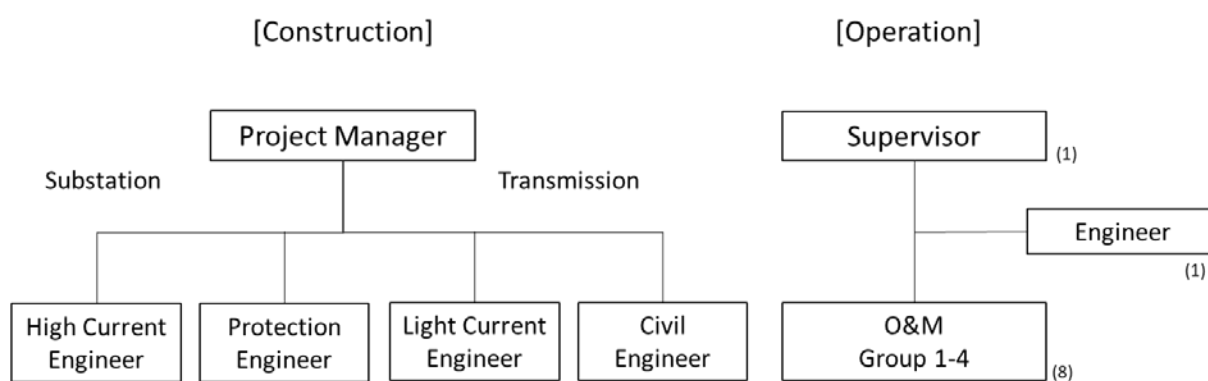


Figure 9-14 Organization Structure for Construction Stage and Operation Stage (Draft)

CHAPTER 10

PROJECT IMPLEMENTATION PLAN

CHAPTER 10 PROJECT IMPLEMENTATION PLAN

Chapter 10 is currently not open to public

CHAPTER 11

PROJECT COST AND ECONOMIC AND FINANCIAL ANALYSIS

CHAPTER 11 PROJECT COST AND ECONOMIC AND FINANCIAL ANALYSIS

Chapter 11 is currently not open to public

CHAPTER 12

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

CHAPTER 12 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

12.1 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

12.1.1 Project Description

(1) Background of the project

1) GDP growth and Increase in Power Demand

According to the Power System Master Plan 2016 Update published by the Ministry of Energy and Minerals, the past GDP growth rate of Tanzania was average 7% per year, and the future GDP growth rate will be continued with the same GDP growth. Gas development, establishment of transportation infrastructure, increase of Foreign Direct Investment (FDI), level of education, construction of communication facilities and construction of modern households are major drivers for the continued GDP growth and the future power demand growth rates in the industrial and commercial sectors are expected to be more than 10%. In fact, the annual growth rate of electric power demand from 2006 to 2011 in the industry sector and commercial sector was more than 10% and it is typical phenomenon in developing countries, according to *the Project for formulation of Power System Master Plan in Dar es Salaam and Coast Regions and Review of Power System Master Plan 2012*, which was implemented with the support from JICA. As the urbanization proceeds, the energy sources are expected to shift from biomass (wood and charcoal) to other modern energy sources such as electricity power, gas and petroleum products. This is also a driver of power demand increase. In addition, when the power shortage is gradually relieved toward the year 2020, power demand will grow at higher rate. The maximum total power demand of the national grid was about 850MW in 2012, reached 1,041MW in 2016, and recorded 1,051MW in June 2017.

2) Installed capacity to meet the demand

Tanzania's current installed capacity connected to the grid is around 1,500MW (1,468 MW, September 2017). The breakdown is as follows; Gas 812.32MW (55.35%), Hydro 567.7MW (38.68%), Liquid fuel 77.04MW (5.25%), Biomass 10.5MW (0.72%), and total 1467.56MW (100.00%). In addition, total installed capacity off grid was about 82MW. In the off grid power system, there are often planned outages in the peak time because of the supply shortage.

As described above, the power demand is expected to increase at the rate of around 10% per year (expected growth rate is between 8.7% and 12.6%: PSMP 2016 Update). To meet this growing demand, the power supply capacity is also to be increased. According to PSMP 2016 Update, the expected power demand (peak demand) is between 1,930MW and 2,190MW, while the current installed capacity is about 1,500MW.

In order to meet the increasing power demand and to achieve the aims to be a middle-income country by 2025, power development is one of the priority items in Tanzanian development plan "Tanzania Five Year Development Plan Phase II (2016/17-2020/21).

3) Gas utilization promotion

Gas-fired power plants are positioned as major new power sources. Tanzanian energy policy, National Energy Policy 2015, states enhancing security of power supply through effective use

of available energy resources as one of the policy's objectives. One of the actions to achieve this objective is to ensure diversification of energy resources in electricity generation. For about two decades, hydro systems supplied about 80% of electricity needs in Tanzania. The discovery and commercialization of natural gas in 2004 coupled with persistent poor hydrology significantly changed the generation mix. In PSMP 2016 Update, generation mix was established to avoid dependence on single energy source and to be balanced to maintain the security of electricity supply, and seasonal variation of energy generated and vulnerability to climate change was taken into consideration. As a result, gas fired power accounts for 40% of energy generation by 2040 in PSMP 2016 Update.

4) Relation to the Climate Change policy

As a new climate action plan, Tanzania submitted its Intended Nationally Determined Contributions (INDCs) to the UN Framework Convention on Climate Change (UNFCCC) in accordance with the decision 1/CP.20. According to the INDCs, Tanzania will reduce greenhouse gas emissions economy wide between 10-20% by 2030 relative to the BAU scenario of 138 - 153 Million tons of carbon dioxide equivalent (MtCO₂e) gross emissions, depending on the baseline efficiency improvements, consistent with its sustainable development agenda. The emissions reduction is subject to review after the first Biennial Update Report (BUR). In order to meet this mitigation contribution, one of the intended action in the energy sector is "expanding the use of natural gas for power production, cooking, transport and thermal services through improvement of natural gas supply systems throughout the country." Thus, this project is in line with this action plan.

(2) Proposed Mtwara Power Plant

1) General description

The proposed 300 MW class thermal power plant project in Mtwara district, will form a part of the base power generation tool and connect to TANESCO's 400 kV grid to Dar es Salaam via Somanga Substation.

2) Location

In terms of the fuel gas supply, currently the Mnazi bay gas field is being developed in southern Tanzania, and a new pipeline was constructed from Mtwara to Dar es Salaam along the coastal area of Tanzania. The gas fired power plant need to ensure the stable fuel supply and the cooling source (i.e. seawater or freshwater) Therefore, the gas-fired power plant location was selected along the coastal area near this pipeline. Considering the constraint on land availability near Dar es Salaam area, and meeting the future power demand in Coastal southern area of Tanzania, the proposed power plant is planned in Mtwara.



Source: JICA Study Team using background map of Google Earth

Figure 12-1 Location of the Proposed Power Plant



Source: JICA Study Team using background map of Google Earth

Figure 12-2 Adjacent Area of the Kisiwa Site

The proposed site is in Kisiwa in Mtwara District in Mtwara Region, 400km south of Dar es Salam, Tanzania. The site is characterised by a gentle slope land and is approximately 0 m to 30 m above sea level, north of the trunk road B2 near Kisiwa village center. The south-eastern corner of the site is the highest elevation about 26 m and gradually decreases with a gentle gradient toward the northwest. The west side of the site faces the Kisiwa Bay and approximately 200 m along the coastline except the sandy beach at the northwest end has a slope of about 10% toward to the seashore.

3) Project duration

The overall time estimated for procurement, delivery, installation, testing and commissioning of the generating sets is tentatively estimated as 29-32 months.

The power plant has an estimated life span of more than 25 years as long as the plant equipment and associated infrastructure are well maintained.

4) Power plant components

The proposed configuration of the power plant is a Gas Turbine Combined Cycle (GTCC) Power Plant of nominally 300 MW class capacity is assumed, with configuration of one or two power blocks each consisting of two gas turbine generators, two heat recovery steam generators and one steam turbine generator.

The proposed plant will also include the plant equipment necessary for operations of equipment such as cooling water system, water treatment system, fire protection and fighting system, ventilation and air conditioning system, electrical distribution system, battery system, lighting system, and plant control system.

Other treatment and storage facilities required include filtered water storage tank, fire water storage tank, water supply treatment plant, wastewater treatment plant, and water intake and discharge facility.

5) Related Facilities

a) Gas pipeline

The power plant will use natural gas as fuel. This will be supplied by the Tanzania Petroleum Development Corporation (TPDC) through a gas pipeline that connects to a gas valve station of an existing natural gas pipeline from Mnazi Bay to Dar es Salaam. The 16km gas pipeline that would connect to the Project will be developed exclusively for the Project. TPDC will be responsible for the new gas pipeline construction, management, operation and maintenance. A separate EIA report has been prepared exclusively for this gas pipeline.

b) Access road

Existing roads and tracks will be used for material transport. Besides upgrading and widening of existing roads for this purpose, a new access road, (approximately 700m) that connects the Project Site to the Kisiwa/Mgao Road, needs to be constructed. A separate EIA report has been prepared exclusively for this access road.

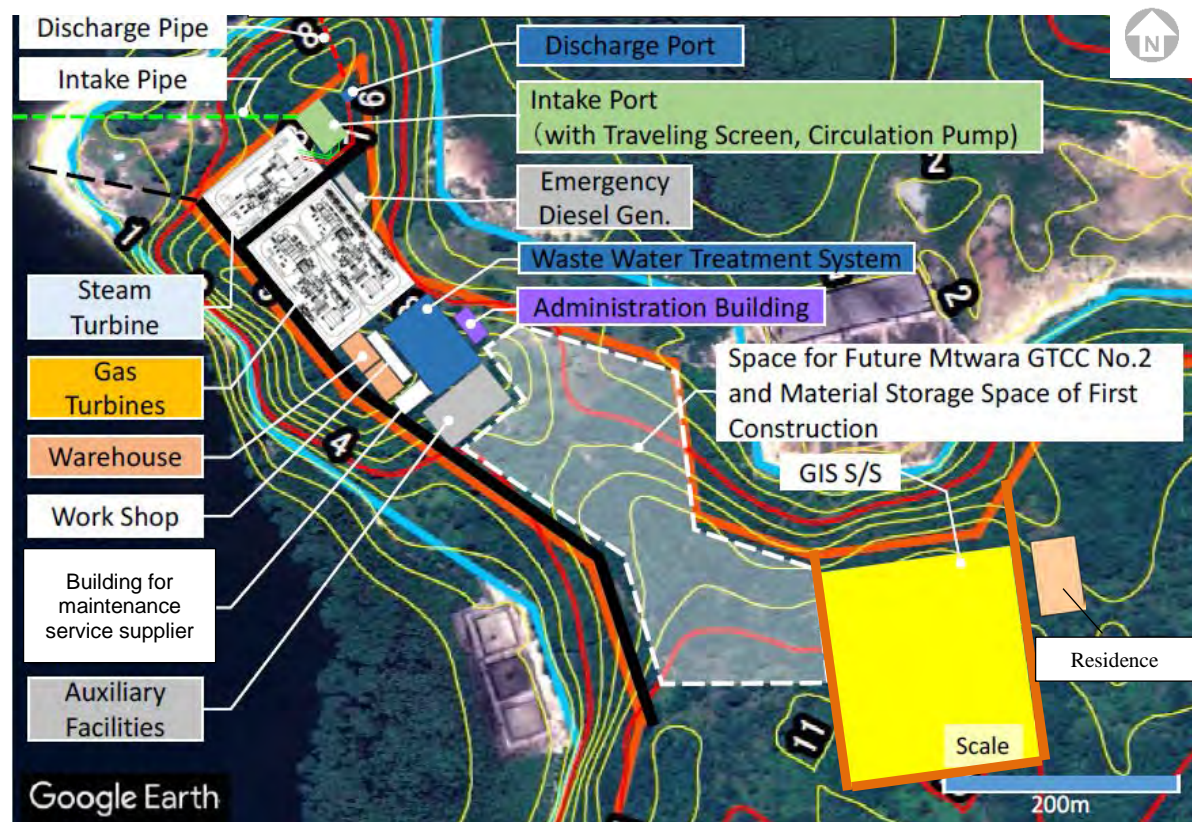
c) Water supply pipeline

The proposed water supply will be provided by the Mtwara Urban Water Supply and Sewerage Authority (MTUWASA) from wells located near The Mbuo River. TANESCO is fully responsible for the new pipeline construction and a separate EIA report has been prepared exclusively for this water pipeline.

6) Project Site Area

The site location is a plot space with dimensions of approximately 1km × 2km, the site can accommodate an additional GTCC within it as marked in white, refer to Figure 12-3. The area

covered by the proposed power plant is approximately 200m × 500m within this area (Figure 12-3).



Source: JICA Study Team using background map of Google Earth

Figure 12-3 Preliminary Site Layout of the Power Plant Site

7) Resources

a) Fuel

Fuel gas will be supplied by TPDC and fresh water will be supplied by MTUWASA. As to the cooling system of the steam turbine condenser, JICA Study Team evaluates technologies and economics of a once-through cooling system. As a result, it is recommended to use the seawater-cooled condenser. Power output from each generator shall be supplied to 400kV new Mtwara substation.

b) Water

It is anticipated that the plant at Kisiwa would require approximately 300m³/day water supply. It will be supplied by deep wells near the project area. The water will be used for fire-fighting, portable and service water, boiler demineralized water, closed circuit and water washing.

8) Project activities

a) Mobilization phase

Acquisition permits, access route selection, clearance of vegetation, topographic survey and geotechnical investigation works, establishment of camps, internal isolation fence, identification of construction materials, mobilization of equipment during the preconstruction phase.

b) Construction phase

The construction phase will include access/approach road, transportation of construction materials, construction of power plant foundations and piling, installation of mechanical equipment, installation of electrical equipment, installation of plant control system, construction of civil and structural elements, construction of administration and control buildings, , construction of a guard house, water treatment, workshop and storage, fuel supply system, construction of switchyard, construction of transmission lines and substations, test operations, performance test and staff training.

Construction material: For the procurement of construction material, two quarry companies with necessary permits are identified near the project site. One is located about 30km to the west supplying low grade aggregate and the other one is located about 90km to the west supplying high grade aggregate.

Waste disposal: For the waste disposal, one landfill site run by Mtwara municipal council is confirmed with an environmental officer of the council (Figure 12-4). Hazardous waste will be treated before the disposal by a licensed waste management company.

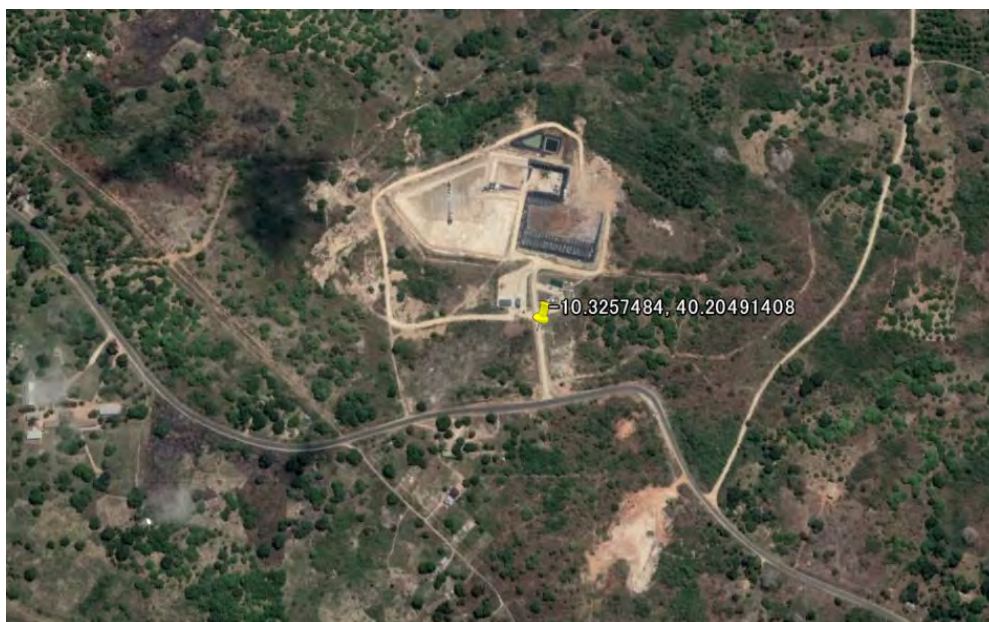


Figure 12-4 Landfill Site operated by Mtwara Municipal Council

c) Operation phase

The operation phase will encompass site maintenance works, repair and maintenance of the power plant, transmission line to Somanga and associated substations.

(3) Mtwara-Somanga 400kV Transmission line and 400kV substations

1) General description

The objective of the project is to improve the power supply in Tanzania. The project also intends to reduce the duration and frequency of power interruptions to the coastal regions, improve voltage conditions at consumer's premises, reduce power system losses, increase customers, and improve the power line capabilities for smooth power transfer to the coastal regions and beyond.

The project is expected to involve acquisition of a wayleave corridor land for the construction of a 400 kV transmission line between Mtwara and Somanga. The planned transmission line (about 270 km) with 52 meter standard width of wayleave (Right-of-Way) and the expected number of transmission line towers is approximately 700. It is in the middle of this ROW, from where all structures will have to be removed, that the line will be built.

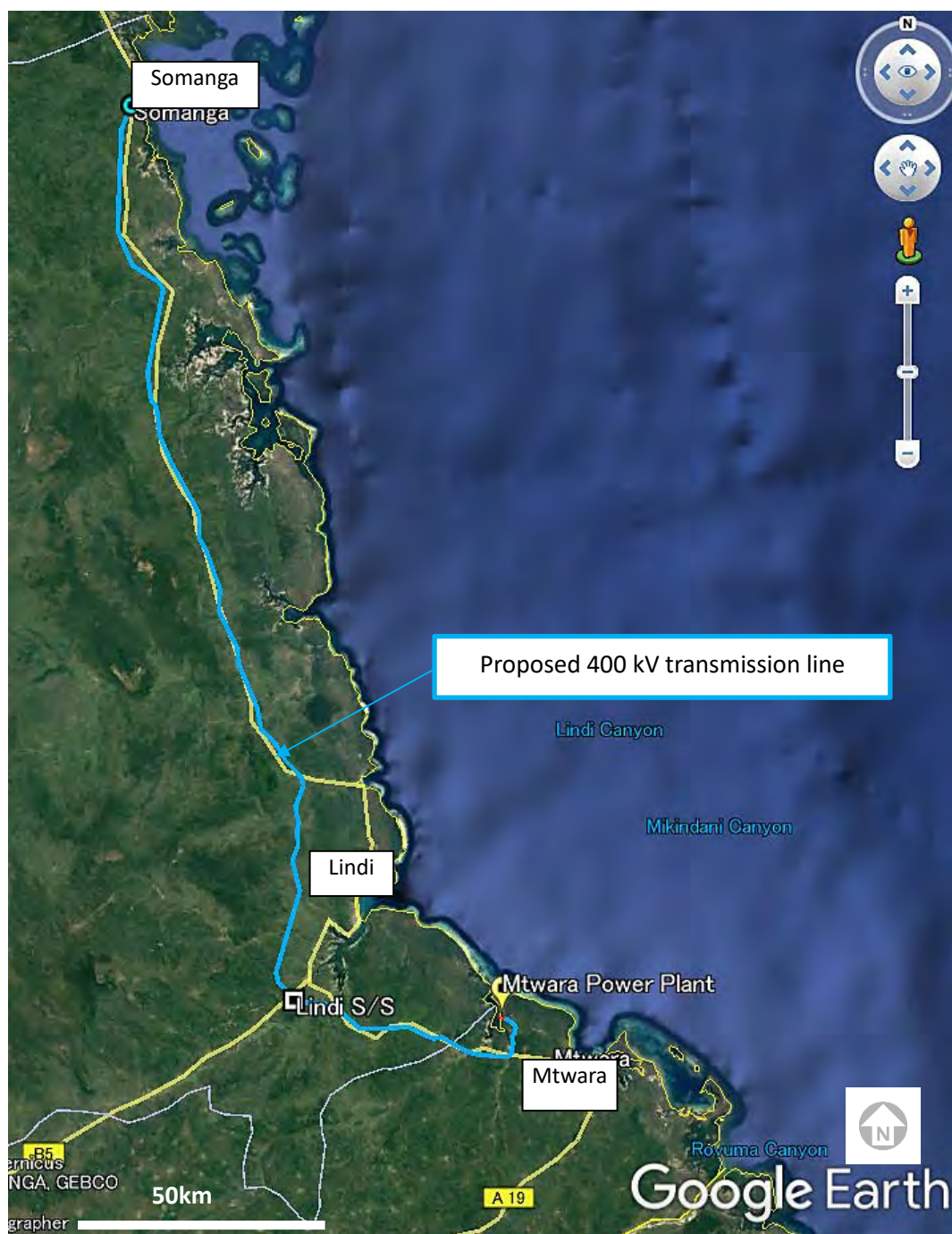
Approximately 22 months is adopted as the construction period of the 400kV Transmission Line from Mtwara to Somanga (about 270km) subject to 3 divisions of the transmission line. Based on the past actual experience of a similar project, 22 months is adopted as the construction period of the 400kV Substations.

During construction, temporary construction camps and access roads can be constructed where required. The location and extent of these components are however not known at this stage of the project.

2) Location

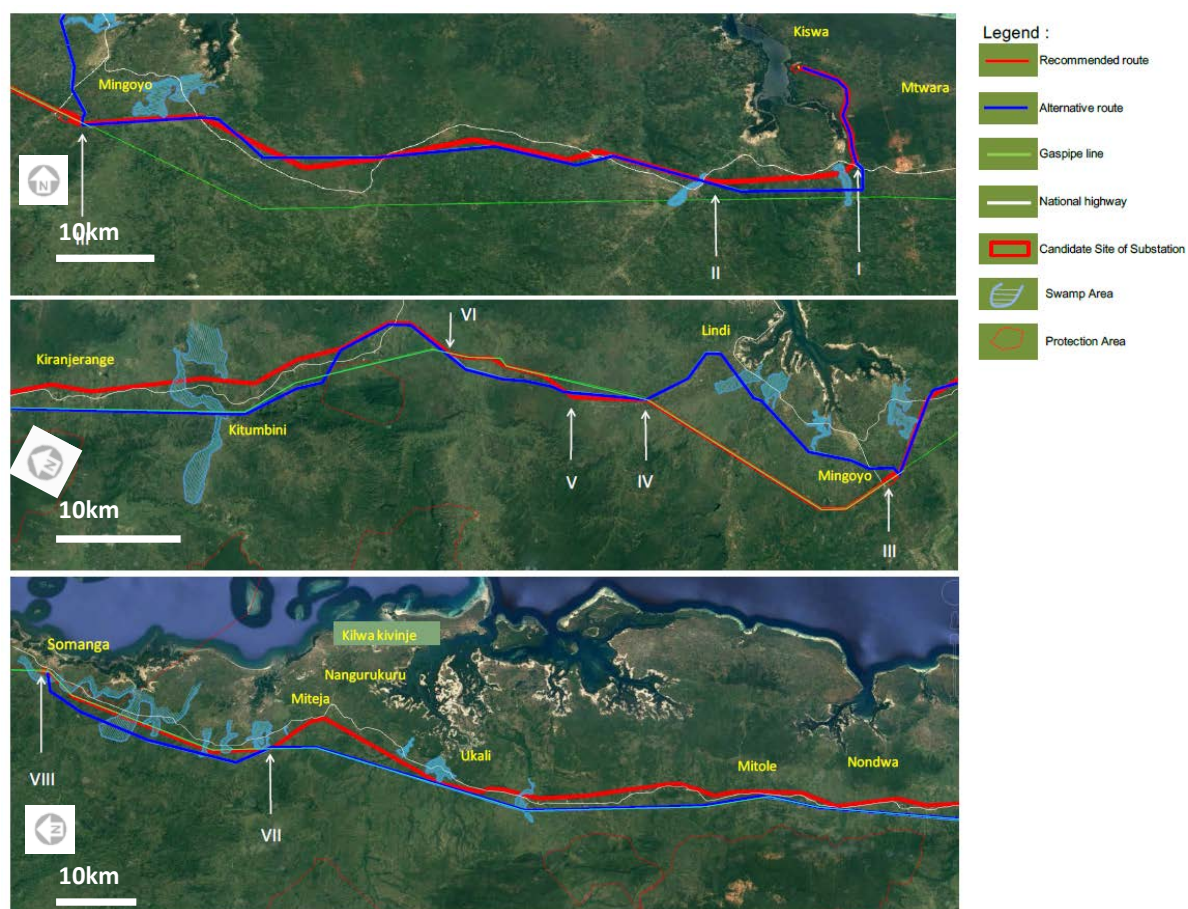
a) 400kV transmission line from Mtwara to Somanga

The proposed line will be built from Mtwara to Somanga. Most sections of the proposed transmission line are expected to run close to the major road between Mtwara and Dar es Salaam as shown in Figure 12-5 with some variations in areas where alternative alignments have been developed (Figure 12-6). The planned line a length of about 270 km will interconnect three substations (S/S) in Mtwara, Lindi and Somanga. The line route is located in the coastal area of Tanzania between 39°15' and 39°59' east and 8°26' to 10°11' south of equator (Figure 12-5). The line is partitioned in seven sections between Mtwara and Somanga.



Source: JICA Study Team using background map of Google Earth

Figure 12-5 Location of the Proposed 400kV Transmission Line

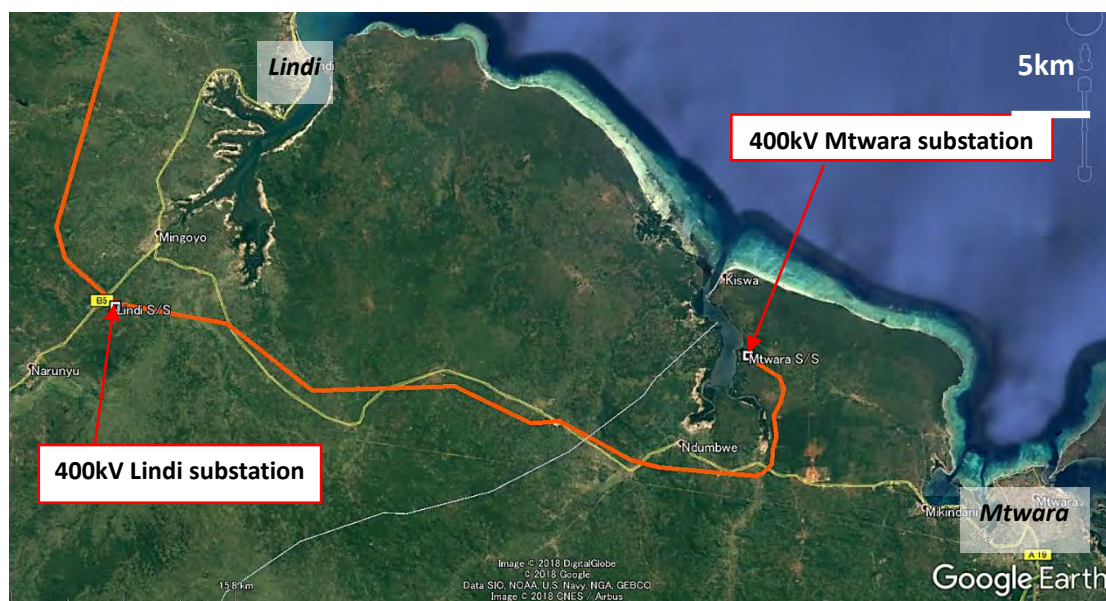


Source: JICA Study Team using background map of Google Earth

Figure 12-6 Route Alternatives of the 400kV Transmission Line between Mtwara and Somanga

b) 400kV Substation

The location of the 400kV Lindi substation and the 400kV Mtwara substation is shown in Figure 12-7 and Figure 12-8 below.



Source: JICA Study Team using background map of Google Earth

Figure 12-7 Location of the 400kV Substation in Mtwara and Lindi

Source: JICA Study Team

Figure 12-8 Situation of 400kV Lindi Substation

3) Major Project Component

a) Transmission Line

The proposed 400 kV transmission line consists of conductors, earthwires, optical groundwires, and transmission towers. Transmission towers will be self-supportive steel lattice structures that will be built on in-situ reinforced concrete.

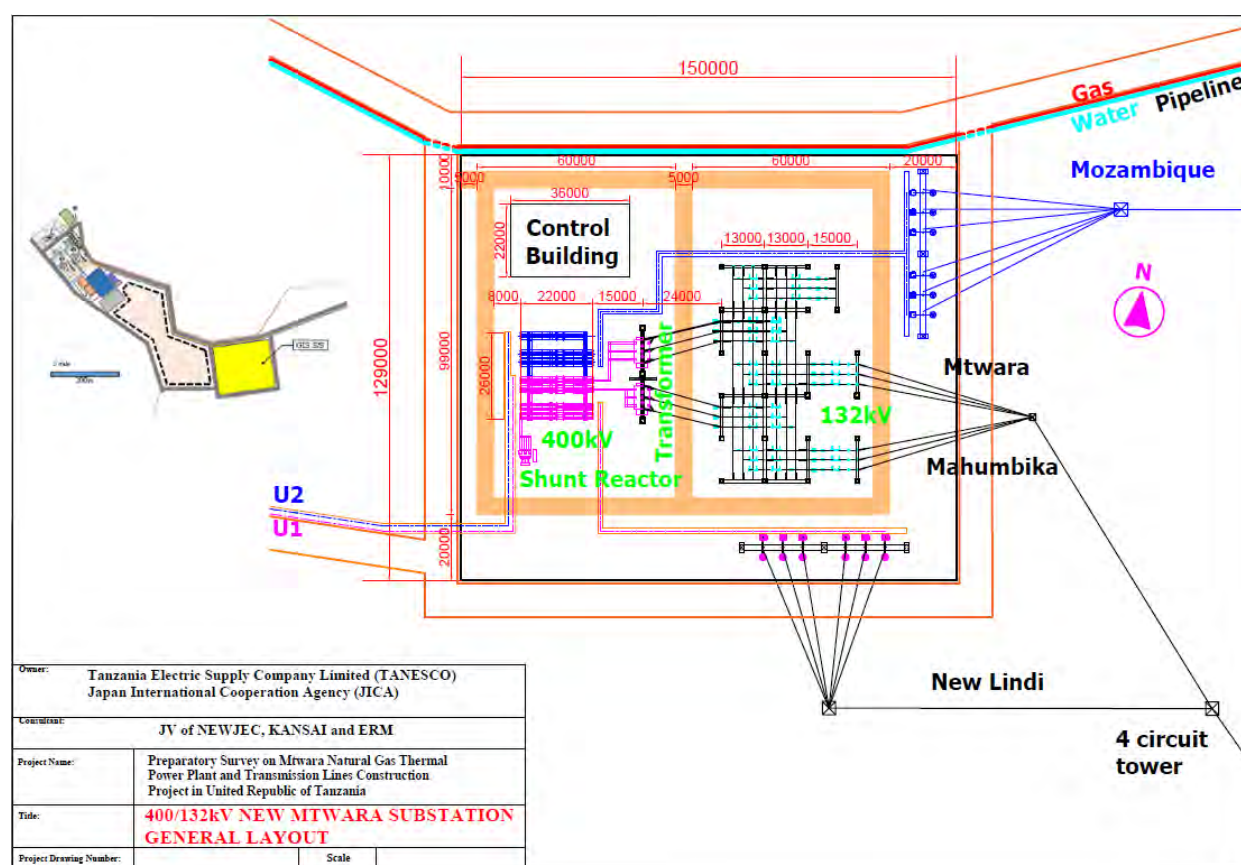
Transmission towers will carry both 400kV and 132kV lines for an approximate length of 8km from Mtwara to Lindi substations. Also, new 132kV transmission lines from 400kV Mtwara substation will connect with existing 132kV Mtwara and 132kV Mahumbika substations. From 400kV Lindi Substation, 400kV electricity lines will be connected to the existing Somanga substation. In the future, there are plans to develop a 400kV cross border transmission line to Mozambique. This line will be connected to the 400kV Mtwara substation.

b) Mtwara Substation

400kV Mtwara substation is expected to adapt GIS and major components are as follows.

- 400/132 kV transformers
- 400kV Reactors
- Gas Insulated Switchgears (GIS) and Air Insulated Switchgears (AIS)

The Mtwara substation covers an approximate area of 3ha. The preliminary layout of the 400kV Mtwara Substation is as shown as shown in Figure 12-9.



Source: JICA Study Team

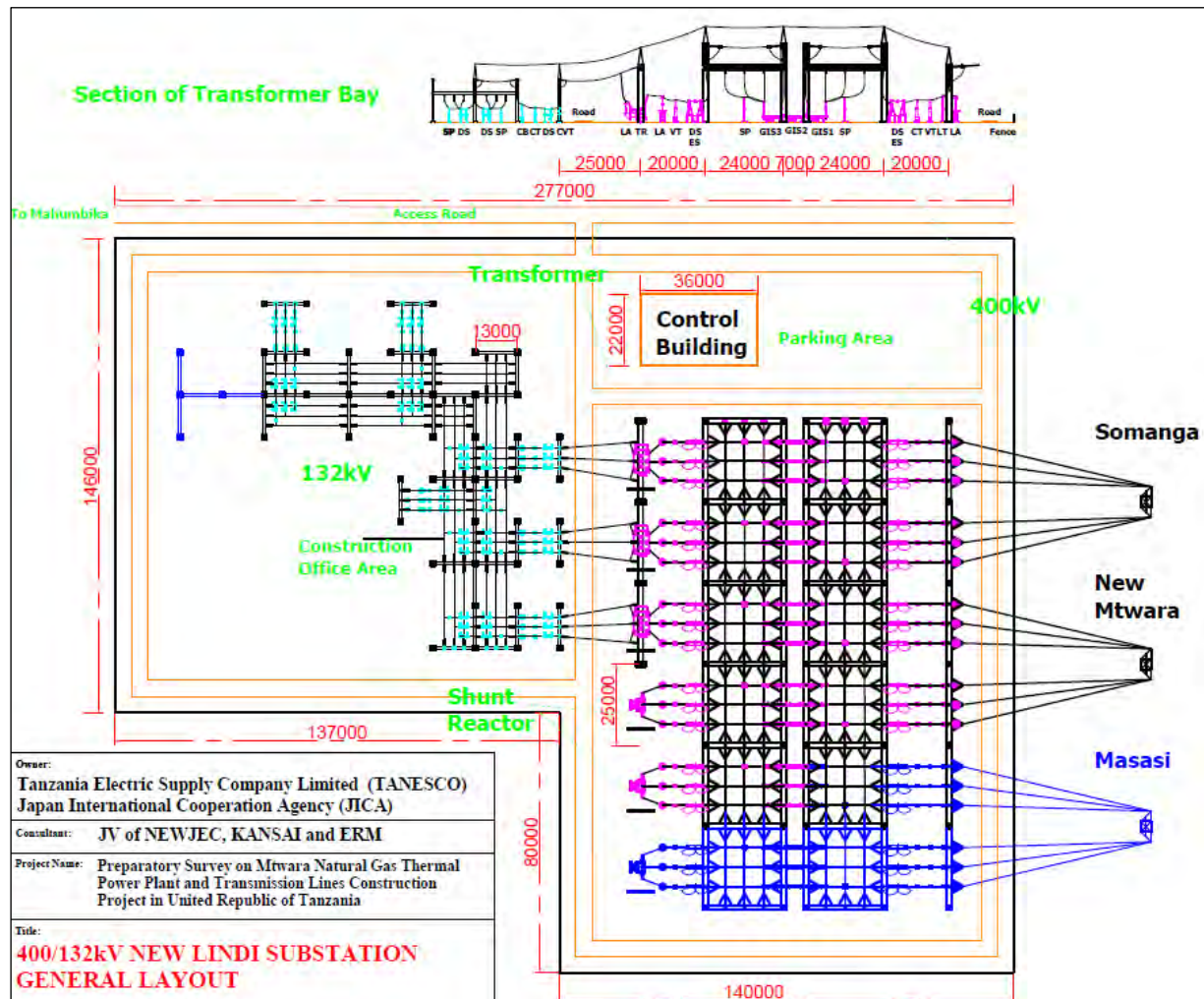
Figure 12-9 Preliminary Layout of the 400kV Mtwara Substation

c) Lindi substation

Major components of 400kV Lindi substation are as follows.

- 400kV feeders to Somanga, Mtwara, and Masasi
- 400kV reactors
- 400/132kV transformers

The Lindi substation covers an approximate area of 6ha. The preliminary layout of the 400kV Lindi Substation is as shown in Figure 12-10.



Source: JICA Study Team

Note: This layout is for H-GIS (Hybrid GIS). In case AIS (Air Insulated Switchgear) is selected, layout will be changed.

Figure 12-10 Preliminary Layout of the 400kV Lindi Substation

12.1.2 Legal Framework and JICA Guidelines

(1) Policies

The proposed project will have implications to several policies. Below is a brief description of the relevant policies to the project.

1) National Energy Policy, 2015

The main objective of the National Energy Policy of 2015 is to provide a framework for the sustainable use of energy resources to ensure optimal benefits to Tanzanians and to contribute towards the transformation of the national economy. The Energy Policy of 2015 stipulates the promotion of energy development through the use of diverse energy sources. It also covers cross cutting issues related to governance, sustainability, economic tools, and social and environmental considerations.

The proposed Project will take into account the provisions of this Policy to ensure that its activities and its operation will be implemented in an environmentally and socially acceptable way.

2) The National Natural Gas Policy, 2013

The National Natural Gas Policy provides a comprehensive framework for promoting and enhancing natural gas development in the country. The Policy seeks to maximize benefits through optimization of value chain which includes mid and downstream activities.

Objectives that are relevant to this project include:

- To ensure the reliability of natural gas supply;
- To promote linkages between the natural gas industry with other strategic sectors of the economy;
- To substantially improve Corporate Social Responsibility in communities neighboring natural gas facilities and operations;
- To promote rational use of natural gas in all sectors of the economy;
- To ensure compliance with Health, Safety and Environment standards in the natural gas value chain;
- To ensure that development of natural gas industry regionally and internationally benefits Tanzania;
- To support activities in the natural gas industry based on gender issues and addressing HIV/AIDS and other infectious diseases;
- To ensure maximization of benefits from the natural gas industry through PPP projects.
- The proposed development will take into account some of the objectives of this policy.

3) Sustainable Industrial Development Policy – SIDP, 1996

Sustainable Industrial Development Policy-SIDP (1996- 2020) (URT, 1996) is a framework for Tanzania's industrialization process within the short, medium and long terms perspectives. The main objectives of the SIDP include human development and creation of employment opportunities; economic transformation for achieving sustainable economic growth; external

balance of payments; environmental sustainability and equitable development (URT, 1996).

The proposed power development at Kisiwa, Mtwara District will support the objectives of this policy, which also recognizes the need for EIA prior to implementation of the projects.

4) National Land Policy, 1995

The overall aim of the National Land Policy (URT, 1995) is to address the various and ever-changing land use needs and “to promote and ensure a secure land tenure system, to encourage the optimal use of land resources and to facilitate broad-based social and economic development without endangering the ecological balance of the environment. Specific objectives that are relevant to the project include:

- Ensure that existing rights in land especially customary rights of small holders (i.e. peasants and herdsman who are the majority of the land users in the area are recognized, clarified, and secured in law;
- Ensure that land is put to its most productive use to promote rapid social and economic development of the country;
- Protect land resources from degradation for sustainable development.

The Project will require land, and therefore this policy will be relevant to this proposed development.

5) National Environmental Policy, 1997

The National Environmental Policy of 1997 outlines six major environmental problems that include loss of wildlife habitats and biodiversity, environmental pollution, land degradation and deforestation (URT, 1997). The Policy stipulates that an EIA shall be mandatory for all major projects to ensure that environmental concerns receive due and balanced consideration in reconciling urgent development needs with long-term environmental sustainability goals. The proposed project of thermal power generation will have to be developed taking into account the requirements of this policy, particularly issues related to air pollution.

6) Water Policy, 2002

The main objective of the National Water Policy of 2002 is to develop a comprehensive framework for sustainable development and management of the Nation’s water resources and putting in place an effective legal and institutional framework for its implementation.

The Policy recognizes the fundamental but intricate linkages between water and socio-economic development, including environmental services. The proposed development will put additional demand on water in an area where already, water is a very scarce resource.

7) The Wildlife Policy of Tanzania, 2007

The Wildlife Policy of Tanzania promotes the sustainable conservation of wildlife and wetland resources. The overall objectives of the Policy are (a) Protection and conservation of wildlife and wetlands (b) Sustainable utilization of wildlife and wetlands (c) Management and development of wildlife and wetland resources (d) Strengthen resource monitoring and research (e) Enhance communication, education and public awareness (f) Coordinate implementation of the policy and, (g) Foster regional and international cooperation.

The policy recognizes the importance of EIA as a tool that can support wise use of the resource. The proposed site for the thermal plant does not have any large mammal remaining in the area, with the exception of small mammals and reptile, that too have to be taken into account when developing and implementing the project; therefore, the requirements of this policy will be taken into account.

8) The National Forestry Policy, 1998

The main objectives of the Policy includes sustainable supply of forest products and services by maintaining sufficient forest area under effective management; increased employment and foreign exchange earnings, ecosystem sustainability through forest conservation, enhanced national capacity to manage forest sector.

The Forest Policy recognizes that investment projects in forest areas may cause adverse environmental impacts. EIA must be conducted in order to ensure damage to the environment is avoided and possible mitigation measures are provided. Although there are no forest with the conservation status in the proposed site, remnants of trees and shrubs are likely to be affected by this development and some of them may be of valuable nature and these will have to be taken into account.

9) The National Employment Policy, 2008

The National Employment Policy (2008) aims to identify potential areas for employment and to lay down strategies of how to utilize such opportunities in promoting employment in the country. The proposed Project provides avenues for employment opportunity and thus supports the national employment policy. Employment opportunities arising from this Project should be extended to all people in terms of skills, numbers and groups (youths, women and others as per the Policy).

(2) Laws and regulations

1) The Environmental Management Act, 2004

The Environmental Management Act No 20 of 2004 (Cap 191) provide comprehensive environmental framework that is intended to streamline management of the environment in Tanzania. Part VI of this Act and in particular Section 81- 103 provides the requirements for EIA and critical aspects that have to be adhered to when undertaking EIAs in Tanzania. The Act makes EIAs mandatory prior to the development of any project. The Act is directly relevant to the proposed development as it calls for full and detailed environmental assessments for such projects.

2) Environmental Impact Assessment and Audit Regulations, 2005

The Environmental Impact Assessment and Audit Regulations provides details on how an EIA and Audit can be conducted. It also list potential projects that shall require mandatory EIA in Tanzania. The First Schedule and in particular item # 7 makes reference to energy projects that require mandatory EIAs. Item 7 (i) which refers to production and distribution of electricity, gas, steam and geo thermal energy is relevant in this case because this project falls into the category of projects requiring mandatory EIA. This EIA is responding to these EIA Regulations and highlight critical areas that require attention of the developer and other stakeholders.

3) Other EMA (2004)-Related Regulations

The Project will be required to adhere to various provisions and standards stipulated in the below-listed regulations in order to comply with Section 141 and Part IX of EMA (2004).

- Environmental Management (Air Quality Standards) Regulations, 2007;
- Environmental Management (Soil Quality Standards) Regulations, 2007;
- Environmental Management (Water Quality Standards) Regulations, 2007;
Note: the standards are for waste water effluent discharge and drinking water.
- Environmental Management (Solid Waste Management) Regulations, 2009;
- The Environmental Management (Control of Ozone Depleting Substances) Regulations, 2007; and
- Environmental Management (Hazardous Waste Control and Management) Regulations, 2009.

4) National Environmental Standards Compendium (NESC), 2009

The National Environmental Standards Compendium (NESC) is a collection of various standards prepared at different times. The NESC consist of three parts. Part One comprises standards that require compulsory compliance, which includes standards for industries with peculiar effect to the environment. Part Two consists of standards that may be implemented on voluntary basis. These include guidelines, codes of practice that can be enforced voluntarily by way of self – regulation. Part Three has the requisite test methods that should be followed when testing for compliance.

Although these are national standards, the NESC states that the standards “are to be reviewed independently to reflect sector specific needs as regulated by the National Environment Management Council”. Most of the compulsory standards in the NESC are relevant to the proposed thermal power development project in Mtwara region and Lindi region. These include standards such as:

- TZS 860 – 2005 Municipal and Industrial Wastewater
- TZS 845 – 2005 Air Quality Specification
- EMDC 2 (1778) Air Quality – Vehicular Exhaust Emissions Limits
- EMDC (1777) Protection against ionizing radiation –Limits for Occupational Exposure
- EMDC 6 (1733) Acoustics- General Tolerance Limits for Environmental Noise
- EMDC 5 (3453) For hand arm and whole body vibration
- EMDC 5 (3454) For vibration at sensitive site including residential areas (subsonic/air over) vibration.

This project will have to comply with those standards to safeguard the environment and the people.

5) Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2015

The main objective of these regulations includes:

- To ensure the maintenance of a healthy environment for all people in mainland Tanzania; the tranquilities of their surrounding and their psychological well-being by regulating noise and vibration levels;
- Prescribe the maximum permissible noise and vibration levels from a facility or activity;

- Provide for the controls of noise and vibration and mitigating measures for the reduction of noise and vibration;
- Set baseline parameters on noise and vibration permissible levels based on a number of practical considerations and acceptable limits;
- Enforce minimum noise and vibration limits prescribed by the National Environmental Standards Committee;
- Help developers such as industrialist to keep abreast with environmentally friendly technologies;
- Ensure protections of human health and the environment from various sources of noise and vibration pollution.

Regulation 9 refers to the permissible noise levels and tolerance limits for environment vibrations. These are noise levels measured during the day (06:00am to 10:00pm) and the night (10:00pm to 06:00am). Part IV of the First Schedule provides allowable noise levels from construction sites to buildings other than homes, institutions of higher learning, homes for disabled persons is 75 dBA during the day and 65 dBA during the night. Part I of the First Schedule provides the permissible noise levels for general environment; in industrial area is 70 dBA during the day and 60 dBA during the night. Part VI of the First Schedule provides the maximum noise level from a place of entertainment or establishment in the Noise Control Zone. According to these regulations, excessive vibration will not be permissible anywhere within 10 meters of residence, hospital, schools, or other premises in which people could reasonably expect to be free from undue annoyance and nuisance caused by vibration.

These regulations also provide directives on how to carry out monitoring of the impact of noise and vibration. The proposed development at Mtwara region and Lindi region must adhere to the provisions of these regulations.

6) The Electricity Act, 2008

The Electricity Act provides for the facilitation and regulation of generation, transmission, transformation, distribution, supply and use of electric energy and to support to broader trade in electricity and the planning and regulation of rural electrification and related matters.

The Act provides requirements for obtaining licenses for (a) generation (b) transmission (c) distribution (d) supply, (e) physical and financial trade in electricity and electrical installation. Any person intending to conduct any of the activities stipulated in Subsection 1 of Section 8 of this Act must apply for a license to the Energy and Water Utilization Regulatory Authority (EWURA).

7) The Land Act and Village Land Act, 1999

The Land Act 1999 (Act No 4 of 1999) and the Village Land Act 1999 (Act No 5 of 1999) provide the legal framework for the implementation of the Land Policy. The two Acts address various issues including defining the legal framework for land tenure system, and how land can be used for social and economic development. The Acts also define issues of land acquisition and compensation to affected people. The Village Land Act addresses land tenure issues with specific reference to land within the village jurisdictions, defining tenure, access and use of such land as well as responsibility for management of the land. The proposed development will require land and therefore the provisions of this Act will be taken into account.

8) The Land Regulations, 2001

Five regulations are relevant to this project as follows:

- The Land (Compensation Claims) Regulations, 2001;
- The Land (Assessment of Value of Land for Compensation) Regulations, 2001;
- The Land (Allocation Committees) Regulations, 2001;
- The Land (Conditions of Right of Occupancy) Regulations, 2001; and
- The Land (Disposition of Right of Occupancy) Regulations, 2001.

The Project proponent will have to comply with these regulations during the assessment of any land value, relocation, resettlement and compensation processes.

9) Land Acquisition Act, 1967

The Land Acquisition Act, (Act No. 47 of 1967) provides for compulsory acquisition of land for public interest and in connection with development aspects. Part II (b) of the Act refers to issues related to compensation and procedures that have to be followed when land is acquired. These procedures are also outlined in the Regulation for the Land Act and include issues of fair and prompt compensation to affected persons. The proposed development will need land for its development therefore; the provision of this Act will have to be taken into account in this EIA.

10) The Local Governments (District Authorities) Act, 1982

The Act requires the Registrar of Villages to register an area as a village and issue a Certificate of Incorporation to the village, which enables the Village Council to become a corporate body with a perpetual succession and official seal. In its corporate name, a village is capable of suing and being sued and is capable of holding, purchasing or acquiring any movable or immovable property in any other way.

The Mtwara District Council, which will be affected by this Project, have the mandate to intervene on any local issues that may be related to the project. These are issues such as access to water bodies for local use, settlement etc.

11) Energy and Water Utilities Regulatory Authority Act, 2003

The Energy and Water Utilities Regulatory Authority (EWURA) (Act # 11 of 2001 and # 8 of 2003 (URT, 2006) establish a Regulatory Authority in relation to energy and water utilities and outlines its *modus operandi*. The Authority is responsible for regulating energy development and water utilities in Tanzania and requires relevant developers to obtain permits and authorization from EWURA for any proposed development. The proposed development includes power generation, which requires permits. TANESCO as the main beneficiary has or is already allowed to establish and run such facilities in Tanzania and prior approval may not be necessary.

12) Water Resources Management Act, 2009

The Water Resources Management Act, 2009 provides a framework for the management and utilization of water, taking into account domestic, social, industrial and environmental needs.

The Act provides principles and objectives of Water Resources Management, which includes among others (a) meeting the basic human needs of present and future generation (b)

promoting equitable access to water (c) promoting the efficient, sustainable and beneficial use of water in the public interest (e) protecting biodiversity, especially the aquatic ecosystem (f) providing a system for the management of the resources and implementation of international obligations.

The Act directs the need to apply and pay all required fees for water utilization permits. It also directs the adoption of integrated water resource management approaches and the application of principles such as (a) precautionary principle (b) polluter pays principle (c) the principle of ecosystem integrity, to mention some.

The proposed development will be located in areas that might result to polluting water bodies and it will also require water for its operations and therefore, the provisions of this Act will be taken into account in order to safeguard this scarce resource.

13) Forest Act, 2002

The Forest Act, (No.14), provides for the management of forests in order to enhance the contribution of the forest sector to the development of Tanzania and the conservation and management of natural resources. Also, the legislation fosters ecosystem stability through conservation of the forest biodiversity, water catchments and soil fertility. The implementation of this Act falls under the jurisdiction of the Ministry of Natural Resources and Tourism. The site for the proposed development is not located in a forested area. However, it may impact a small part of mangroves.

14) The Wildlife Conservation Act, 2009

The Wildlife Conservation Act provides for the management and utilization of wildlife resources in Tanzania. Part 11, Section 5 (1) (a-m) of the WCA specifies the objectives of the Act, which include among others (a) To protect and conserve and administer areas with great biodiversity, including wetlands. (b) Protect and conserve wildlife resources and its habitats in game reserves, wetland reserves, game controlled areas, Wildlife Management Areas, dispersal areas, migratory routes corridors, buffer zones and all animals found in areas adjacent to these areas.

The Act stipulates various provisions including making it illegal for any off take of wildlife resources that is not regulated or authorized. It calls for the adoption of management tools such as management plans; environmental impact assessment, wildlife impact assessment and environmental auditing and monitoring in case development is taking place in wildlife resource areas. Wildlife in this Act includes large and small mammals, reptiles and the habitat in which these are found. The Ministry of Natural Resources and Tourism is responsible for implementing this Act.

15) The National Land Use Planning Commission Act, 1984

The National Land Use Planning Commission Act, (No.3), 1984, established the National Land Use Planning Commission (NLUPC), as the principal advisory organ of the Government on all matters related to land use. The NLUPC is responsible for ensuring that land resources are used in sustainable manner taking into account the need for land use plans.

16) The Industrial and Consumers Chemicals (Management and Control) Act, 2003

The Industrial and Consumers Chemicals (Management and Control) Act No 3 of 2003 (URT,

2003) provides a legal framework for the management and control of industrial and consumer chemicals throughout their life cycle.

The law requires that all those persons who intends to produce, import, export, sale, deal in industrial and consumer chemicals must register with the Registrar of Industrial and Consumer Chemicals so that their capacities to manage chemicals can be assessed. The law also requires that facilities used in the production, storage disposal of chemicals and waste must be registered for the same reasons of ensuring that they are of sound designs and that are operated properly.

The proposed development will possibly be dealing with various chemicals that fall under this Act and the developer will thus be required to register with the Registrar of Industrial Chemicals and have the facilities inspected and regularly monitored as provided for under Part III and IV of the Act.

17) Occupation Health and Safety Act (OSHA Act)

The Occupation Health and Safety Act, (No. 5) (2003), deals with issues related to health and safety of workers in industrial areas. Under the Act, the Minister responsible for Labour shall appoint the Chief Inspector (CI) to perform the functions stipulated in the Act. Specific provisions of the OSHA Act, namely Section 21, 60, 61, 73-75 and 96 must be fully addressed in order to comply with this legal requirement.

The Act addresses issues of safe equipment, provision of personal protective equipment and a clean and safe work environment (e.g. provision of regular medical examination, air, drinking water, sanitary convenience, washing facilities, accommodation for clothing, first aid facilities: including safety training etc.). The proposed development should operate within the requirements of this Act in addition to those of the Electricity Act and others as outlined in this section.

18) The HIV and AIDS (Prevention and Control) Act, 2008

This Act provides for: prevention, treatment, care, and control of HIV and AIDS; promotion of public health in relation to HIV and AIDS; appropriate treatment, care and support using available resources to those people living with or at the risk of HIV and AIDS; and related matters.

The Act also provides for the requirement of public education and programmes on HIV and AIDS. Section 8(1) of the Act states that the Ministry of Health and Social Welfare, health practitioners, workers in the public and private sectors and NGOs are required, for the purpose of providing HIV and AIDS education to the public, to disseminate information regarding HIV and AIDS to the public. Furthermore, Section 9 states that every employer, in consultation with the Ministry of Health and Social Welfare, shall establish and coordinate a workplace programme on HIV and AIDS for employees under his control and that such programmes shall include provision of gender-responsive HIV and AIDS education.

The provision of this Act should be followed during the various stages of the project development in view of its potential to create conditions where such HIV/AIDS transmissions are likely to occur.

19) The Workers Compensation Act, 2015

This Act provides for compensation to workers for injuries suffered in the course of their employment, which result in disablement or death. This Act needs to be complied with as Project workers will be exposed to various dangerous and hazardous environments during project implementation.

20) Antiquities Act 1964, Amendments 1979

This Act is aimed at the conservation and protection of important archaeological, historical, and natural relics and monuments. It stipulates responsible government agency, designation process, required protocols in the discovery and excavation of relic/monument, restrictions in export and sales, among others. However, this Act does not cover landscape and visual values.

21) Other Relevant Laws

Other regulatory frameworks that are relevant to the proposed development include; the Town and Country Planning Ordinance (Cap 378 of 1958) and Amendment of 1961, for planning purposes. Others are the Grave Removal Act, 1969 and the Local Government Act. No.9 of 1982. These Acts will be examined in relation to the proposed development.

(3) Environmental standards

1) Air Quality

Table 12-1 shows comparison of emission standards for thermal power stations and Table 12-2 shows the comparison of ambient air quality standards between national and international ones.

**Table 12-1 Comparison of Emission Standards for Thermal Power Stations
(mg/Nm³:O₂ 6% converted)**

	Tanzanian regulation	IFC EHS GUIDELINES Natural Gas (all turbine types of Unit > 50MWth)
NO _x	300 mg/Nm ³	51 mg/Nm ³ (25 ppm)

Source: Environmental Management (Air Quality Standards) Regulations, 2007, Tanzania
IFC, Environmental, Health, and Safety Guidelines (Thermal Power Plants) (December 2008)

Table 12-2 Comparison of Ambient Air Quality Standards

	Tanzanian regulation	IFC EHS GUIDELINES
NO ₂	-	1-year: 40 (ug/m ³) 1-hour: 200 (ug/m ³)
NO _x	24-hour: 150 (ug/Nm ³) 8-hour: 120 (ug/Nm ³)	-
PM _{2.5}	-	1-year: 10 (ug/m ³) 24-hour: 25 (ug/m ³)
PM ₁₀	Hourly: 0.20 ug/Nm ³ Daily average of hourly value 0.10 ug/Nm ³	1-year: 20 (ug/m ³) 24-hour: 50 (ug/m ³)

Source: Environmental Management (Air Quality Standards) Regulations, 2007, Tanzania
IFC, General Environmental, Health, and Safety Guidelines (2007)

2) Noise

Table 12-3 shows the comparison of noise standards of Tanzanian regulation and IFC EHS guidelines.

Table 12-3 Comparison of Noise Standards

	Tanzanian regulation (dB)		IFC EHS Guidelines (dB) (general) ¹	
	Industrial area	Residential building	Industrial area	Residential, institutional, educational
Daytime	70	50	70	55
Nighttime	60	35	70	45

Source: Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2015
IFC, Environmental, Health and Safety Guidelines (Thermal Power Plants) (December 2008)

3) Wastewater standards

Table 12-4 shows comparison of the wastewater quality standards of Tanzanian regulation and IFC EHS guidelines.

Table 12-4 Comparison of Wastewater Quality Standards

	Tanzanian regulation PERMISSIBLE LIMITS FOR MUNICIPAL AND INDUSTRIAL EFFLUENTS	IFC EHS GUIDELINES
pH	6.5-8.5	6–9
Total suspended substances (TSS) (mg/l)	100 mg/l	50
Oils (mg/l)	10	10
Total residual chlorine (mg/l)	-	0.2
Chrome (Cr) (mg/l)	1.0	0.5
Copper (Cu) (mg/l)	2.0	0.5
Iron (Fe) (mg/l)	5.0	1.0
Zinc (Zn) (mg/l)	5.0	1.0
Lead (Pb) (mg/l)	0.1	0.5
Cadmium (Cd) (mg/l)	0.1	0.1
Mercury (Hg) (mg/l)	0.005	0.005
Arsenic (As) (mg/l)	0.2	0.5
Temperature range (°C)	20 to 35	Temperature increase by thermal discharge from cooling system is to be Assessed in EIA

Source: Environmental Management (Water Quality Standards) Regulations, 2007, Tanzania
IFC, Environmental, Health, and Safety Guidelines (Thermal Power Plants) (December 2008)

¹ Daytime (7:00–22:00), Nighttime (22:00–7:00)

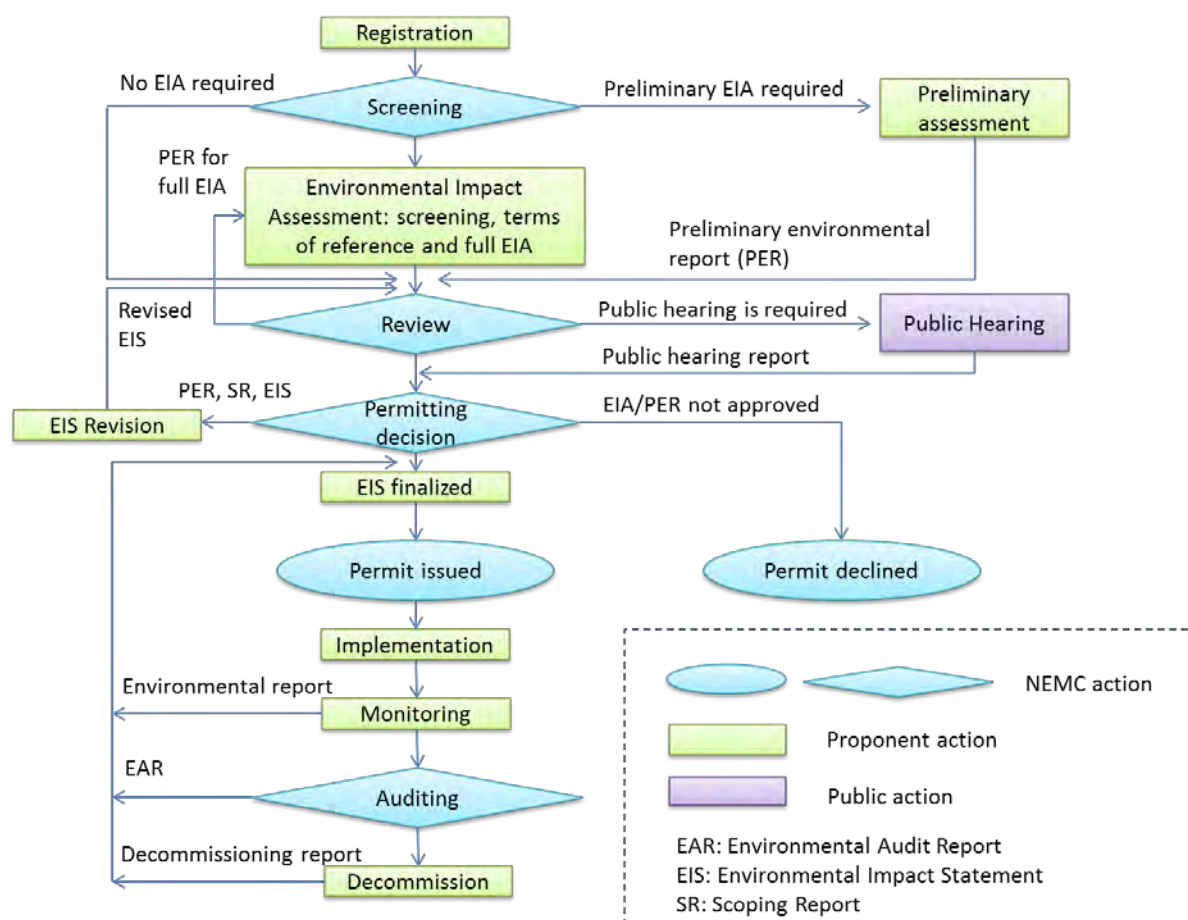
(4) EIA Process in Tanzania

According to the First Schedule of the Environmental Impact Assessment and Audit Regulations of 2005, the following projects require EIA for the energy sector:

- Production and distribution of electricity, gas, steam, and geothermal energy
- Storage of natural gas
- Thermal power development
- Hydroelectric power
- Development of other large scale renewable and non-renewable sources of energy

An activity listed in the First Schedule of the EIA and Audit Regulations cannot proceed without obtaining the necessary license from the relevant licensing authority (line ministry). The licensing authority, however, will not issue a license without having first received an EIA Certificate from the NEMC. The Developer must commence with his/her authorized development within three years.

The EMA 2004 makes a provision of the EIA to be conducted at the national, sectoral or local government levels. Currently, all EIA projects are still being administrated at the national level. Figure 12-11 shows the EIA process flow diagram. The EIA Report is officially referred to as the Environmental Impact Statement (EIS).



Source: Energy Sector EIA guideline, MEM, 2012

Figure 12-11 Process Flow Diagram

1) Screening Phase

The proposed project must be registered with the National Environment Management Council (NEMC) to initiate the screening process. Registration is done by preparing and submitting to NEMC a project brief, that describes in brief the project, its scope and potential impacts and mitigation options, and filling in a project registration form. Screening is stage where NEMC determines the level of environmental assessment based on the screening criteria provided under Regulation 6 (1) of the EIA and Audit Regulations and its details provided under First Schedule of these Regulations. Level of environmental assessment is to determine if EIA is required for the project, or EIA is not required, or a preliminary environmental assessment is required.

2) Scoping Phase

This stage of the EIA process is intended to determine the scope of the Study by defining the boundaries and the issues involved. The main objectives of this stage are:

- Development of appropriate study methods;
- Determination of spatial, temporal and institutional boundaries of the EIA study;
- Identification of relevant stakeholders;
- Identification and discussion of project alternatives and designs;
- Identification of the likely positive and negative impacts of the project;
- Identification of data requirements; and
- Development of Terms of References for undertaking a full EIA

3) Detail Impact Assessment

This stage will follow after NEMC has approved the Terms of Reference for this work that are submitted together with this scoping report. The Terms of reference provide details of the activities that have to be undertaken during detailed EIA.

4) Disclosure of the EIA Report

Disclosure of the project information helps affected people and other stakeholders understand the risks, impacts and opportunities associated with the project and is undertaken as part of the on-going stakeholder engagement. Thus, disclosure of the information will happen at different stages of the EIA process. For example, during initial site visit, scoping and detailed EIA, access to relevant information will be provided to affected persons. More disclosure will happen when the draft EIA report will be submitted to NEMC and copies will be sent to various stakeholders for comments. This will provide opportunity for stakeholders to comment on the report and ensure their views are taken on board. The next disclosure will happen when the report is finalized and sent to NEMC, which will develop a review report to obtain the Minister's decision. At this stage the final report will be sent to various stakeholders including (in principle) the District Council that will have the information and understanding of the various issues addressed in the report. The copies will also have executive summaries in Kiswahili and English (an official language) that will help stakeholders understand the issues contained in the report and mitigation measures.

The EIA Regulations (2005) stipulates requirements for public disclosure of project information through the following:

- Posting posters in strategic public places in the vicinity of the site

- Publishing a notice about the proposed project for two consecutive weeks in a nation-wide newspaper
- Making a radio announcement in both Kiswahili and English languages for at least once a week for two consecutive weeks
- Hold public meetings with affected parties and communities, where appropriate (will be decided by NEMC)
- Send out notices at least one week prior to the meetings (set at a convenient time and venue for the affected communities and parties)

NEMC or VPO does not as yet have a system of uploading EIA reports into their web sites, instead and according to the Environmental Management (Fee and Charges) (Amendment) Regulations, 2016, Government Notice #191 of 3rd June 2016, any person that want to access the EIA report for inspection and viewing will have to pay Tshs 15,000 and if they want to read they will pay Tshs 30,000.

(5) International Treaties and Conventions

Tanzania is signatory to several international conventions that this project will have to adhere to since the Government has ratified many of them and has expressed commitments to enforcing them as part of their own laws and principles. Some of the conventions include the following:

1) International Convention on Biological Diversity

Tanzania is signatory to the Convention on Biological Diversity (CBD) since June 1992 and has taken steps to ensure conservation and use of these resources in judicious ways. Biological resources in Tanzania are facing a significant threat from unsustainable utilization, including increased poaching of wildlife. While the proposed site for this development may not be very rich in terms of biodiversity of large mammals and plants, it is nonetheless equally important to ensure the basic tenets of this Convention are adhered to in all stages of the project development.

2) UNESCO Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention) 1972

This convention aims at encouraging the identification, protection, and preservation of earth's cultural and natural heritage. It recognizes that the nature and culture are complementary and that cultural identity is strongly related to the natural environment in which it develops.

The Convention provides for the protection of those cultural and natural 'properties' deemed to be of the greatest value to humanity. In the course of implementing this Project, cultural and heritage objects may be discovered. Recommendations will be made according to the Tanzanian legislation and policies and international best practices on how to handle these objects.

3) The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1979

This Convention seeks to control the trade in species of wild animals and plants that are, or may be, threatened with extinction as a result of international trade. Project sponsors must ensure that such trade is not happening in the project site during the construction of the project. During operation, such issues are under the jurisdiction of the Customs Department of the

TRA and the Ministry of Natural Resources and Tourism (MNRT).

4) The African Convention on the Conservation of Nature and Natural Resources, 1968

This Convention requires contracting states to adopt measures necessary to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people. Protected species should be accorded special protection, including the maintenance of habitats necessary for their survival.

5) The Ramsar Convention on Wetlands of International Importance, 1971

The Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat is an international treaty for the conservation and sustainable use of wetlands. This is a United Nations, Education Culture and Scientific Organization (UNESCO) Convention that was signed in the city of Ramsar in Iran in 1971 and came into force in 1975. The Convention provides for national action and international cooperation regarding conservation of wetlands and wise, sustainable use of their resources, and their conservation and restoration. Tanzania has four Ramsar sites that includes Kilombero Valley and Floodplain (796,735ha); Lake Natron (224,781ha); Malagarasi-Moyovosi Wetland (3,250,000ha) and Rufiji-Mafia-Kilwa Marine Ramsar Site (596,908).

6) The Paris Agreement

This Agreement brings together nations across the globe to commit themselves in addressing climate change through intended nationally determined contributions (INDCs). The Agreement presents several frameworks (e.g. financial, technology, capacity building, monitoring and evaluation) that would enable countries to achieve their ambitious targets in terms of emission reductions and enhance support to developing countries, particularly those vulnerable to the impacts of climate change. The Project is aligned with Tanzania's INDCs, which stipulated an emission reduction target between 10-20% by 2030. It will expand the use of natural gas as an alternative source of energy, which is one of the intended action in the INDC's energy sector.

(6) JICA guidelines for Environmental and Social Considerations and Tanzanian environmental legal framework

1) JICA guidelines for environmental and social considerations (2010)

The objectives of the guidelines are to encourage Project proponents to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for and examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents in order to facilitate the achievement of these objectives.

While project proponents bear the ultimate responsibility for the environmental and social considerations of projects, JICA supports and examines appropriate environmental and social considerations undertaken by project proponents etc. to avoid or minimize development projects' impacts on the environment and local communities, and to prevent the occurrence of unacceptable adverse impacts.

JICA establishes "*the Advisory Committee for Environmental and Social Considerations*" as

an independent council composed of external experts with the knowledge necessary to provide advice regarding support for and examinations of the environmental and social considerations of cooperation projects.

JICA confirms that projects comply with the laws or standards related to the environment and local communities in the central and local governments of host countries. JICA also confirms that projects do not deviate significantly from the World Bank's Safeguard Policies, and refers as a benchmark to the standards of international financial organizations; to internationally recognized standards, or international standards, treaties, and declarations.

2) Major Gaps between JICA guideline, World Bank's Safeguard Policy and Tanzanian legislation on environmental and social consideration

There are some gaps between JICA guideline, World Bank Safeguard Policy and Tanzanian legislation on environmental and social consideration as below. Measures bridging the gaps are shown below.

a) EIA

Table 12-5 Gaps between JICA Guideline, World Bank Safeguard Policy and Tanzanian Legislation on Environmental and Social Consideration

Response policy including JICA's guideline and the World Bank's Safeguard Policy	Relevant laws in Tanzania	Main gaps	Potential measures bridging the gap
<ul style="list-style-type: none"> Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. Whenever feasible, projects are sited on lands already converted (excluding any lands considered to have been converted in anticipation of the project). JICA does not support projects involving the significant conversion of natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs. If the environmental assessment indicates that a project would significantly convert or degrade natural habitats, the project includes mitigation measures acceptable to JICA. Such mitigation measures include, as appropriate, minimizing habitat loss (e.g., strategic habitat retention and post-development restoration) and establishing and maintaining an ecologically similar protected area. JICA accepts other forms of mitigation measures only when they are technically justified. 	<ul style="list-style-type: none"> The Environmental Management Act 2004 stipulates that the Minister responsible for Environmental Protected Areas by considering flora and fauna, special feature, the interests of the local communities and accordance with international society. (Article 47) Under the National Policies for National Parks in Tanzania, 1994, although, the primary objectives are the protection and inheritance of natural resources (Article 3.1), permission of all projects in National Parks is granted based on Environmental Impact Assessment, which clarify positive and negative impacts. 	Under the domestic law in Tanzania, even within National Parks, project permission can be granted depending on the EIA result. It is not prescribed as for the necessity of analyzing if the economic benefits outweigh environmental costs.	<ul style="list-style-type: none"> Avoid protected areas. Wherever feasible, project location is sited on lands already converted.
<ul style="list-style-type: none"> Confirm that projects comply with the laws or standards related to the environment and local communities in the central and local governments of host countries; it also confirms that projects conform to those governments' policies and plans on the environment and local communities. 	<p>There is Environmental Impact Assessment System provided by EMA.</p> <p>Regulation on air quality, water, soil, waste management are established by the following regulation under the EMA.</p> <p>Environmental Management (Air Quality Standards) Regulations, 2007;</p> <p>Environmental Management (Soil Quality Standards) Regulations, 2007;</p> <p>Environmental Management (Water Quality Standards) Regulations, 2007;</p> <p>Environmental Management (Solid Waste Management) Regulations, 2009; and</p> <p>Environmental Management (Hazardous Waste Control and Management) Regulations, 2009.</p>	In terms of the legal framework on environmental management, there is not any difference in particular. However, there are some gaps in the environmental standards between Tanzania and IFC EHS guidelines.	The project will comply with both Tanzanian environmental standards and IFC EHS guidelines. Between the two, the Project will adopt the stricter standard.

Response policy including JICA's guideline and the World Bank's Safeguard Policy	Relevant laws in Tanzania	Main gaps	Potential measures bridging the gap
<ul style="list-style-type: none"> EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. For explanations, documents must be formulated in a language and manner, and that are understandable to the affected local people. 	EISs (EIA reports) etc. should be formulated in languages understandable to stakeholders.	There is no difference in particular.	-
<ul style="list-style-type: none"> In principle, host countries etc. disclose information about the environmental and social considerations of their projects. Assist project proponents etc.as needed. Encourage host countries etc. to disclose and present information about environmental and social considerations to local stakeholders. EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted. In principle, host countries etc. consult with local stakeholders to a reasonable extent. Assist host countries as needed. 	<ul style="list-style-type: none"> From screening step of project, participation opportunities are provided. During EIA report review period, public consultation is held and EIA report is made public and comments are received verbally and in writing. Contents to be covered in EIA in Tanzania is stipulated in EIA and Audit Regulation, 2005. Also, EIA report is stored as official document by NEMC and available for perusal when needed. 	<p>There is no difference in particular.</p> <p>Items to be covered in EIA is generally the same.</p>	-
<ul style="list-style-type: none"> Confirm monitoring results through host countries etc. to verify environmental and social considerations are implemented surely. The information necessary for monitoring confirmation must be supplied by host countries etc. by appropriate means, including in writing. Also, disclose the results of monitoring conducted by host countries etc. on its website to the extent that they are made public in host countries etc. 	NEMC shall conduct environmental assessment review. Project proponents should store monitoring data and formulate annual report and report actual result compared with original plan to NEMC. When negative impacts were occurred, appropriate mitigation measures shall be planned and implemented.	No gap is identified.	Monitoring results will be sent to JICA as requested.

b) Land Acquisition and Resettlement

Table 12-6 Gaps between JICA Guideline, World Bank Safeguard Policy and Tanzanian Legislation on Land Acquisition and Resettlement

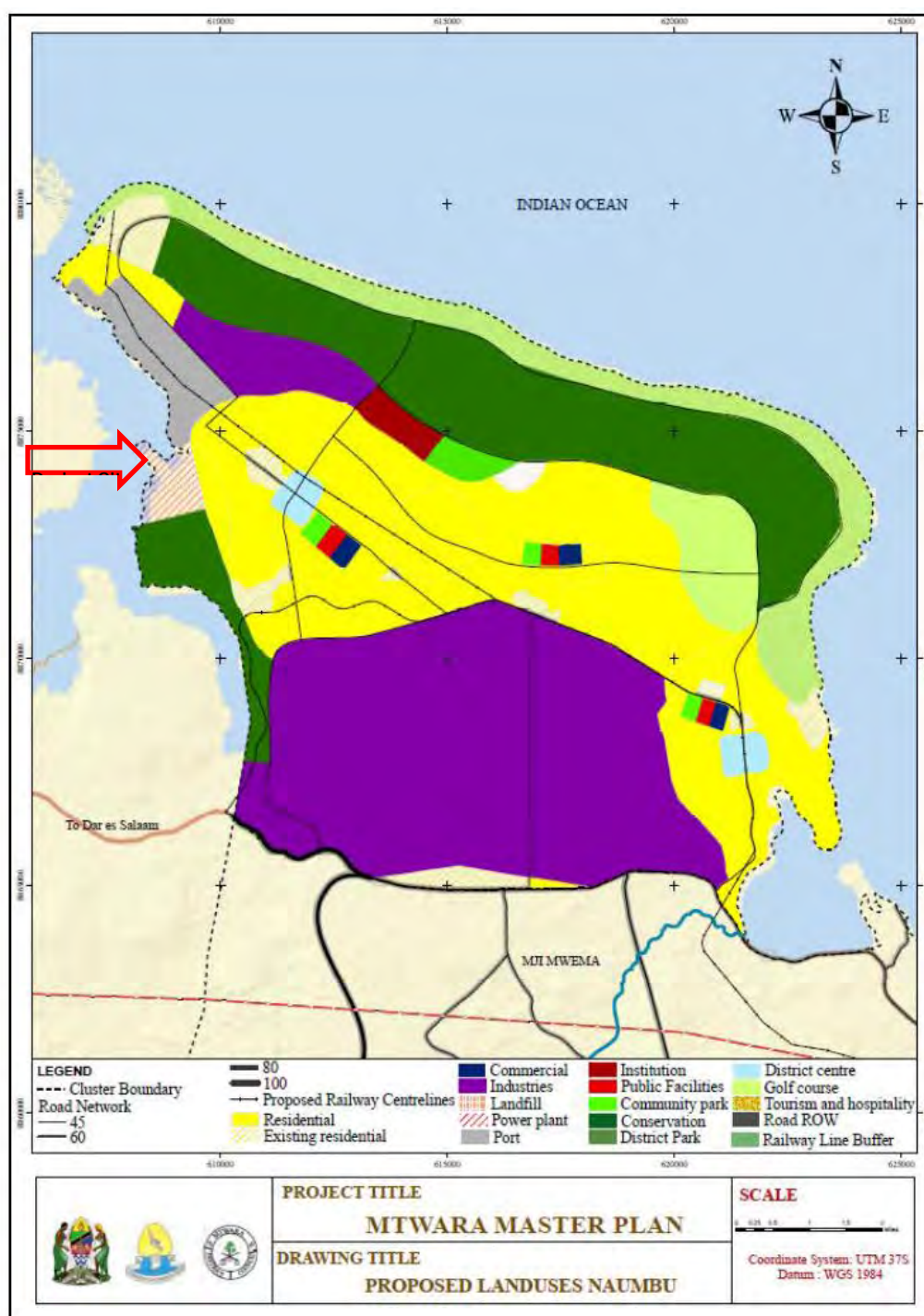
Contents	Response policy including JICA's guideline and the World Bank's Safeguard Policy	Relevant laws in Tanzania	Main gaps	Potential measures to bridge the gap
Avoidance of involuntary resettlement	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	No specific provisions on avoiding involuntary resettlement and loss of means of livelihood although these can come from the EIA	Avoiding involuntary resettlement is not mentioned in Tanzania land laws.	Avoid involuntary resettlement when feasible.
Compensation for loss	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	<ul style="list-style-type: none"> When displacement is unavoidable, compensation will be given as follows (Land Act, 1999 – Cap 113, Part II Section 3 (1) (g) , Section 34 and 156) Market value of unexhausted improvement², disturbance allowance, transport allowance, accommodation allowance and loss of profits, although depreciated replacement value is given and valuation is often not done properly because some aspects that need to be included are not taken into account – for example, using market values is sometimes ignored and information to affected persons is not sufficiently provided. 	Full replacement value (market value) plus transaction costs is the gap in dealing with the displacement impact.	On this comparison compensation shall be made relying on full replacement cost. Therefore valuers shall consider this during valuation exercise.
Livelihood Restoration	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	Livelihood restoration is not addressed although, sometimes done through provision of alternative affected social services- for example, providing an alternative health facility or a school are cases in point.	Livelihood restoration is not explicitly stated in Tanzania laws.	TANESCO will decide assistance/ allowances for the loss of livelihood such as farmland, fish landing site as per Entitlement Matrix in this RAP.
Full Replacement Cost	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	Market values but usually in practice provide with depreciated replacement values.	Full replacement cost may not be paid although various allowance items may compensate for it.	Compensation shall be made relying on full replacement cost.

² Land Act, 1999 interprets unexhausted improvement as anything or any quality permanently attached to the land directly resulting from the expenditure of capital or labor by an occupier or any person acting in his behalf and increasing the productive capacity, the utility, the sustainability of its environmental quality and includes trees standing crops and growing produce whether of an agricultural or horticulture nature. This condition has been amended by the Land (Amendment Act), 2004 by replacing Subsection 8 and 9 of the Land Act 1999 to allow for sale land without unexhausted improvements. For development purposes or as joint venture.

Contents	Response policy including JICA's guideline and the World Bank's Safeguard Policy	Relevant laws in Tanzania	Main gaps	Potential measures to bridge the gap
Timing of Compensation Payment	Compensation and other kinds of assistance must be provided <u>prior to displacement</u> . (JICA GL)	<p>Tanzania law requires that compensation should be full, fair and prompt. Prompt means it should be paid within 06 months after the valuation.</p> <p>Where amount of compensation remained unpaid for six months after acquisition or revocation, interest at the percentage average rate of interest offered by commercial banks offered on fixed deposits shall be recoverable until such compensation is paid.</p> <p>Legally, compensation for the acquired land does not have to be paid before possession can be taken, but in current practices it is usually paid before existing occupiers are displaced.</p> <p>In practice compensation is not paid promptly most of time, and delays are not rectified paying the interest rate as required by the law.</p>	In terms of timing, both Tanzanian laws and the JICA Guidelines/OP 4.12 require that compensation should be paid promptly and before any activities are started in the affected land.	<p>If the payment of compensation is delayed from the timing stipulated in the law, TANESCO will take measures as below:</p> <ol style="list-style-type: none"> 1) Taking into account the interest rate as required by law. 2) Conduct re-evaluation. <p>No PAPs will be relocated before compensation.</p>
Preparation of RAP	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	For large scale involuntary resettlement compensation must be provided (Land Acquisition Act 1967 Part II Section 11 and Land Cap 113, Part II Section 3 (1) (g))	Tanzania Law does not consider Resettlement Action Plan as mandatory.	TANESCO will prepare the RAP.
Consultation with PAPs	<p>In preparing a resettlement action plan, <u>consultations must be held with the affected people and their communities</u> based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.</p> <p>Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)</p>	<p>There scanty provisions related to consultation and disclosure in Tanzania law. The notice, under the Land Acquisition Act, informs land owners about the President's need to acquire their land, and their right to give objections.</p> <p>The Land Act allows displaced to fill in forms requiring that their land be valued, and giving their own opinion as to what their assets are worth.</p> <p>Since resettlement is not provided legally, there are no provisions about informing the displaced persons about their options and rights; nor are they offered choice among feasible resettlement alternatives.</p> <p>Information regarding valuation and any activities related to compensation reaches the PAPs through a legally recognized procedure which has to start from</p>	There is no major gap.	-

Contents	Response policy including JICA's guideline and the World Bank's Safeguard Policy	Relevant laws in Tanzania	Main gaps	Potential measures to bridge the gap
		the regional, district, ward up to the village and sub village level. The village leader notifies the PAPs on every stage and activities to take place. This is done in advance/prior to start consultation and valuation.		
Grievance Mechanisms	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	Tanzania land law provides a mechanism for dealing with grievances including lodging complaints to the courts (Land Acquisition Act 1967, Section 13 (1) and (2) and Land Act, Cap 113. Part XIII Section 167 (1))	Tanzania grievance mechanism may not be enough for the PAPs to easily access.	Appropriate and accessible grievance mechanisms will be developed in the RAP.
Initial Baseline Survey	<u>Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey</u> (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	The law does not cover economic and social impacts of relocation and as such socio-economic surveys are not part of the land acquisition process.	Although the law mentions valuation of the affected properties, the full census survey (socio-economic baseline survey) is not in the land acquisition process.	Census survey, inventory of loss and socio-economic survey has conducted during the preparation of this draft RAP (RPF) as a part of JICA Preparatory Survey.
Eligibility	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of valuation but have invested on land will be eligible for compensation of assets but not land (recognized as tenants) Land Act Cap 133	Tanzania Law does not explicitly state about encroachers.	Payments of allowances helping the PAPs to improve their livelihoods, compensation for assets other than land, and/or support for livelihood restoration as per Entitlement Matrix in this RAP will be considered only for the encroachers who have been in the land <u>before the cut-off date.</u>
Land based resettlement	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	Land based resettlement is not stipulated in the law. In Tanzania, finding new land is not difficult especially in rural area. Therefore, PAPs tends to prefer compensation by monetary based not land based.	Land based compensation is not stipulated in the law, but practically TANESCO supports vulnerable PAPs (e.g. provide support to elderly and those in need to better understand and engage in the compensation process).	-

Contents	Response policy including JICA's guideline and the World Bank's Safeguard Policy	Relevant laws in Tanzania	Main gaps	Potential measures to bridge the gap
Support for the Transition Period	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	Tanzania regulations require an accommodation allowance to be paid to PAPs to support them to afford at least monthly rent for an alternative accommodation during resettlement transition period. Accommodation allowance is equivalent to the rent of the acquired property per month over thirty-six months, this allowance is only paid to those who have habitable houses.	For transition period, disturbance and accommodation allowances are paid. Measures for the transition period will be considered as per Entitlement Matrix in this RAP.	-
Vulnerable Groups	<u>Particular attention must be paid to the needs of the vulnerable groups</u> among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	There are no provisions that require the government to pay special attention to vulnerable groups or indigenous peoples.	The Tanzanian law does not make provisions requiring government to pay special attention to vulnerable groups in the administration of compensation.	Based on the identification of Vulnerable groups in the PAPs, TANESCO will consider the situation of identified vulnerability of PAPs, and their needs and take measures as in-kind compensation.
Abbreviated Resettlement Plan	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	N/A	N/A	N/A



Sources: Mtwara RAS

Figure 12-12 Land Use Map of Naumbu, Mtwara

Some pictures around the proposed Project Site (ca, 150 ha) are shown in Figure 12-13 below. The land use and land cover for this area includes open woodland, and open shrubland. Salt ponds are located close to the project site.



Open area behind the Project site



*Salt field in the low land
(Outside the project site)
Mangrove forest at the back*



High land



Foot pass in the high land

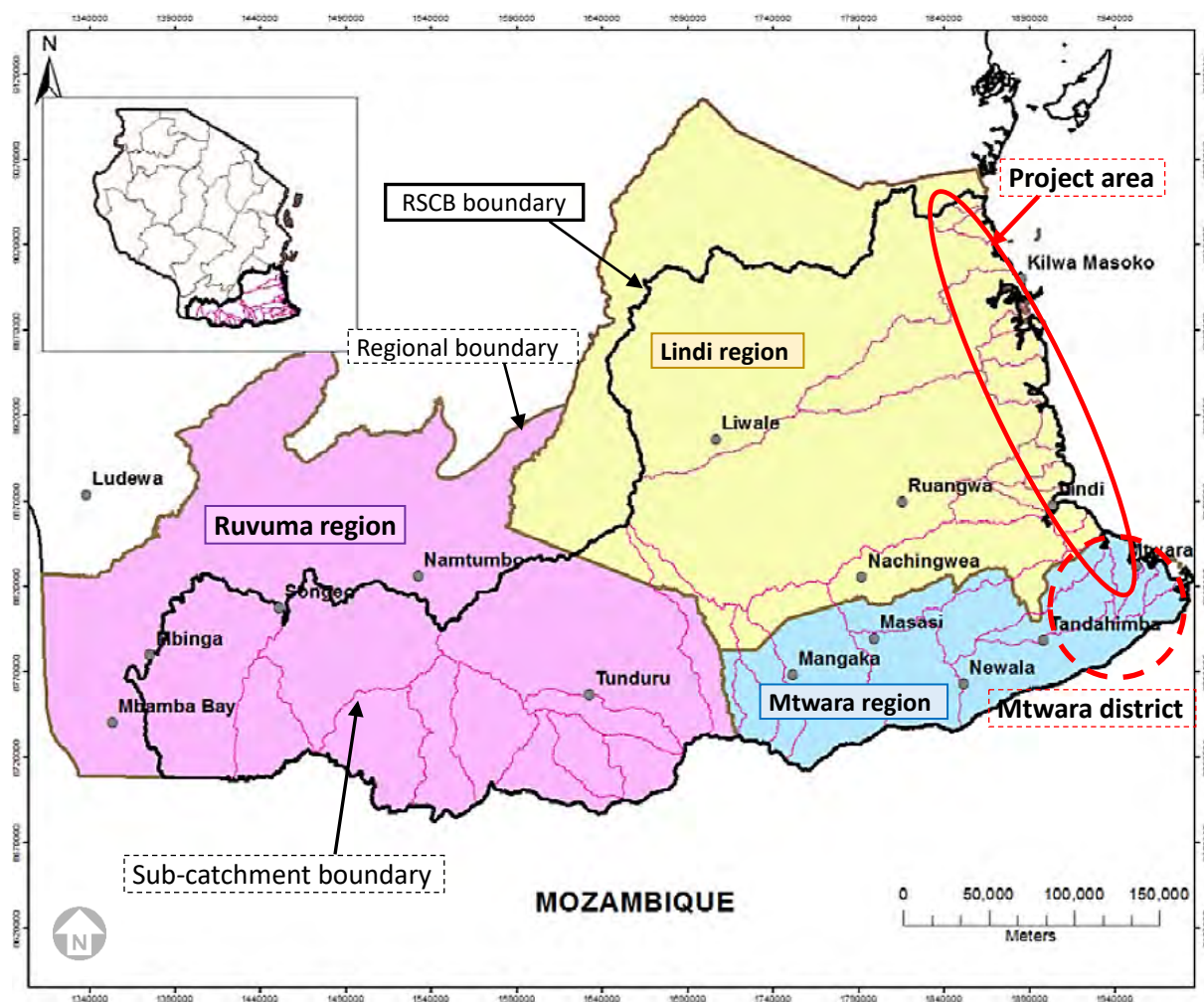
Figure 12-13 Land Use around the Proposed Project Site

2) Location and Topography

The project area of the proposed Mtwara power plant and 400kV transmission line is located in the Ruvuma River and Southern Coast Basin (RSCB) and belong to Mtwara and Lindi region as shown in Figure 12-14. RSCB is underlain by deeply weathered sedimentary rocks and granites, and as a result is relatively flat.

The northern part of the RSCB, within the Lindi region, is characterized by hilly, eroded terrain. Close to the coast, the elevation generally remains below 150 m. Several ocean gulfs extending inland also occur in the area.

The altitude of the Mtwara coastal area, where the proposed Mtwara power plant is located, ranges between 1 and 200 m above sea level. The topography is made up of a coastal sedimentary zone with a large presence of limestone with more sandy soils occurring along the coastline. The low-lying areas along the coast are especially vulnerable to flooding during the rainy season. Although the topography consists of predominantly hills, there are some steep slopes. These slopes will need to be taken into account when developmental areas and types are considered.



Source: Integrated Water Resources Management and Development Plan for the Ruvuma River and Southern Coast Basin, Ministry of Water, 2013

Figure 12-14 Ruvuma River and Southern Coast Basin (RSCB) and Region Boundaries

3) Hydrology

a) Water Catchment

The proposed Mtwara power plant is located in the Mambi sub-basin as shown in Figure 12-15 (refer to area within red dotted perimeter). The mean rainfall in Mambi sub-basin is estimated at 5,977 mm³/year, while the mean water runoff is estimated at 501mm/year, as shown in Table 12-7 below. The closest perennial river is the Ruvuma River located approximately 40 km to the south and other rivers in the coastal Mtwara area do not have constant flow.

12.1.3 Baseline Conditions

The baseline conditions in Mtwara region, especially the area related to the proposed Mtwara power plant, are described as follows. The survey for the baseline conditions in Lindi region, where the proposed 400 kV transmission lines passes, is underway and it is expected to be described in the further reports.

(1) Physical environment

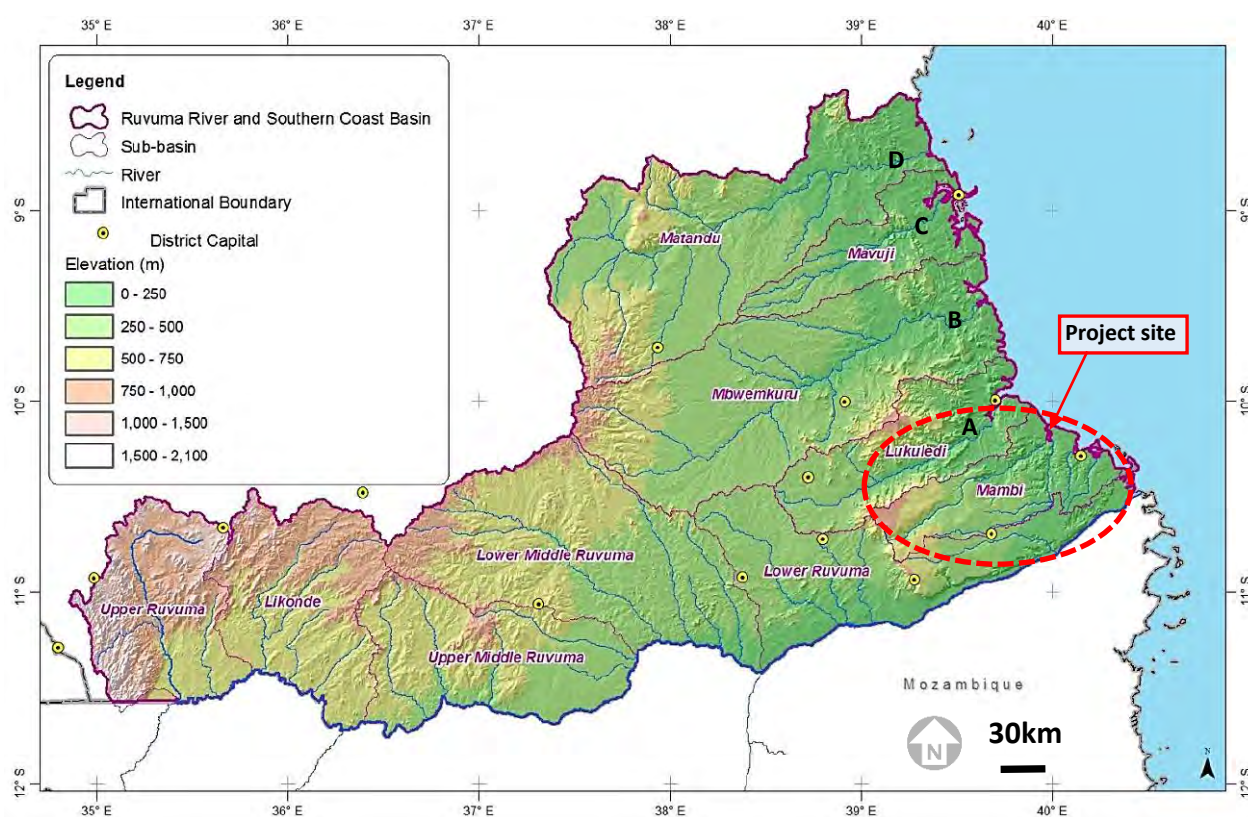
1) Land use

The Master Plan of Mtwara RAS stipulates the proposed land use for Naumbu, Mtwara (refer to Figure 12-12). The MP had got the government approval in March 2017 based on the Urban Planning Act No.8 of 2017 through a few years' process. Based on the land use map in the Master Plan, the Project Site is designated as a power plant development area.

Table 12-7 Mambi Sub-basin and its Sub-catchments

Sub-Basin	Area (Sq.km)	Sub-Catchment	Area (Sq.km)	Mean Annual Rainfall (mm)	Mean Annual Runoff (mm)
Mambi	5,258	Mnazi	251	984	72
		Nachenjere	326	1,004	81
		Mikindani	492	1,032	105
		Mbuo	1,405	990	87
		Mambi	2,523	959	70
		Madangwa	261	1,008	86

Source: Integrated Water Resources Management and Development Plan for the Ruvuma River and Southern Coast Basin, Ministry of Water, 2013



Source: Integrated Water Resources Management and Development Plan for the Ruvuma River and Southern Coast Basin, Ministry of Water, 2013

Figure 12-15 River Network and Sub-basins in the Ruvuma River and Southern Coast Basin

The water quality of the surface water at the four locations indicated in Figure 12-15 (A: Lukuledi river, B: Mbwemkuru river, C: Mavuji river, D: Matandu river) is shown in Table 12-8.

Table 12-8 Surface Water Quality in the Coastal Area of Lindi Region and Mtwara Region

Parameter	Standards		A: Lukuledi river (Mkwaya bridge)		B: Mbwenkuru river (Mbwenkuru bridge)		C: Mavuji river (Mavuji bridge)		D: Matandu river (Matandu bridge)	
	Tanzania	WHO	Nov/2009	Jan/2010	Nov/2009	Jan/2010	Jan/2010	Dec/2011	Nov/2009	Jan/2010
pH	6.5-9.2	6.5-8.5	7.6	7.6	8.2	7.2	7.1	8.2	7.9	7.0
EC(μs/cm)	2000		490.0	876.0	640.0	173.8	143.0	250.0	705.0	144.0
TDS(mg/l)		500	143.0	438.0	138.0	86.9	71.5	116.4	133.0	72.0
Salinity	200-600		n/a	n/a	n/a	n/a	n/a	0.1	n/a	n/a
Turbidity (NTU)	0-30	0-15	8.5	MCL	2.0	MCL	MCL	6.0	5.5	MCL
Total Hard. (mg/l)	600	500	45.5	110.5	87.5	43.5	40.0	37.0	94.0	40.5

Note: MCL- maximum concentration level

Source: Integrated Water Resources Management and Development Plan for the Ruvuma River and Southern Coast Basin, Ministry of Water, 2013

b) Surface Water

There are number of rivers crossed by the transmission line in the Ruvuma and Coast River Basin (RSCB) for the Lindi and Ruvuma regions. During the field survey conducted in August 2018, five locations were selected for surface water quality analysis as shown in Table 12-9.

Physical, biological and chemical parameters were analyzed to establish the baseline data for the water quality parameters. Ideally, drinking-water should not contain any microorganisms known to be pathogenic capable of causing disease or any bacteria indicative of faecal pollution. The chemical and physical quality of water may affect its acceptability to consumers and may cause health risks. Table 12-10 shows the water quality parameters for the sampled locations. It can be noted that the all parameters are within the acceptable range according to Tanzania drinking water and WHO standards.

Table 12-9 Surface Water Sampling Locations

S/N	Name of the river	Location		Remarks
		Easting	Northing	
1	Lukuledi	0571778	8879538	Located at Namunda village and Used for domestic purposes and irrigation
2	Mloeka	0567482	8881529	Located at Mnazi moja village. Used for irrigation, car washing and other non-drinking and cooking purposes
3	Ruaha	0561517	8882780	Located in Ruaha village. Used for domestic purposes
4	Mbwenkuru	0555515	8941258	Located in Mbwenkuru village. Used for irrigation and domestic purposes
5	Mavuji	0535122	8998827	Located in Mavuji village. Used for irrigation and domestic purposes

Source: IRA 2018

Table 12-10 Result of Surface Water Quality Analysis

S/N	Parameters	Lukuledi	Mloeka	Ruaha	Mbwemkuru	Mavuji	TZS drinking water standards	WHO guidelines	Remarks
		Sampling date: 13/8/2018 Sampling Time: 07:08	Sampling date: 13/8/2018 Sampling Time: 07:21	Sampling date: 13/8/2018 Sampling Time: 08:06	Sampling date: 12/8/2018 Sampling Time: 11:45	Sampling date: 13/8/2018 Sampling Time: 12:00			
	pH	7.90	7.85	7.85	7.89	7.37	6.5-9.2	6.5-8.5	Acceptable
	Temperature (°C)	25	26.5	20.6	26.6	25	-	-	
1	EC (µS/cm)	690	642	382	1074	290	<2000		Acceptable
2	Total dissolved solids (mg/l)	360	320	190	550	150	1000 - 1500	500	Acceptable
3	Total hardness (mg/l CaCO ₃)	145	130	80	250	62	500 -600	500	Acceptable
4	Calcium hardness (mg/l CaCO ₃)	110	110	67	210	35	-	-	
5	Magnesium (mg/l)	25	18.4	5.3	50	7.8	50-100	150	Acceptable
6	Calcium (mg/l)	32	28	14	81.4	11	75-300	200	Acceptable
7	Chloride (mg/l)	70	64.5	40	126	31.5	200-800	250	Acceptable
8	Sulphate (mg/l)	46	39.6	21	90	25	200 - 600	400	Acceptable
9	Nitrate (mg/l)	5.5	12	5.8	10	3.2	10 - 75	0-30	Acceptable
10	Total Coliform (No./100ml)	0	0	0	0	0	0	0	Acceptable
11	BOD ₅ (mg/l)	0	0	0	0	0	< 6	0	Acceptable
12	COD (mg/l)	0	0	0	0	0	< 10	0	Acceptable

c) Seawater

The proposed Mtwara power plant is located close to the Sudi Creek (Kisiwa Bay) (also known as Kisiwa Bay) in Mtwara District. Analysis of the water quality of the creek was conducted at three locations (Mgao, Kisiwa, Namgogoli).

The physico-chemical parameters for the seawater monitoring involved in-situ measurements of pH, Dissolved oxygen (DO), temperature and salinity, and collection of water samples using a Niskin bottle for subsequent laboratory measurements. The physical conditions of the sea water at three locations in Sudi Creek (Kisiwa Bay) at different depths (1m and 5m) during wet and dry seasons are presented in Table 12-11. The results of the laboratory analysis of sea water samples are as shown in Table 12-12.

Table 12-11 Results of In-situ Seawater Quality Test (Sudi Creek (Kisiwa Bay))

Site	Temperature (°C)		Salinity (‰)		DO (mg/L)		TDS (g/L)		pH	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
@ 1m depth										
Namgogori	28.0	31.6	36.98	26.9	2.76	3.03	36.29	34.03	8.44	8.50
Kisiwa	27.8	31.7	36.75	26.9	3.45	2.88	36.08	34.94	8.49	8.14
Mgao	27.6	30.2	36.43	24.7	3.11	3.13	35.8	32.14	8.31	8.22
@ 5m depth										
Namgogori	28.0	31.3	37.03	26.3	2.90	3.11	36.33	34.26	8.44	8.50
Kisiwa	27.7	31.4	36.83	27.0	2.97	2.86	36.16	35.18	8.47	8.17
Mgao	27.5	30.2	36.42	23.7	2.96	3.24	35.79	30.79	8.47	8.22

Source: IRA 2018

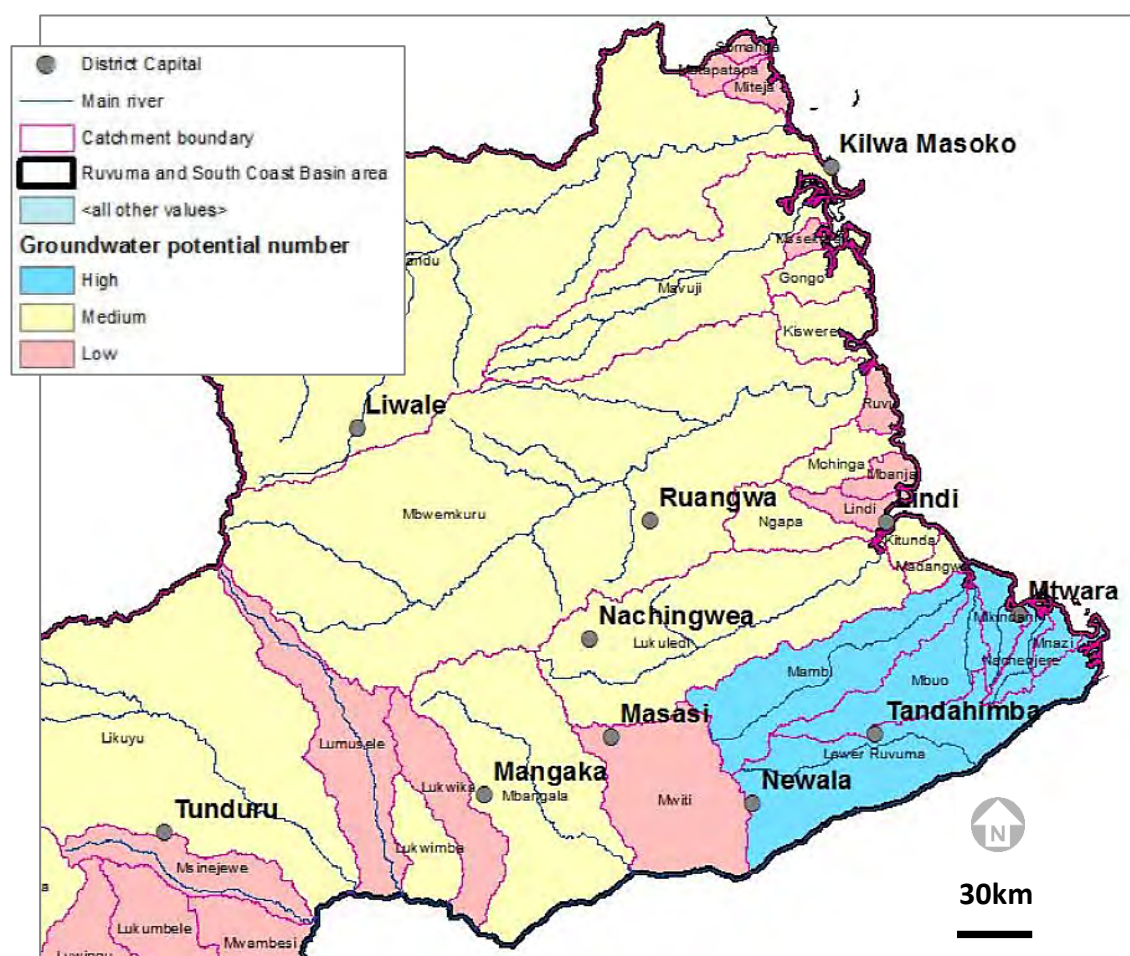
Table 12-12 Laboratory Results of Seawater Quality Test (Sudi Creek (Kisiwa Bay))

Site	COD	Chlorophyll-a (C mg/m ³)		TSS (g/l)		Total Coliform		Oil & Grease (mg/l)		Mineral Oil & Grease (mg/l)	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
@ 1m depth											
Namgogori	11.58	1.78	2.85	0.030	0.029	19	31	0.09	27.69	0.09	25.0
Kisiwa	11.86	1.62	3.00	0.030	0.030	ND	35	0.02	41.44	0.02	22.15
Mgao	10.48	1.55	2.09	0.031	0.029	11	15	0.49	37.19	0.67	34.55
@ 5m depth											
Namgogori	13.48	1.70	3.60	0.031	0.036	22	29	0.20	22.85	0.19	18.76
Kisiwa	13.34	1.71	3.59	0.029	0.030	12	37	2.05	28.56	1.85	24.44
Mgao		1.85	2.10	0.029	0.029	14	19	1.19	30.95	1.07	27.25

Source: IRA 2018

d) Groundwater

Both shallow and deep groundwater are found in the coastal zone in Lindi and Mtwara region. As shown in Figure 12-16 Mtwara region has high potential of ground water.



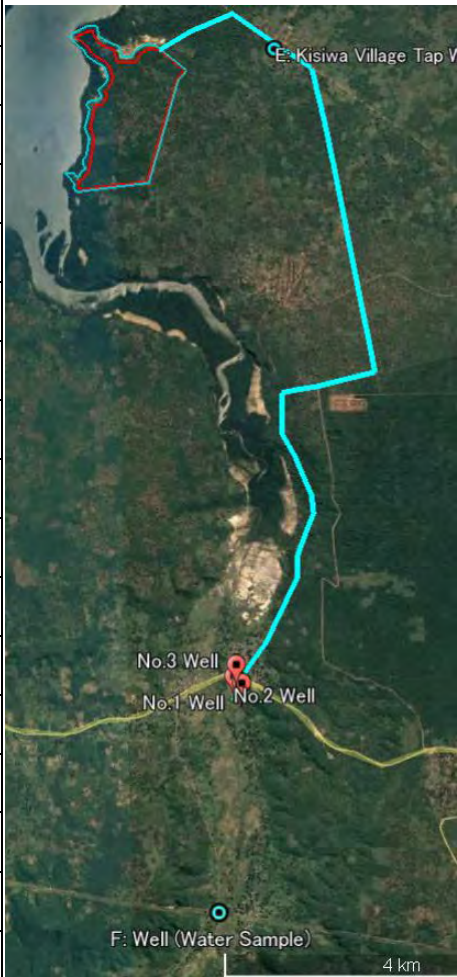
Source: Integrated Water Resources Management and Development Plan for the Ruvuma River and Southern Coast Basin, Ministry of Water, 2013

Figure 12-16 Groundwater Potential in the Coastal Area of Lindi Region and Mtwara Region

e) Groundwater quality around the project area

The ground water quality analysis results for Mtwara Power plant area are as shown in Table 12-13. Some wells do not meet TZS standards.

Table 12-13 Ground Water Quality Assessment Results

Parameter	Standards		E: Kisiwa	F: MBUO	Location of Sampling Points
	Tanzania (TZS 789:2008)	WHO	Mar/2018	Mar/2018	
pH	6.5-9.2	6.5-8.5	7.61	7.35	
EC(μs/cm)	2000		1241	598	
TDS(mg/l)		500	683	242	
Turbidity (NTU)	0-30	0-15	9	11	
Total Hard (mg/l)	600	500	174.83	83.18	
Ca (mg/l)	300	200	49.4	28.4	
Mg (mg/l)	100	150	12.5	2.98	
Fe (mg/l)	0-1.0	0-0.3	0.02	0	
Mn (mg/l)	0-0.5	0-0.1	0.016	0.06	
SO4 (mg/l)	600	400	8	2	
Cl ⁻ (mg/l)	800	250	385.67	106.23	
Alk. (mg/l)	500	500	80.0	76.0	
NO3 (mg/l)	10-75	0-30	4.8	6.9	
F (mg/l)	0-8.0	0-1.5	0	0	
Na (mg/l)	250	200	46	184	
K (mg/l)	100	-	28.39	35.95	
Temperature (°C)	35.0 (Highest)		30.2	30.8	

Source: IRA 2018

4) Soil and lithology

According to Soil and Terrain (SOTER) database, Ferralic Cambisols (2,190 km²) suitable for agriculture is the main soil in and around the project site (Figure 12-17 and Table 12-14). The Lithology of this area is rich in Clastic sedimentary rock (Figure 12-18).

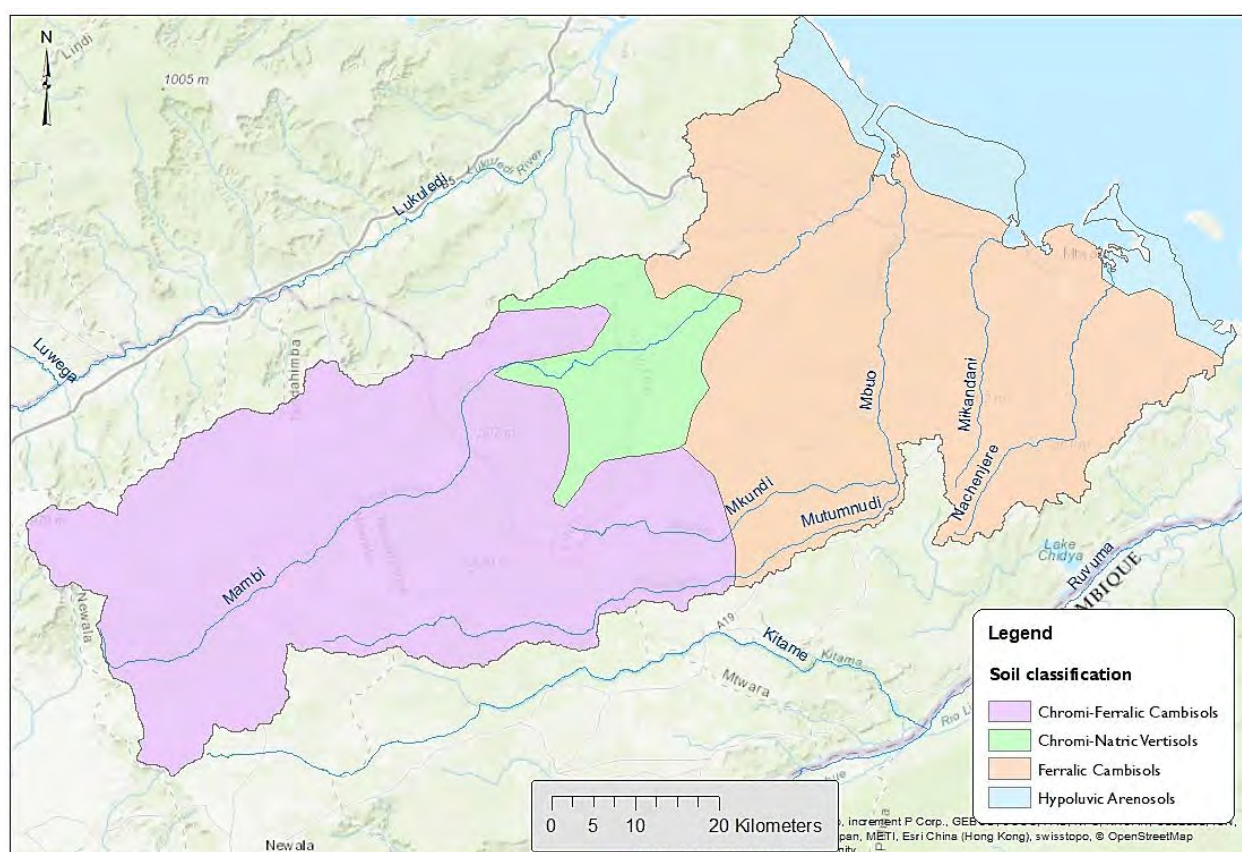


Figure 12-17 Soil Classification in Mambi Catchment

Table 12-14 Characteristics of the Soil Types in Mambi Catchment

Soil type	Description
Chromic-Ferralic Cambisols	Medium and fine-textured materials derived from a wide range of rocks, mostly in colluvial, alluvial or aeolian deposits. Cambisols make good agricultural land and are intensively used.
Chromic-Natric Vertisols	Sediments that contain a high proportion of clay, or products of rock weathering that have the characteristics of clay. Vertisols become very hard in the dry season and are sticky in the wet season. Tillage is difficult, except for a short period at the transition between the wet and dry seasons. Vertisols are productive soils if properly managed.
Ferralic Cambisols	Moderately developed soils. Shallowness and stoniness are characteristics features. These soils make good agricultural land
Hypoluvis Arenosols	Arenosols consists of sandy soils, developed in residual sands, in situ after weathering of old, usually quartz-rich soil material or rock, and soils developed in recently deposited sands as occur in deserts and beach lands.

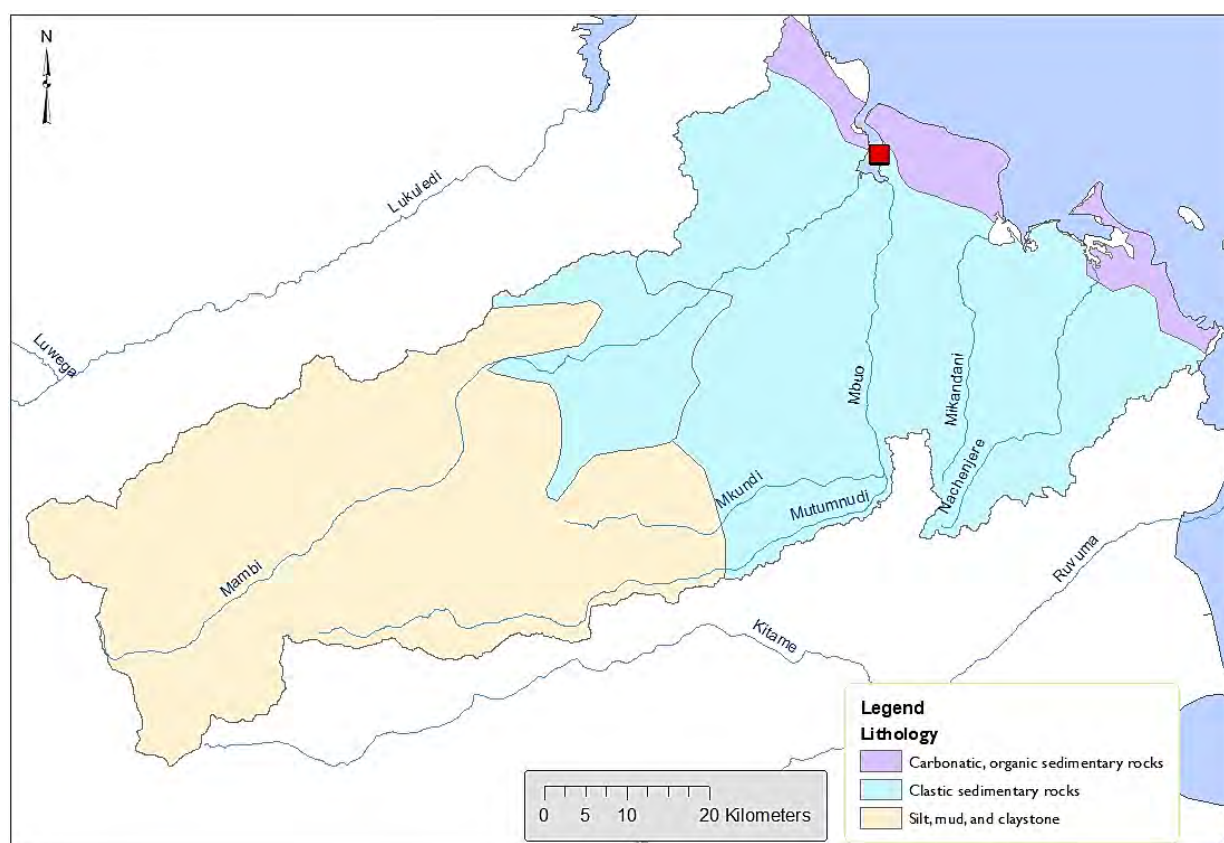


Figure 12-18 Lithology of the Mambi Catchment

5) Air quality, Noise and Vibration

The air quality, noise level and vibrations measurements were conducted at three monitoring stations. Station 1 corresponds to the proposed Power Plant site, station 2 in Kisiwa village and station 3 in Namgogoli village. The location of these sampling points are presented in Figure 12-19.

At monitoring station 1, data collected include particulate matter (PM10) and NO_x gases, wind speed, wind direction, temperature, noise level and ground-borne vibrations. At Kisiwa village "monitoring station 2" and Namgogoli village "monitoring station 3", noise level and vibration were recorded.



Note: **P1** – Power plant (Temperature, wind speed & direction), **P2** – Power plant (NO_x, PM₁₀, noise and vibration),
P3 – Kisiwa village (Noise & Vibration), **P4** – Namgogori village (noise&vibration),

Source: IRA 2018

Figure 12-19 Location of Sampling Points for Air, Noise and Vibration

a) PM₁₀

The maximum value of suspended particulate matters (PM₁₀) is 0.028 mg/m³ recorded on 24-03-2018 at 16:07 whereas the minimum value is 0.007 mg/m³. As observed from Table 12-15, nearly all values of suspended particulate (PM₁₀) are significantly below the upper limits of 0.075 mg/m³ for Tanzania Bureau of Standards (TBS) standard and slightly below the WHO standard of 0.025 mg/m³.

Table 12-15 PM10 Ambient Air Dust Concentration Measurements taken in the Project Area

Monitoring station1 – Power Plant site: GPS (0608362, 8874370)				
Date	Time of measurement	PM10 [mg/m ³]	TBS Standard [mg/m ³]	WHO Standard [mg/m ³]
23/03/2018	7:45	0.008	0.075	0.025
	12:09	0.014	0.075	0.025
	16:21	0.019	0.075	0.025
24/03/2018	7:00	0.007	0.075	0.025
	12:00	0.022	0.075	0.025
	16:07	0.028	0.075	0.025
25/03/2018	7:01	0.010	0.075	0.025
	12:03	0.016	0.075	0.025
	16:00	0.016	0.075	0.025
26/03/2018	8:08	0.007	0.075	0.025
	12:00	0.012	0.075	0.025
	16:00	0.013	0.075	0.025
27/03/2018	7:14	0.007	0.075	0.025
	12:06	0.013	0.075	0.025
	16:11	0.019	0.075	0.025
28/03/2018	6:52	0.008	0.075	0.025
	12:42	0.018	0.075	0.025
	16:11	0.017	0.075	0.025
29/03/2018	6:49	0.008	0.075	0.025

Source: JICA Study Team

b) NO_x

Air sampling and measurement was carried out at a single location within the proposed Mtwara Power Plant project area. A Dragger Pump and Tubes were used to characterize the ambient air quality. The results obtained are summarized in Table 12-16. As can be observed from this table the values for different NO_x gases were below detection limit (BDL).

Table 12-16 NO_x Measurements taken within the Proposed Mtwara Power Plant Site

NO _x gas measurements					
Monitoring station - Plant site: GPS (0608362, 8874370)					
Date	Testing time	# pressing, n	NO _x gas tested	Value	Minimum detection level
23/03/2018	07:30	5	Nitr.-0.5	BDL	0.5 ppm
24/03/2018	12:00	5	NO ₂ - 0.5	BDL	0.5 ppm
25/03/2018	16:00	5	NO ₂ - 0.5	BDL	0.5 ppm
26/03/2018	10:00	5	Nitr.-0.5	BDL	0.5 ppm
27/03/2018	07:30	10	NO + NO ₂	BDL	2 ppm
28/03/2018	12:00	10	NO + NO ₂	BDL	2 ppm
29/03/2018	16:00	10	NO + NO ₂	BDL	2 ppm

Source: JICA Study Team

c) Noise level

Table 12-17 shows the noise level measurements recorded at different monitoring stations. The monitoring locations were isolated from human activities and the only source of noise was wind and leaves in motion. The recorded ambient noise levels at all monitoring stations were significantly lower in comparison to the TBS and WHO standards upper limit values.

Table 12-17 Noise Level Measurements (dBA, Leq)

Tanzania local time [Hr]	Plant site GPS: 0608280 8874335 23/03/2018 [dBA]	Kisiwa village GPS: 0610616 8874054 24/03/2018 [dBA]	Namgogoli village GPS: 0610256 8871537 25/03/2018 [dBA]	TBS and WHO Standards
07:00	44.6	41.2	39.8	55
08:00	40.1	36.8	37.4	55
09:00	36.2	35.1	40.5	55
10:00	32.4	37.4	37.4	55
11:00	33.7	38.3	38.6	55
12:00	35.6	32.7	35.6	55
13:00	33.4	38.8	34.7	55
14:00	34.8	38.6	38.6	55
15:00	36.7	36.5	36.8	55
16:00	35.8	35.5	38.2	55
17:00	35.4	33.7	35.8	55
18:00	37.1	33.8	36.2	55

Source: JICA Study Team

d) Vibration

Ground vibrations were measured using an Erbesd Instruments vibration measuring system based on EI Calc software. The results of the root mean square (RMS) ground acceleration and velocity, as well as peak acceleration and velocity amplitudes for the three stations are summarized in the following tables. All the results are below the referred standards.

Table 12-18 Power Plant Project Site (GPS: 0608362, 8874370) - Results Summary

	Measured RMS acceleration (mm/s ²)	ISO (1997)/ASHRAE RMS acceleration (mm/s ²)	Measured RMS Velocity (mm/s)	ISO (1979)/ASHRAE RMS velocity (mm/s)
Lowest	11.71	-	0.13	-
Highest	12.16	20.0	0.14	0.2

Source: JICA Study Team

Table 12-19 Kisiwa Village (GPS: 0610616, 8874054) - Results Summary

	Measured RMS acceleration (mm/s ²)	ISO (1997)/ASHRAE RMS acceleration (mm/s ²)	Measured RMS Velocity (mm/s)	ISO (1979)/ASHRAE RMS velocity (mm/s)
Lowest	11.82	-	0.13	-
Highest	12.11	20.0	0.14	0.2

Source: JICA Study Team

Table 12-20 Namgogoli Village (GPS: 0610256, 8871537) - Results Summary

	RMS acc measured (mm/s ²)	ISO (1997)/ASHRAE RMS acc (mm/s ²)	Measured RMS Velocity (mm/s)	ISO (1979)/ASHRAE RMS velocity (mm/s)
Lowest	11.78	-	0.13	-
Highest	12.49	20.0	0.14	0.20

Source: JICA Study Team

(2) Biological environment

Ecological baseline survey was conducted by desk study and field study. Field study was conducted in dry season (Oct to Nov 2017) and in wet season (March to May 2018).

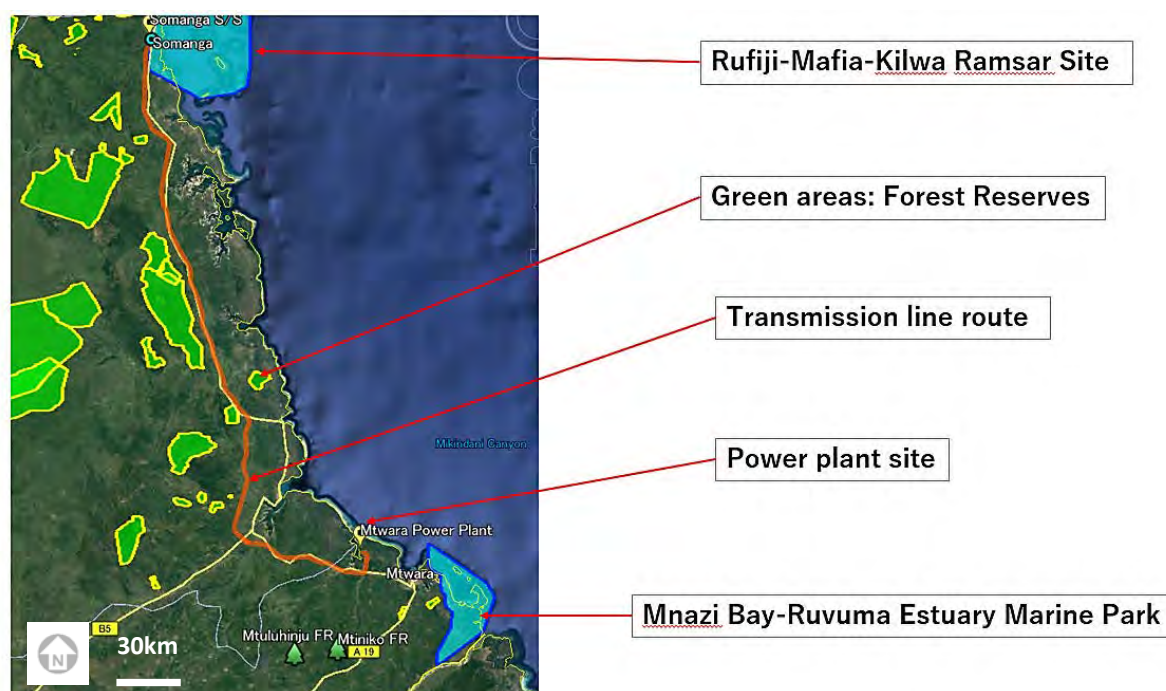
1) Protected Areas

Lindi and Mtwara Regions, where the Project Site is located, has forest reserves, a marine park, and a Ramsar site. These protected areas are mapped out in Figure 12-20. The Project components are neither located within nor passes through any of these protected areas.

2) Forest Reserve

There are forest reserves that are close to the power plant and transmission line are shown in Figure 12-20 (refer to green highlighted areas). None of these forest reserves are internationally designated sites for conservation. The closest forest reserve to the project site is the “Ruawa Forest Reserve” which is one of six forest reserves designated as IBA and KBA in Lindi District. It is 3km away from the proposed transmission line.

Among these, there are five forest reserves in Mtwara District. Three of these are under the management of the Central Government (Ministry of Natural Resources and Tourism). The forest reserves under the management of Mtwara District Council include the Mtiniko/Mnivata (1,736ha) and Mtuluhinju (296ha) forest reserves.



Source: JICA Study Team using background map of Google Earth

Figure 12-20 Location of Protected Areas around the Project Area

a) Marine Park

There is one national marine park in Mtwara District; Mnazi Bay Ruvuma Estuary Marine Park (MBREMP). IUCN Management Category for this marine park is VI. In 2000, MBREMP was gazetted as a Marine Park (Government Notice No. 285, published on 4/8/2000) made under Section 9 of the Marine Parks and Reserves Act, No. 29 of 1994 after being identified as an area of high biodiversity value at both the national and international levels. The Marine Park is under the management of the Ministry of Natural Resources and Tourism.

b) Ramsar Site

The extensive mangrove forest that form a continuous block of mangroves extending from Rufiji delta to Kilwa exhibits high biodiversity. This area is a designated Ramsar site, Rufiji- Mafia - Kilwa Ramsar site. A large part of this area comprise of mangrove forests covering an estimated area of 550 km², as well as extensive intertidal flats and sandbars (Figure 12-21). The Rufiji drainage basin forms a delta and covers about 20% of mainland Tanzania.

According to Information Sheet on Ramsar Wetlands (RIS), “The Ramsar Site comprises a variety of coastal and marine habitats made up of four significant features. The Rufiji Delta formed by the outflow of Rufiji River; the Mafia Island about 25 km off-shore and surrounding smaller islands, sandbars and coral reefs; the Songo-Songo Archipelago to the south; and the deeper waters in between i.e. the Mafia Channel and the water between Mafia and Songo-Songo Archipelago.” Within the Ramsar Site, various economic activities are taking place including fishing and extraction of other coastal and mangrove resources. Also cultivation especially rice, seaweed farming and tourism are the major activities.

The proposed transmission line will not pass through the Rufiji- Mafia - Kilwa Ramsar site. The closest distance between the border of the Ramsar Site and the proposed transmission line is approximately 800m.

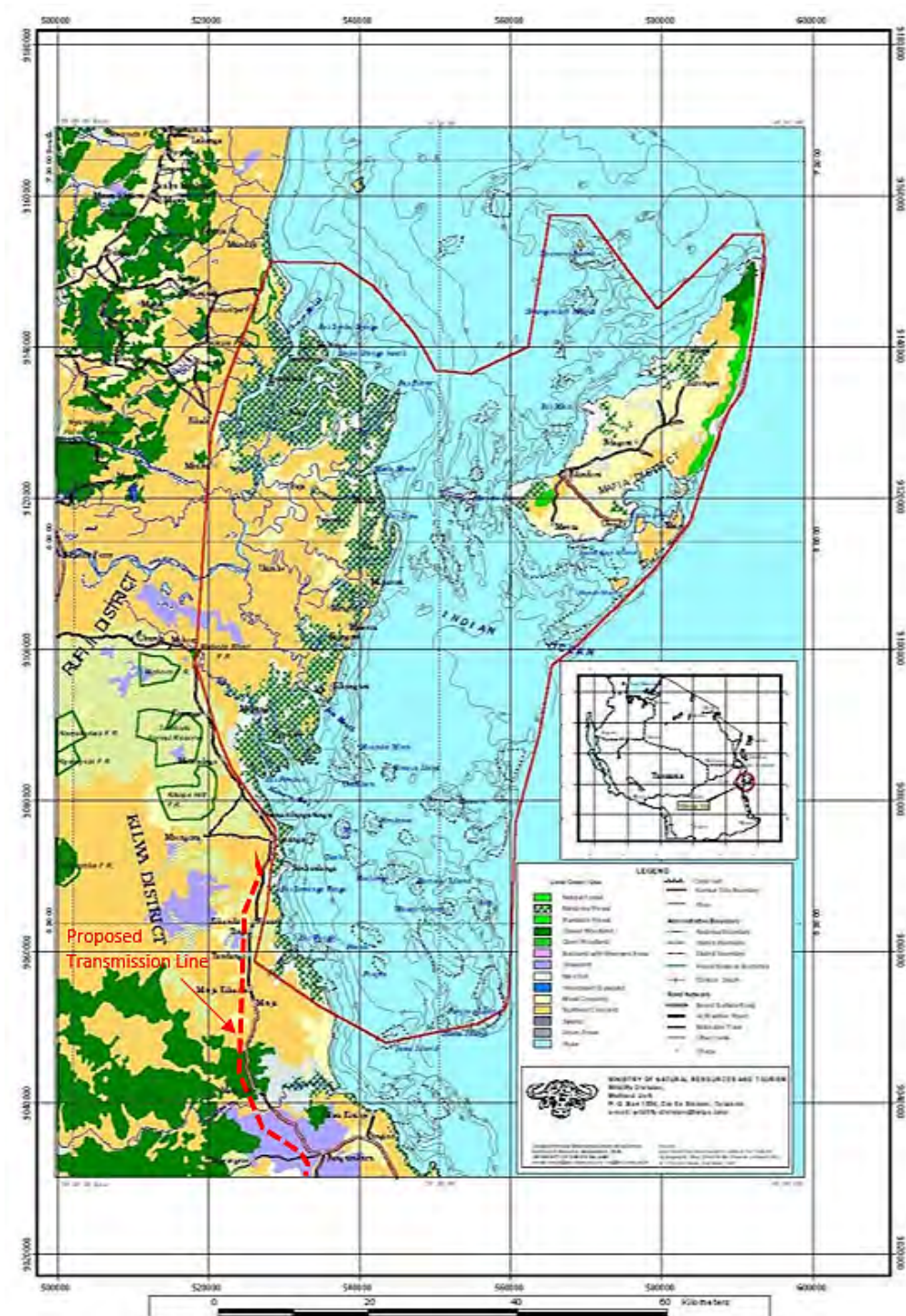
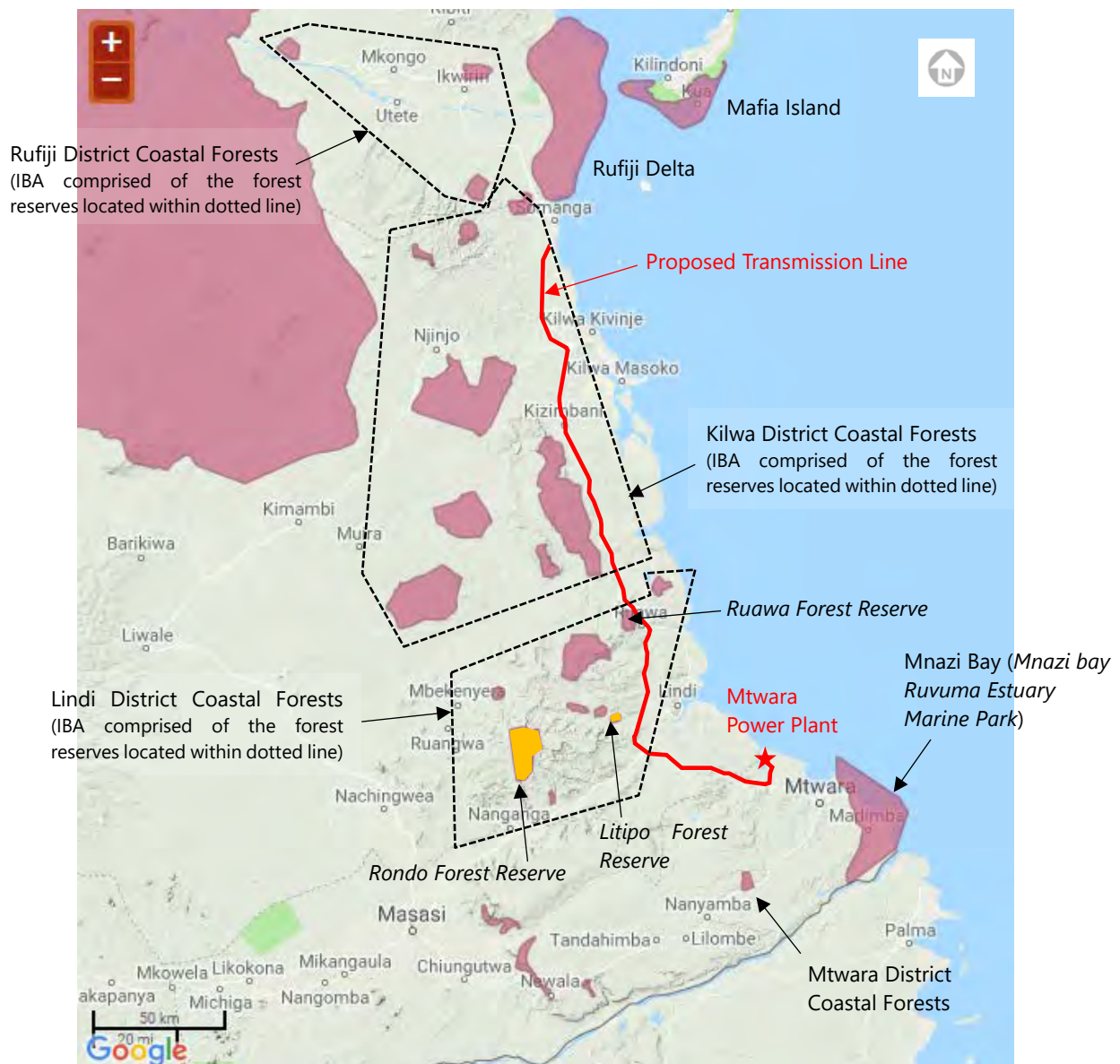


Figure 12-21 Rufiji-Mafia-Kilwa Ramsar Site

3) Sensitive areas and Sudi Creek (Kisiwa Bay)

a) Important Bird Areas (IBAs) and Spotted Ground Thrush

Mtwara coast area especially the Mnazi bay Ruvuma Estuary Marine Park falls under A1 category for IBA in Tanzania as published by IBAs. This area provides habitats connection to the inland coastal forests for number of birds including migrating species from Europe and Asia. Various species of birds found in nearby coastal forests migrate into the mangrove forest found onshore where they feed. Also the birds feeding in these areas utilize the intertidal zones rich in crustacean and crabs. The closest IBA to the proposed transmission line is “Ruawa Forest Reserve” which is one of six forest reserves designated as IBAs in Lindi District and 3km away from the proposed transmission line.



Source: <https://www.ibat-alliance.org/ibat-conservation/mapviewer01213>

Figure 12-22 Location of the IBAs around the Project Area

Among key bird species identified in the IBAs near the Project Site, only one species, the Spotted Ground-thrush (*Geokichla guttata*) (EN), is a migratory bird (IUCN 2018). The Spotted Ground Thrush has breeding sites located in Litipo and Rondo Plateau Forest Reserves, which are both part of Lindi District Coastal Forests IBA (refer to yellow areas in Figure 12-22). Litipo Forest Reserve is approximately 7km, while Rondo Forest Reserve is approximately 34km from the proposed transmission line route.

To understand the current status of Spotted Ground-thrush around the project site, the following bird survey was conducted from 6th to 26th of December, 2018 at Litipo and Chitoa Forest Reserves in Lindi District Coastal Forests as shown below.

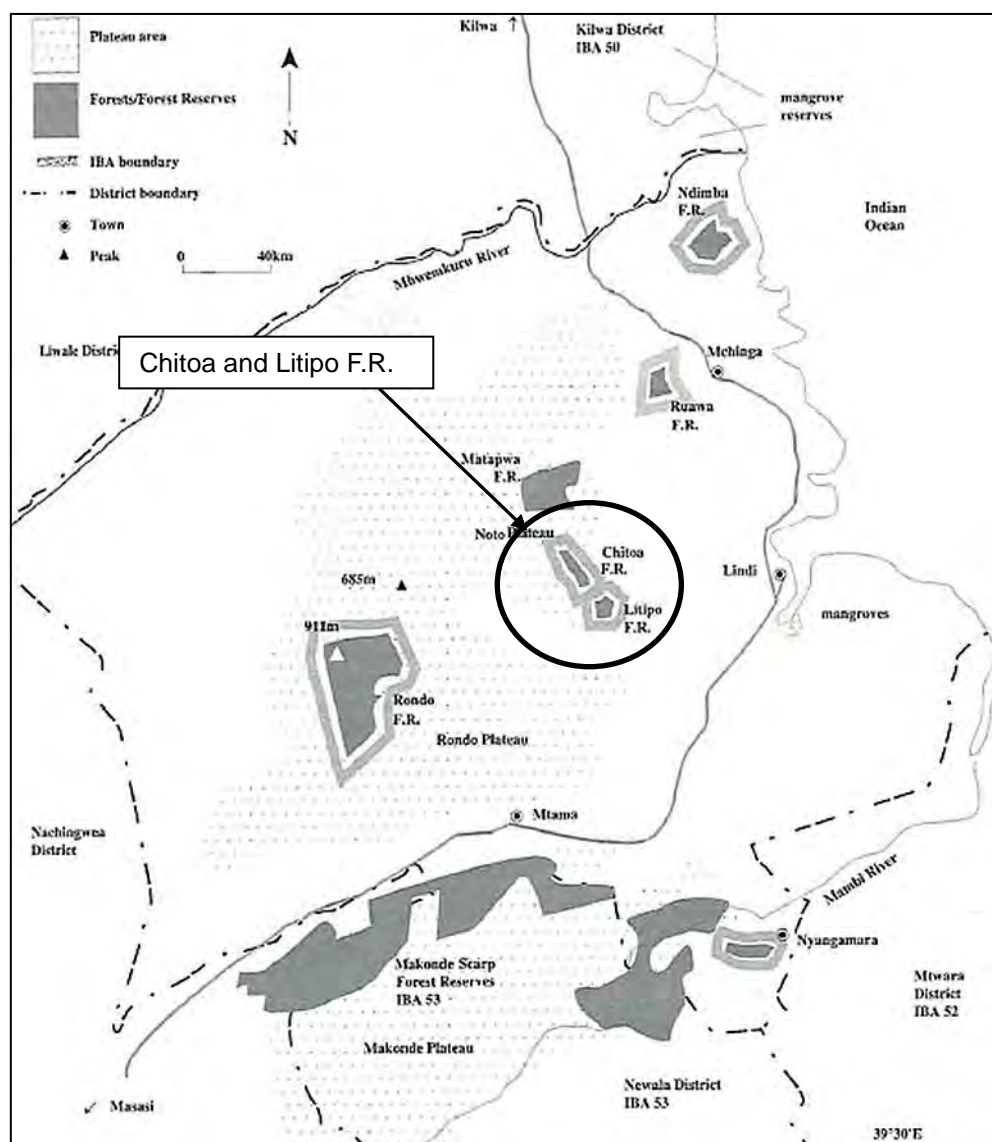


Figure 12-23 Lindi District Coastal Forests

Three methods of data collection were used

- Mist-netting: This method was used primarily to capture and register low height flying birds and other shy species that are difficult to record during the visual

observations. Mist nets of 8 × 2.5 m were used. During the day the nets are set to capture the birds and time for visiting were set after every 30 minutes. The birds that were caught in the net were identified, marked by cutting the tip of one or two of the tail-feathers to avoid recapturing of birds. The nets were removed at late evening and in the rare event of rainfall. c but other birds like sun birds and other low height flying birds were caught marked and released.

- Systematic observations on foot. The purpose of this activity is to supplement the data from the mist netting in order to determine which species are found in our study area. The observations were done using binoculars and field guide books the “Fields – list method” (1999) which is based on the “MacKinnon - list method” (Mackinnon & Phillipps 1993): The observer slowly walks along natural paths and tracks and write down all bird species seen and/or heard. Only species associated with the forest are listed. These observations were done within a specific study site of 1½-2 square kilometer in order to make the observations specifically associated with a particular area (vegetation). The following results of the birds list were obtained through mist netting and Systematic Observation from four different habitats and were put together in the same check list
- Collaborative discussion (Round table discussion). According to the villagers/ communities its shows that the targeted species (Spotted Ground-thrush) is observed in the area seasonally (breeding seasonal).

The following results of the birds list were obtained through mist netting and systematic observation.

Table 12-21 List of Bird Species identified in Litipo and Chita F.R.

Common Name	Scientific name	Conservation status	HABITATS			
			Lake	River	Forest	Agriculture
White browed coucal	Centropus superciliosus	LC	-	-	√	-
Common bulbul	Pycnonotus barbatus	LC	-	-	√	-
Paradise fly catcher	Terpsiphone	LC	-	-	-	√
Square tail drongo	Discurus ludwigii	LC	-	-	√	√
Green backed cameroptera	Cameroptera brachywa	LC	-	-	√	√
Violet backed starling	Cinnyricinclus leucogaster	LC	-	-	√	-
Sulphar breasted bush shrike	Chlorophoneus sulfureopectus	LC	-	-	√	-
Black crowned tchagra	Tchagra senegalus	LC	-	-	-	√
African fish eagle	Haliaeetus vocifer	LC	√	√	-	-
Lizard buzzard	Kaupifalco monogrammicus	LC	-	-	√	√
Striped kingfisher	Halcyon chelicuti	LC	-	-	-	√
Diederick couckoo	Chrysococcyx caprius	LC	-	√	-	-
Palm swift	Gypsiurus balasiensis	LC	-	-	-	√
Palm nut vulture	Gypohierax angolensis	LC	-	-	√	-
African harrier hawk	Polyboroides typus	LC	-	-	√	-
Ratling cisticola	Cisticola chiniana	LC	-	-	√	-
Hammer kop	Scopus umbretta	LC	√	√	-	√
Blue caped cordon blu	Uraeginthus cyanocephalus	LC	-	-	-	√
Fan tailed widow bird	Euplectes axillaris	LC	-	-	-	√
Collared sun bird	Hedydipna collaris	LC	√	√	√	-
Barn swallow	Hirundo rustica	LC	√	√	-	-

* LC : Least concern

b) Important feeding and nesting sites

The loggerhead turtle (*Caretta caretta*) is considered vulnerable while the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), and leatherback turtle (*Demochelys coriacea*) are all considered endangered by Frazier (1976) and Thiagarajan (1991). Information on sea turtles indicates that all five species of sea turtle found in the West Indian Ocean have been sighted in Tanzanian waters (Tanzania Coastal Management Partnership, 2004). These are the Green turtle, Hawksbill turtle, Olive Ridley turtle, Loggerhead turtle and Leatherback turtle. Two of the five species, Green and Hawksbill, are known to nest on the Tanzanian beaches. Quantitative nest data indicates that concentrated nesting activity occurs on Misali Island in Pemba, Mnemba Island in Unguja, Mafia Island in Juani Island and Kungwi, Madete and Mtwara in Msimbati and Litokoto and Kingumi Islands.

The Leatherback and Hawksbill are classified by the IUCN as Critically Endangered because of a population decline of over 80% in the past 50 years while the others are categorized as Endangered. These are listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2011), which prohibits international trade in the species on the list.

According to the marine survey conducted in May 2018, there are no turtle nesting sites in the vicinity of the project area. Based on a study about the status of turtles in Mnazi Bay (Muir, 2004), four turtle nesting sites have been observed within the MBREMP. The closest nesting site is approximately 30km away from the power plant site (refer to northwest nesting site in Figure 12-24).

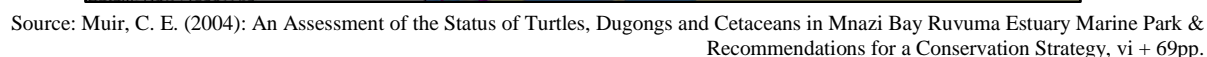
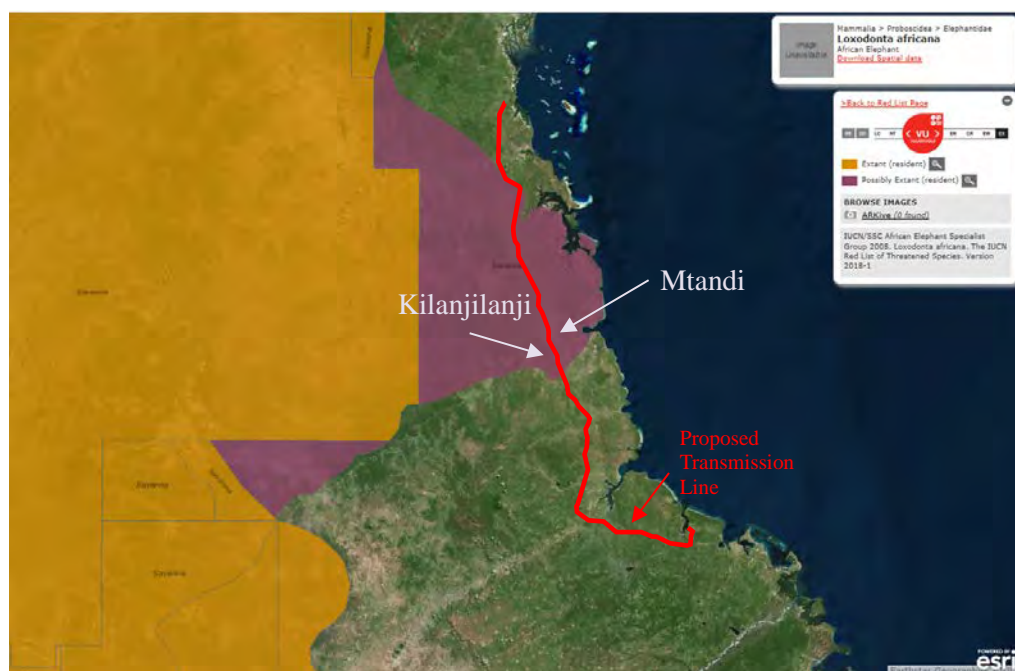


Figure 12-24 Turtle Nesting Sites in Mnazi Bay

The African elephant (*Loxodonta Africana*) is regarded as an important animal in Tanzania. This species is considered Vulnerable based on the IUCN Red List of Threatened Species (2018).

The proposed transmission line will pass through an area in Kilwa District, where African elephants are possibly present (“possibly extant”). And this corridor is still active with the latest occurrence in 2018. According to consultations with local people, the elephant corridor between Kilanjilangi village and Mtandi is the only known wildlife corridor in the Study Area. During field survey, no signs of elephant movement was recorded. Increasing human population in the coastal villages is said to have contributed to this.



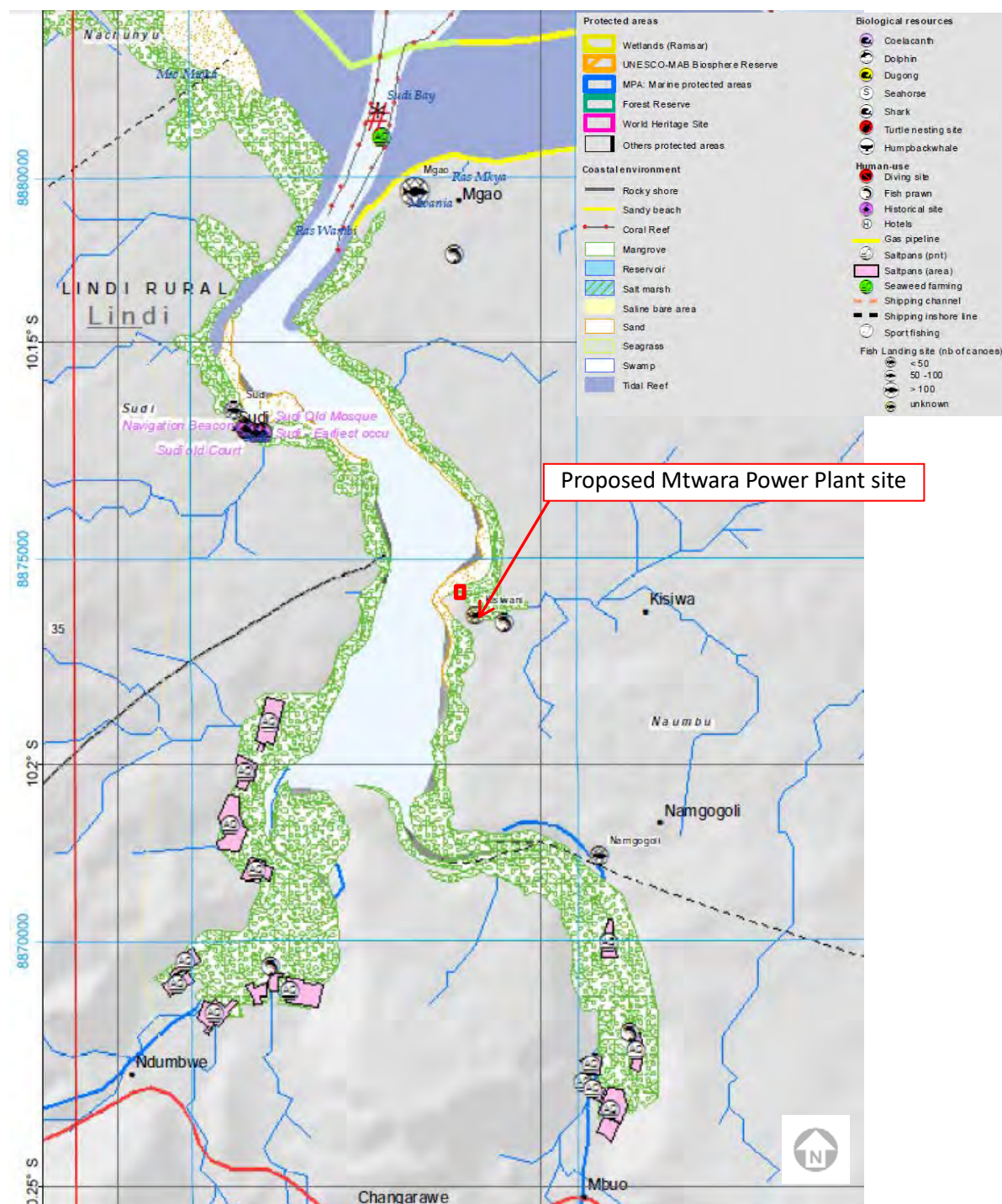
Source: IUCN Red List 2018

Figure 12-25 Extant Areas for African Elephants

d) Sudi Creek (Kisiwa Bay)

The Proposed power plant will be constructed along Sudi Creek (Kisiwa Bay) and plans to use the sea water for cooling. As shown in Figure 12-26, Sudi Creek (Kisiwa Bay) is surrounded by Mangrove and not a habitat for dugong nor turtles. According to the field survey, some corals and sea grass are found at the mouth of Sudi Creek (Kisiwa Bay) where sandy beach is used for landing site and fish market by fishermen. Due to the closed environment, the water quality of Sudi Creek (Kisiwa Bay) is affected by the run-off of organic matters from the surrounding areas, and turbidity is higher than the Indian Ocean outside the creek. There is only one fish market at Mgao village around Sudi Creek and fishermen bring relatively big fish of market value to the place for deals with business persons from the town. The market place is a simple structure without walls. Villagers around Sudi Creek catch relatively small fish mainly for self-consumption and the catch seems to be not so much. Since there is no official catch records, the amount is unknown.

According to IRA, there has been no academic scientific research on ecosystem of Sudi Creek and there is no existing inventory of fauna living in Sudi Creek.



Note: Green dotted area is mangrove vegetation. No sea weed bed is located in the creek. Distribution of coral outside the creek will be confirmed in the further study.

Source: Tanzania Sensitivity Atlas, Institute of Marine Sciences of University of Dar es Salaam, Samaki Consultants Ltd., Obscom Paris, 2015)

Figure 12-26 Coral and Sea Weed Location around Kisiwa Site

4) Flora

a) Marine and coastal vegetation

Sea weed beds: In Tanzania, seagrass beds are widely distributed from high intertidal to shallow subtidal areas including along the shoreline in Lindi region and Mtwara region. They are found in sheltered areas of the coast around Kilwa, Rufiji, Ruvu and Moa. Seagrass beds are highly productive and serve many ecological functions. These include providing breeding, nursery, and feeding areas for many invertebrate and vertebrate species including commercially important species of finfish and shellfish; and shelter and refuge for resident and transient adult animals. Seagrasses are an important food source for herbivorous invertebrates, fish, dugong, and green turtles. Additional ecological functions of seagrass include the trapping of sediments, which reduces sedimentation over coral reefs and therefore protects shorelines, and the dissipation of wave energy, which also provides protection to the beaches. Major threats to the survival of seagrass beds come from excessive sedimentation of coastal waters resulting from the different human activities; from increased turbidity, which tends to cut down the light penetration; and from inshore prawn trawling and seine nets, which destroy seagrass beds.

Mangrove: Mangrove forests (Mikoko) are found along the intertidal mud flats in Sudi Creek (Kisiwa Bay). They provide habitats for fish, invertebrates-crabs, epiphytic plants, rare species of birds and insects. A total of 5 species of mangrove *Rhizophora mucronata*, *Sonneratia alba*, *Ceriops tagal*, *Brugiera gymnorhiza* and *Avicennia marina* are often seen in the region. Mangroves provide shelter for different species and nursery and spawning ground for fish and prawns (shrimps); and roosting sites for migratory birds. Mangroves are also important in the protection and stabilisation of shorelines and riverbanks as well as in the enhancement of coastal water quality. Additionally, mangroves export nutrients and organic matter to adjacent ecosystems. Villagers catch the small fish along the Mangrove belt by using fishing net. There are no mangrove forests within the proposed power plant site. However, a small portion of mangrove forest along Sudi Creek (Kisiwa Bay) may have to be cleared to give way to the power plant's water discharge pipeline (refer to red frame in Figure 12-26).

Consultation with TFS was necessary as a stakeholder with regards to forest and forest related products in this case mangrove forest. Therefore, during the EIA process consultation with TFS-mangrove Unit and Fishery Unit in Mtwara was done and they had the following views and comments: They both pointed out the importance of marine organisms as one of the potential biodiversity resources. The TFS regional manager pointed out that within the area proposed for development the only forest resource likely to be affected was mangrove. Also he clarified on the procedures to be followed before implementing the project that would affect forest resources. The manager insisted that if the proposed development project will clear mangroves, compensation should be paid to TFS as stipulated in the GN. 255, of THE FOREST (AMENDMENTS) REGULATIONS, 2017. The regulation states that for forest resources likely to be cleared and compensated, TFS will carry out inventory to quantify the amount to be lost and cost to be paid.

b) Terrestrial vegetation

Coastal forests: Coastal forest are predominantly located on the coastal plain including Mtwara region and Lindi region and are commonly found on hills and plateaus in land several km away from the sea. Coastal Forests are characterized by a mosaic of habitats including closed canopy forests, savannah woodlands, thickets and bush lands which together form a complex mixture of land cover types. They are found from sea level to a maximum of 1,100 m altitude depending on ecological conditions but do not include

mangroves. Most Coastal Forests in Tanzania are in Forest Reserves gazetted during the colonial period although a number of sites are currently unreserved; some have been degazetted in the past and others have never been officially gazetted. These forests support many endemic genera and species of plants and animals. They include bird species of global conservation significance, rare mammals, reptiles, amphibians and invertebrates. In Mtwara region these forest are found on Makonde plateau forest reserve, Kambona forest reserve and Mkunya River forest reserve. These are the forest reserves managed by the central government.

Peri-urban areas: Most of the natural vegetation found in per-urban areas in Mtwara compose Miombo vegetation and coastal shrubs.

Cashew nut -Coconut vegetation: This vegetation type is characterised by a land which its natural vegetation have been cleared being replaced with agricultural crops and settlements. This vegetation type extends from raised plateaus to low laying area with well drained soils. The characteristics species include Cashew nut (*Anacardium occidentale*), Coconut trees (*Cocos nucifera*), cassava field (*Manihot esculenta*) and Mango (*Mangifera indica*). The project activities will affect this vegetation type especially the substation site, transmission, establishing access road and gas pipeline to the plant and other auxiliary activities of the project.

5) Fauna

a) Marine and aquatic fauna

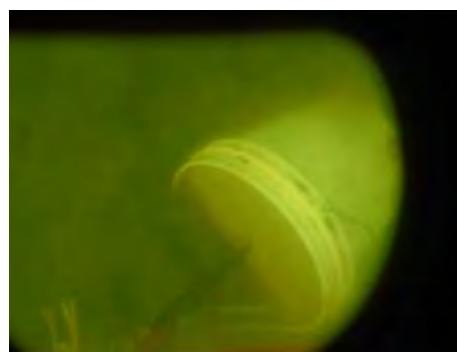
Corals: Due to the narrowness of the continental shelf of most of Tanzania, coral reefs are typically situated close to land. Coral reefs are common along much of the Tanzanian coastline, and well-developed barrier reefs occur along most of the ocean-facing eastern coastline of the islands. There are also extensive coral reefs and coral outcrops on the leeward side of the islands, and these vary in species diversity. In Mtwara, coral reefs are a major feature in the inner part of Mikindani Bay and adjacent to Shangani waterfront. There are also extensive reefs located on the outer, open sea facing shore of the Msangamkuu Peninsula and the Pemba to the north. There are about 700 species of reef-associated corals world-wide, and 150 species of scleractian corals have been reported from Tanzanian reefs.

The sea bottom characteristics as revealed by underwater photographs taken at Kisiwa (inside Sudi Creek (Kisiwa Bay)) and Mgao (at the mouth of the creek) is summarized in Figure 12-27 and Figure 12-28. There was considerable difference between the sea bottom ecological environment at Kisiwa and sea bottom ecological environment at Mgao. The sea bottom at Kisiwa was generally devoid of visible living fauna/flora, while the sea bottom at Mgao was highly enriched with visible living marine fauna such as diversified species of corals and sea grass beds, sea urchins, bivalves, and others.

Coral reef is not found inside the Sudi Creek (Kisiwa Bay) but found at the mouth of the Sudi Creek (Kisiwa Bay) at Mgao as shown in Figure 12-27 and Figure 12-28.



Sea bottom dominated by fine sand, with no visible living fauna/flora



Sea bottom dominated by coarse sand, with no visible living fauna/flora

Figure 12-27 Representative Sea Bottom Photos taken at Kisiwa showing the Underwater Ecological Environment



Rocky sea bottom dominated by corals



Rocky sea bottom dominated by coral colony and fish

Figure 12-28 Representative Photos taken at Mgao showing the Underwater Ecological Environment

Invertebrates: Various marine invertebrates such as gastropods (branched murex [*Chicoreus ramosus*], tulip snails [*Fasciola trapezium*]; Bivalves (prickly pen shell [*Pinna muricatum*], giant clam [*Tridacna squamosa*]); Crustacea (crabs, lobster, and shrimps); Mollusca (squid, octopus, sea snails, and shellfish); Cnidaria (jellyfish, sea anemones, and corals); Echinodermata (sea stars, sea urchins and sea cucumbers) and other invertebrates are common along the sea waters of Mtwara coastal areas.

Marine vertebrates except fish: As a few incidences, turtles (Hawksbill turtle and Loggerhead turtle) have been observed around Msangamkuu, Mikindani, Mangowela, Pemba and Litingi sand beach area. These turtle species are cited as endangered and are protected by law in Tanzania. Hawksbill turtle is classified as Critically Endangered (CR), and Loggerhead turtle is classified as Vulnerable (VU) in IUCN Red List Category. Mtwara is a known nesting site and the main nesting season is during the northeast monsoon between December and April (Muir, 2005). Based on the results of the marine survey conducted in May 2018, there are no known turtle nesting sites in the vicinity of the project area.

Marine fish: Marine fishes that are potentially found inside and outside (near the mouth

of) Sudi Creek (Kisiwa Bay) are listed in Table 12-22 and Table 12-23, respectively. None of these species is considered to be endangered or threatened. Most of the species have a conservation status of least concern. The Bigeye tuna is the only species considered to be vulnerable. Table 12-22 will be updated during implementation stage.

Table 12-22 Marine Fish Species identified Inside Sudi Creek (Kisiwa Bay)

Family name	Species name	Local name	IUCN category
Scombridae	Bigeye tuna (<i>Thunnus obesus</i>)	Jodari macho	Vulnerable
Scombridae	Swordfish (<i>Xiphias gladius</i>)	Nduwaro	Least concern
Scombridae	Mackerel tuna (<i>Euthynus afinis</i>)	Sehewa	Least concern
Scombridae	Indian mackerel (<i>Rastrelliger kanagurta</i>)	Vibua	Data deficient
Serranidae	Peacock hind (<i>Cephalopholis argus</i>)	Chewa	Least concern
Siganidae	White-spotted spinefoot (<i>Siganus canaliculatus</i>)	Tasi	Least concern
Sphyraenidae	Barracuda (<i>Sphyraena obtusata</i>)	Msusa, Mzia	Not evaluated

Source: IRA

Table 12-23 Marine Fish Species identified Outside Sudi Creek (Kisiwa Bay)

Family name	Species name	Local name	IUCN category
Siganidae	White-spotted spinefoot (<i>Siganus canaliculatus</i>)	Tasi	Least concern
Lutjanidae	Black and White snapper (<i>Macolor macularis</i>)	Changu	Least concern
Mullidae	Freckled goatfish (<i>Upeneus Tragula</i>)	Mkundaji	Least concern
Lethrinidae	Black-blotch emperor (<i>Lethrinus harak</i>)	Changudoa	Least concern
Mugilidae	Bluetail mullet (<i>Valamugil bichanani</i>)	Mkizi	Least concern
Serranidae	Peacock hind (<i>Cephalopholis argus</i>)	Chewa	Least concern
Octopidae	Lanket octopus (<i>Octopus chromotus</i>)	Pweza	Least concern
Sphyraenidae	Obtusa barracuda (<i>Sphyraena obtusata</i>)	Mzia	Not evaluated
Scombridae	Indian mackerel (<i>Rastrelliger kanagurta</i>)	vibua	Data deficient
Casionidae	Yellowback fusilier (<i>Caesio xanthanata</i>)	Mbono	Least concern
Loliginidae	Indian squid (<i>Uroleuthis duvaucelli</i>)	Ngisi	Not evaluated

Source: IRA

b) Terrestrial fauna

The most common and widely distributed large mammal species in the peri-urban include the velvet monkey (IUCN Red list category: LC), African civet (LC), squirrel, wild rat, elephant-shrew (LC), dik dik (LC), rabbit, hyena (LC) and varieties of reptiles and amphibians. Around Mikindani site, African fish eagle (*Haliaeetus vocifer*) is observed, according to the local villager. African fish eagle is classified as LC in IUCN RED list category.

(3) Socio-economic Profile

1) Demographic profile

a) Population

Mtwara Municipal Council: According to 2012 National Population Census, Mtwara Municipal Council has total population of 108,299 of which Males are 51,062 and Females are 57,237 with average growth rate of 1.2 compared to average growth rate of 1.7 in 2002 national census. Statistics show that there is an increase in the municipality population. For example, within a period of 34 year, the population increases about 49%.

Mtwara District Council: Mtwara District has a population of 127,623 of which 67,214 are females and 60,409 are males with a growth rate of 1.4. The dominant ethnic group in the District is the Makonde. The district has 41,596 households with an average of 4 people per household (Population Census 2012). The social economic survey for the Mtwara Master Plan that was conducted in May 2016 revealed that the household size within the planning area ranged between 3 and 6 people.

Population size, distribution and household size: The population is an important resource for development; at the time the growth of population increases demands for food, water, energy and other natural resources. Moreover, the growth and distribution of population determines the demand for essential social services, such as education, health, water, transport and housing. Table 12-24 shows the population distribution in the project area of the power plant in relation to the nation, Mtwara region and the district population. The district had an average household size of 3.9 persons. The average household size was slightly higher than the regional and lower than the national average household size which stood at 3.7 and 4.8 respectively.

Table 12-24 Population Distribution in Mtwara Region and the Project Area

Location	Population					HH	
	Male	Female	Total population	Sex ratio	Inter-censual growth rate	Number of Households	Average household size
Tanzania	21,869,990	23,058,933	44,928,923	95	2.7	9,276,997	4.8
Mtwara Region	599,648	671,206	1,270,854	89	1.2	344,834	3.7
Mtwara District	107,922	120,081	228,003	90	1.2	-	3.9
Naumbu Ward	4,662	5,083	9,745	92	-	-	3.9-
Kisiwa village	540	628	1168	86	-	325	-
Namgogoli village	998	1045	2043	96	-	523	-

Source: 2012 Tanzania Population and Housing Census, Village office data, 2018

The population distribution along the 400kV Transmission line route is summarized in Table 12-25.

Table 12-25 Population Distribution along the 400kV Transmission Line Route

No.	District Name	Ward Name	Village Name	Male	Female	Total
1	Mtwara	Naumbu	Namgogoli	1017	1026	2043
2	Mtwara	Ndumbwe	Mbuo	1538	1825	3363
3	Mtwara	Ndumbwe	Changarawe	306	430	736
4	Mtwara	Ndumbwe	Ndumbwe	1405	2285	3690
5	Mtwara	Mpapura	Mpapura	952	1573	2525
6	Lindi Rural	Sudi	Mtegu	595	668	1263
7	Lindi Rural	Sudi	Madangwa	985	1200	2185
8	Lindi rural	Sudi	Pangatena	514	711	1225
9	Lindi Rural	Sudi	Njonjo	443	564	1007
10	Lindi Rural	Sudi	Hingawili	1408	1442	2850
11	Lindi Rural	Mnolela	Zingatia	1400	1800	3200
12	Lindi Rural	Mnolela	Mnolela	1681	1185	2866
13	Lindi Rural	Mnolela	Ruhokwe	1343	1562	2905
14	Lindi Rural	Mnolela	Namunda	980	1068	2048
15	Lindi Rural	Kiwalala	Mahumbika	1129	2989	4118
16	Lindi Urban	Mingoyo	Ruaha	659	746	1405
17	Lindi Urban	Ngapa	Ng'apang'apa	299	320	619
18	Lindi Urban	Chikonji	Chikonji kaskazini	1829	1952	3781
19	Lindi Urban	Chikonji	Chikonji kusini			
20	Lindi Rural	Matimba	Likwaya	301	349	650
21	Lindi Rural	Matimba	Moka	540	727	1267
22	Lindi Rural	Kilangala	Mtumbikile	1233	908	2141
23	Lindi Rural	Kilangala	Kilangala A	1311	1321	2632
24	Lindi Rural	Kilangala	Kilangala B	1818	2254	4071
25	Lindi Rural	Kilangala	Mnimbila	737	963	1700
26	Lindi Rural	Kitomanga	Kitomanga	1196	1223	2419
27	Lindi Rural	Kitomanga	Mkwajuni	1142	1158	2300
28	Kilwa	Mtandi	Mbwemkuru	850	1144	1994
29	Kilwa	Mtandi	Kiranjeranje	1587	1826	3413
30	Kilwa	Mtandi	Mtandi	516	653	1169
31	Kilwa	Mtandi	Mirumba	682	821	1503
32	Kilwa	Mandawa	Mandawa	3000	2600	5600
33	Kilwa	Mandawa	Hoteli Tatu	783	923	1706
34	Kilwa	Mandawa	Kiwawa	989	1040	2029
35	Kilwa	Mandawa	Mavuji	1200	2200	3400
36	Kilwa	Kivinje Singino	Nangurukuru	2211	2509	4720
37	Kilwa	Kivinje Singino	Matandu	3008	2549	5557
38	Kilwa	Miteja	Miteja	1323	1315	2638
39	Kilwa	Tingi	Mtandango	750	871	1621
40	Kilwa	Tingi	Tingi	2035	4048	6083
41	Kilwa	Tingi	Njianne	3170	3150	6320
42	Kilwa	Kinjumbi	Somanga Kusini	810	885	1,670
TOTAL				49,675	58,783	106,763

Source: NBS, 2012 and Village government offices, 2018

b) Population migration

Mtwara Municipality like other urban areas in Tanzania, its population growth is influenced positively by natural births and immigration and negatively by deaths and emigrations. People tend to flow in the Municipality in search of a better life in different economic activities like commercial activities, industrial development sector (*e.g.* cement factory, oil and gas exploration), construction activities and agricultural and fishing sector. The Municipality attracts many people from rural areas in search of better life mainly through better employment opportunities in different economic sector taking place in the municipality. People also flow out of the municipality for the same reasons hence affecting population size, age and sex composition. The later phenomena also affect the working/productive group within the municipality due to loss of manpower needed in economic production. (Mtwara Environmental Profile, 2013).

c) Population Projections

The population of Mtwara Municipality is expected to be 143,576 people by the year 2017 and 192,954 in 2027. This projection has been calculated based on the 3% growth rate on the assumption that Mtwara Municipality is poised to grow fast given its potentiality in the natural gas and oil industry, Mtwara Development Corridor and other socioeconomic development and urbanization.

2) Ethnic composition

Tanzania has a multi-ethnic population with more than 125 different ethnic communities. Four of these, the Hadzabe, the Akie, the Maasai and the Barabaig, identify themselves as indigenous peoples. The concept of indigenous peoples is not acknowledged in Tanzania but the government recognizes the vulnerability of some of the marginalized communities³. In early 2012, a Draft Indigenous Peoples Policy Framework was issued by the government's Social Action Fund (TASAF). This document specifically mentions the Hadzabe and the Barabaig. The majority of the indigenous peoples live in northern Tanzania, in the Arusha and Manyara regions.

In Mtwara Region, the most dominant group is the Makonde, which made 60% of the population, followed by the Makua and the Yao⁴ and there is no indigenous group.

a) Mtwara power plant

According to the focus Group discussion with elders in Kisiwa and Namgogoli villages Village, the original inhabitants in the villages were the Makonde, however, currently; there is a significant rate of migrants who are attracted by fishing activities and availability of land for agriculture and pasture. In this case, there are other groups such as the Makua, Yao, Wamwera and few Sukuma who are agro-pastoralists. In terms of religion, the majority of the population is made up of mainly Muslims, with a small proportion of the population of other religion.

b) Transmission line

The ethnic composition along the proposed power transmission line is dominated by the Makonde, Makua, Yao and Mwela, According the discussion with the district and village leaders, there is a significant number of Makonde people in Mtwara rural district as

3 Country Technical Notes on Indigenous Peoples' Issues: The United Republic of Tanzania, International Fund for Agricultural Development (IFAD), 2012.

4 Mtwara Region Socio-Economic Profile, Mtwara Regional Commissioner's Office

compared to other districts. In terms of religion, it was observed that the majority of the population is made up of mainly Muslims, with a small proportion of the population still practicing traditional African religions.

3) Economic activities

a) Economic activities nearby the project area

Detail economic activities nearby the project area will be studied in the further study. It is briefly described in the alternative analysis section.

Agriculture: Agriculture is the predominant economic sector in Mtwara District. About 90 per cent of the agricultural output is by small holder farmers. 7 per cent of the total population involving in fishing activities, 2 percent in business and 1 percent are employed. The district depends on farming as the main source of income, of which contributes about 75% of the total income. Mtwara district has a total of 358,700 hectares of land, 250,000 hectares arable land; this is 69.5% of the total land. Land under cultivation is 184,385 this is 73% of the total arable land or 51% of the total land. Land under people's settlement is 5,000 hectares, under water is 1,800 hectares and under forest reserve is 55,465 hectares. Potential land for livestock is 16,651 hectares. 160,000 people out of the district population are provided as farm labor.

Food crops grown include: Cassava, Sorghum, Paddy, Maize, Sweet potatoes and legumes. Cash crops include: Cashew nuts, sesame, coconuts and groundnuts. At present yield of all crops in the district are very low compared to National yield index, the challenge therefore is to increase the yield of crops productivity and consequently raise the living standard of the people in the district. The district needs to be self sufficient in food to feed the population of over 200,000 people, at present the district always has food deficit and always becomes food aids recipients from the National reserve.

The Mtwara Municipal Council has a total of 9,000 hectares of arable land favorable for agriculture which is equal to 55.2% of the whole area of council. Among the 9,000 hectares only 6,757 hectares is used for agriculture. The most important livelihood activity for smallholder households in the Municipality is seasonal crop farming, off-farm income and permanent crop farming and about 33% of the total populations are engaged in agriculture and other related activities. Normally agricultural and forestry activities are practiced at subsistence level and there are no enough surpluses from those activities.

b) Fisheries

Mtwara Region: The Mtwara Region is one of Tanzania's coastal regions with a long (ca.130 km) coastline with a number of fisheries opportunities including tuna, swordfish, sea trout, octopus, and squid. Currently, the region has about 5,459 registered fishermen involved in artisanal fisheries using simple fishing gear and equipment, thus being able to reach not more than 2.0 km off shore.

The marine fisheries contribute 97% of the revenue collected from the fishing sector, while fresh water contributes only 3%. The type of gear and equipment used in fishing in Mtwara Region is poor including dug-out canoes, dhows, motorized boats, fish nets and hooks. Apart from fishing in the Indian Ocean, fishing is also undertaken in rivers (Ruvuma and Lukuledi) and in ponds (in Chidya na Kitele). The region has a total of 46 fish ponds in various districts. Also there are crab fattening and seaweed farming (of Pearl oysters).

Table 12-26 Fisheries Yield Trends in the Mtwara Region

Year	2009	2010	2011	2012	2013
Approximate Weight (tons)	60.45	64.3	64.6	58.0	48.5
Revenue (TZS)	168,808,741	182,109,670	83,298,350	204,255,645	172,106,140

Source: Mtwara Regional Secretariat

Beach Management Unit in Mtwara: For management purposes, there are a total of 34 Beach Management Units (BMUs) in Mtwara Region, most of which are in Mtwara Mikindani. The main challenges facing the fishing industry are associated with human population growth, increased dynamite fishing, overexploitation, and overuse of coastal and marine resources e.g. mangrove cutting, coral mining, dynamite fishing, and construction along the coast.

Mtwara Municipal Council: The Mtwara-Mikindani Municipal Council has a small coastal strip of 25km, though most of its fish products comes from Mtwara Rural, Lindi, Kilwa and neighbouring Mozambique. The average annual fish production is 385 metric tones recorded at Shangani fish landing sites. According to 2008 survey, the municipality has total of 600 fishermen and 350 vessels mostly bearing larger sailboats (*dhow*s) and dugout canoes (*mitumbwi*) which carry 1-2 fishermen.

The fishermen in the municipality are divided into three groups; fishermen owning fleet of boats with engines on board, well equipped fishing gear and employ hired labour. This group can reach up to deeper waters of the ocean. The second group is average fishermen owning poor resources such as small boat, seine net, trawling and small mesh nets and mostly fish in the shallow water and can only stakeout for a single night. The 3rd groups of fishermen are poor fishermen carry out their fishing activities in shallow water near the shorelines for their livelihood and family consumption only.

Mtwara District Council: In Mtwara District council, fishing is done on a 125 km coastal strip and along the Ruvuma River using poor equipment and dynamite. The fishing industry in the district is faced with the shortage of modern fishing gear. Discussion with Mtwara District Fishery officer, acknowledged that there is no official fish catch data by BMU nor by type of fish, but fish catch decreases due to environmental factors such as climate change and population increase which increases more fishers in the area, and illegal fishing gears. According to the Mtwara Master Plan (Ministry of Lands, Housing and Human Settlements Development), the average price of fish ranges between 2,062 TZS and 2,500 TZS fish per kilogram with the peak season for fishing being between March and June, thus July to February can be viewed as the off-peak season for fishing.

Village Level (Project Site): The Project Site extends to the seashore. Only a little area of the site faces the seashore line like the nose. The nose area is being utilized as the mooring point of fishing boats. Consultation with fishermen in Kisiwa village at the fishing landing site revealed that the existing fishing land site is currently being used by two villages – Kisiwa and Naumbu kusini. The fishing land site is currently used by a total of 61 fishermen who have a total of about 244 dependents of which 52 are spouses and 192 are children.

Livestock keeping: In the Mtwara District, livestock keeping is very low, resulting into adverse effects on the status of the people. One person consumes less than a liter of milk and less than a kilo of meat and 1¼ egg per year. The estimated livestock population amounts to 2,770 million cattle, 2,080 sheep and 250,000 poultry. At present yield of all Livestock production in the district are very low compared to National index.

Salt production: Salt is also recovered from evaporation of seawater collected in salt pans located along the coast, adjacent to mangrove forests. Salt mining and illegal live coral mining has resulted into dramatic decrease in mangrove forests, destruction of coral reefs and marine environments in late 1990'.

Coastal tourism: There are several tourist destinations within and outside Mtwara town. As follows:

The Mikindani Old Town which consists of old colonial building such as Dr. Living, Stones' house, Slave market, Old Prison and Boma (old German fort), Indian Ocean for surfing, sea safari's and scuba diving as well as beach activities, Naliendele War Hero Cemetary with past revolutionary history (the remaining of war hero soldiers fought in the Mozambique civil war against independence), Community and Village forest reserve such as Mkundi forest, Namayanga forest, The Mtwara port including Yatch club, the old port at Mikindani and airport facilities, Other potential attractive sites for ecotourism include wetlands and streams such as Mtawanya and Mchuchu. Sacred places such as old cemetery and community forest are considered secrets places but could have been used as a tourist attraction sites. Also Tourism is found in Msimbati where there is an 18km beach, and one beach camp.

c) Economic activities of the interviewed PAPs (Power Plant)

Occupation: The major and dominant economic activity throughout the project area is agriculture accounting for 85.5% of the sampled population. Although fishing is common activity along the coast in Kisiwa and Namgogoli villages few people are engaged as shown below.

Table 12-27 Population Distribution by Primary Occupation

Occupation	Primary occupation		Secondary occupation	
	Number	Percent	Number	Percent
Farmer	129	85.5	9	17.3
livestock keeper	1	0.8	5	9.6
Petty trader	9	5.9	30	57.7
Casual labour	9	5.9	7	13.5
fisherman	3	1.9	1	1.9
Total	151	100.0	52	100.0

Source: JICA Study Team, 2018

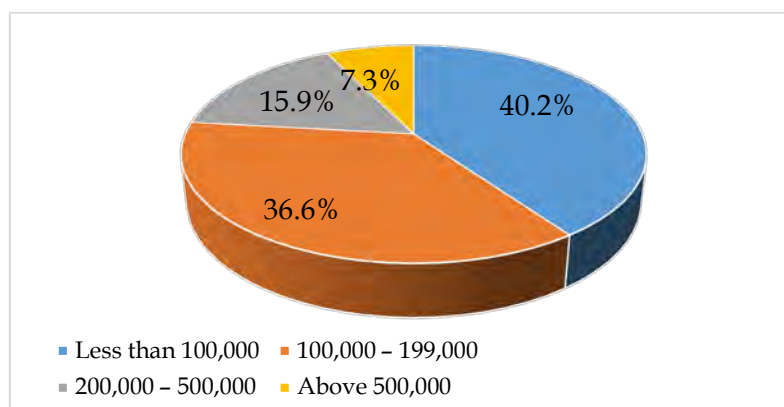
Table 12-28 Primary Occupation in relation to Household Head

	Number of household head	Percent
Farmer	29	80.6
Livestock keeper	0	0
Petty trader	1	2.8
Casual labourer	3	8.3
Fisherman	3	8.3
Total	36	100.0

Source: JICA Study Team, 2018

The involvement of high proportion of potentially affected people in farming activities means that significant adverse impact on farming activities and farm lands will have far reaching adverse social and economic consequences not only for the population of the affected communities, but also for the surrounding communities.

Source and average monthly income: The annual income of selected respondents in the Study area is shown in the Figure below.



Source: JICA Study Team, 2018

Figure 12-29 Percent Distribution of Average Household Annual Income

Figure 12-29 shows that a significant number of the household's members (40.2 percent) earn less than Tsh 100,000 per month. 36.6% of the members earn between Tsh 100,000 - 199,000 per month. Some 15.9 percent of the surveyed population earn between Tsh 200,000-500,000 per month. Only 15.6 percent reported to earn more than Tsh 500,000 per month. The income profile is characterized by low-income earners. This is not surprising because the majority of those interviewed are engaged in subsistence agriculture and fishing activities with limited agricultural inputs which lead to low production of crops.

Ownership of livestock: The assessment of ownership of livestock as shown in Table 12-29, show that livestock keeping is taking place in the two affected villages. Since a significant number of people will be affected by loss of agricultural land, therefore, there is a need to encourage and raise awareness to the local people to engage on other alternative means of livelihood such as livestock keeping rather than depending of farming activities alone.

Table 12-29 Ownership of Other Assets (Livestock)

Cow	Goats	Sheep	Chicken	Pig	Dog	Cats
06	121	12	349	00	00	00

Source: JICA Study Team, 2018

d) Economic activities of the interviewed PAPs (Transmission Line)

Occupation: Data of socio-economic survey among adult population over working age shows that farming is the primary economic activity undertaken by a significant number of the heads of households 164 (86.8%). Other head of households were involved in petty trade 07 (3.7%), fishing (3.2%), livestock keeping (1.5%) and casual labourer (4.8%) as

shown in Table 12-30. The major food crops grown in the village are maize, paddy, sorghum, cassava, sweet potatoes and millets. Maize and paddy are the major staple food crops. Other food crops in the area include groundnuts, tomatoes, fruits and vegetables. The assessment of primary occupation to all household's members is shown in Table 12-31.

Table 12-30 Population Distribution of Head of Households by Primary Occupation

Primary occupation	Number	Percent
Farmer	164	86.8
Livestock keeper	03	1.5
Petty trader	07	3.7
Casual labourer	09	4.8
Fisherman	06	3.2
TOTAL	189	100.0

Source: JICA Study Team, 2018

Table 12-31 Population Distribution of Head of Households by Primary Occupation

District	Farmer	livestock keeper	Petty trader	Students	Casual labour	fisherman	Total
Mtwara Rural	63.6	0.4	4.2	27.6	3.3	1.1	100.0
Lindi Rural	60.6	0.0	4.0	33.2	1.8	0.0	100.0
Lindi urban	67.4	0.0	0	30.2	2.3	0.0	100.0
Kilwa	72.6	0.5	2.3	23.4	1.0	0.0	100.0
Total	68.5	0.3	3.5	25.4	2.1	0.3	100.0

Source: JICA Study Team, 2018

Source and average monthly income: The Study findings reveal that most (87.8%) of the households had sources of income while least (12.2%) had no source of income in the past year. For those who had sources of income, most of the respondents reported that their major (79.3%) source of income in the past year was agriculture. The average monthly income for the head of households is shown in Table 12-32.

Table 12-32 Head of Households' Average Monthly Income

Average monthly income	Number	Percent
Less than 100,000	61	40.5
101,000 - 200,000	39	25.8
201,000 - 300,000	28	18.6
301,000 - 400,000	12	7.9
401,000 - 500,000	7	4.6
Above 500,000	4	2.6
Total	151	100.0

Source: JICA Study Team, 2018

Ownership of Livestock: 41 percent of all households own both small and large livestock while only 13 percent of all households own large livestock.

Table 12-33 Ownership of Other Assets (Livestock)

Cow	Goats	Sheep	Chicken	Pig	Dog	Cats
12	167	09	746	01	05	01

Source: JICA Study Team, 2018

4) Education

a) Pre-Primary School Education

It is only in recent years that pre-primary school education has gained popularity. There were only 88 nursery schools in 2008 but by 2014 this had increased to 117 schools in Mtwara District. So that it is estimated more than 93% of eligible 5 to 6 years old attended pre-schools in 2014.

b) Primary Education

The Mtwara District Council has total of 127 primary schools with a total enrolment estimated at 46,519. Girls are 23,138 of the total enrolment, whereas boys are 23,381. Enrolment in primary schools stands at 92%, whereas, drop out and truancy rate stands at 38%. On the other hand, while pass rate at standard seven is estimated at 63%.

Table 12-34 Primary Education Ratios

Indicators	Current Situation	Objective/Target
Enrolment rate for school age children	94%	98%
Teacher pupil ratio	1:55	1:40
Classroom pupil ratio	1:64	1:40
School desks pupil ratio	1:4	1:2
Book pupil ratio	1:5	1:1
Toilet pupil ratio	1:53 for boys 1:50 for girls	1:25 1:20
Teacher quarter ratio	1:4	1:1

Source: Brief report of district development status, 2015

c) Secondary Education

The Mtwara District Council has a total of eleven (11) secondary schools which are owned by Government. The total student body in these schools stands at 5,561 with 2,396 boys and girls 3,165. Transition rate from primary to secondary school stands at 100%. But this does not mean that the facilities especially classrooms, Libraries, Laboratories and Hostels are enough, it just imply that, on one hand the available secondary schools can meet the demand or the pass rate at standard seven (The primary school grade is from Standard I to Standard VII in Tanzania). With these deficits of school infrastructures, the district is trying to solicit funds from different sources so as to close the gap of deficit. The table below indicates the status of education facilities in secondary schools within a district.

d) Adult Education

The Mtwara District Council has illiterate rate levels standing at 13%. In this regard, adult education is an area that the Council should give a due consideration. To reduce this level, the council plans to operate adult classes in every village in the council.

5) Health services and health profile

The district has a total number of 38 health facilities of which four (4) of them are health centers and thirty four (34) dispensaries that are owned and managed by both public and private institutions. However, health performance is adversely affected by limited funds. This has resulted into inadequate supply of drugs, materials, shortage of qualified and skilled personnel and poor incentive for the existing staff. The summary of the health facilities in the district is as follows. All government health facilities provide free services while private charge user fees for their services.

Table 12-35 Health Facilities by Operating Agency in Mtwara District

Facility Type	Government	Private	Total
Hospital	-	-	-
Health centres	3	1	4
Dispensaries	34	-	34
Grand Total	37	1	38

Source: Mtwara District Council Socio-economic Profile, 2011

According to records from Ligula Regional hospital, ten common diseases that majority of people suffer in Mtwara are Malaria, Acute Respiratory Infection, Upper Respiratory Infection, Acute Diarrhoea, Surgical disease, Pneumonia, Asthma, Urinary Tract Infection (UTI), Eye Infection and Intestinal worms. According to the household survey that was conducted for the Mtwara Master Plan, UTI was the most prevalent disease (33.7%) followed by typhoid (16.3%) , malaria and flue combined constitute 16% and Tuberculosis (TB) that accounted for 15.8% disease. The summary of health indicators in the Mtwara District is as follows.

Table 12-36 Health Indicators in the Mtwara District

Indicator	Mtwara District
Under 5 Mortality rate	231/1,000
Maternal Mortality Ratio (MMR)	192 deaths per 100,000 live births
Crude Death Rate (CDR)	21 deaths per 1,000 persons
HIV/Aids infection	5.1%
Malaria Infection	21%
Use of proper latrines	27%
Life expectance at birth for female	48 years
Life expectance at birth for male	47 years

Source: Mtwara District Council Socio-economic Profile

In view of the above, the Mtwara District Council aims at reducing under five mortality rate, improves vaccination coverage, increases number of health centres, dispensaries, building District Hospital, increases the supply of essential supplies and staff among other things.

6) Settlements and housing

Within the area covered by the Mtwara Master Plan, 3 house types were identified that comprised of normal houses (detached, semidetached, raw houses); apartments (block of flats and Apartment blocks) and others (Swahili and traditional houses). The Mtwara Master Plan area is largely characterized by single story buildings predominantly private residential houses. The predominant house types in central part of the Mtwara town are block of flats, building with contemporary as well as modern architecture. Housing density in many urban centres vary from the centre of Mtwara Municipality Central Business District (CBD) to the periphery suburbs of both Mtwara Municipality and Mtwara District. Linear houses spread along the major roads and sparsely nuclear housing population is common pattern in the Mtwara Master Plan area.

7) Vulnerable households/population

a) Mtwara Power Plant

These are people with special needs that would require special consideration and assistance from project implementers or community in general. They include the elderly, sick (HIV/AIDs afflicted persons), orphans, women with special needs (unmarried, widow, small-scale female) and farmers likely to suffer loss of land due to construction of Mtwara power plant, stations or terminals (whether owners, encroachers or tenants). These groups are being identified as particularly vulnerable so that special attention would be paid to them by identifying their needs from the baseline study. The household survey identified different categories of vulnerable people as shown in Table 12-37.

Table 12-37 Vulnerable Households/Population of Interviewed Households

Type of vulnerability	Number
Women headed household	04
Elderly	08
Disabled – physical	01
Total	13

Source: JICA Study Team, 2018

b) Mtwara-Somanga 400kV Transmission line and 400kV substations

The household survey identified different categories of vulnerable people as shown in Table 12-38.

Table 12-38 Vulnerable Households/Population

Type	HHs	
	Number	%
Women headed household	24	21.6
Elderly	59	53.2
Disabled - mental	04	3.6
Disabled - physical	13	11.7
Chronically ill	11	9.9
Total	111	100.0

Source: JICA Study Team, 2018

(4) Grave

In Mtwara Region, one antiquities site is listed by the Ministry of Natural Resources and Tourism (MNRT), which is Mikindani Historic Town. A town is situated along the protected bay in Mtwara region as shown in Figure 12-30. It is one of the Swahili historic towns that flourished between 15th and 19th centuries. It was a trade centre with internal links whereby traders were coming from as far as Zambia, Malawi, Angola and DRC. The town also experienced the influence of Europeans via the works of both missionaries and explorers. All these events resulted in growth and glorification of the town, for which the results are different architectural buildings. The buildings include Old Boma, the Agakhan House, the Gavoron's house, the bank house, Livingstone's house, old prison and the slave market⁵. The project site is located approximately 10km from this historical town, thus it is unlikely to affect landscape values of the heritage site.



Source: JICA Study Team using background map of Google Earth

Figure 12-30 Location of Mikindani Historical Town

⁵ Tanzania's Maritime and Underwater Cultural Heritage Assets: Strategies Towards Sustainable Conservation and Management, Ichumbaki, E. 2010.

Apart from the listed heritage site, cultural and historical sites at the village level are generally neither recognized nor recorded at the regional and/or central government levels. The official process recognized in Tanzania is to consult the Village Executive Officer or Village Chairperson to inquire about such information. There is no cultural and historical site in the two sites. According to the Kisiwa village chairman, the historical site in Kisiwa village is located north of the Kisiwa site.

Based on consultation with the Village Chairperson and random surface walkover archaeological surveys coupled with ethno-historical surveys, the followings were observed at the Thermal Power Plant project area:

- **Presence of a graveyard site in the project area:** The graveyard is crossed or rather bisected by the intake port channel. It also contains a ritualistic Baobab tree. Based on visible stone signs, one can estimate that there are approximately over 50 graves.

Based on random surface walkover archaeological surveys coupled with ethno-historical surveys, it was possible to identify the following issues along the 400kV transmission line project area:

- **Graveyards and/ or ritualistic sites in Mandawa and Mandangwa villages along the transmission line:** Some are isolated graves while others are concentrated graveyards for the community. Some are abandoned and others are in use. As elsewhere, the graveyards are used for ritualistic activities. Given sensitivity of graveyards to the villagers, these non-archaeological sites have high importance.
- **Archaeological sites in Mahumbika and Kitomanga villages:** The archaeological sites are mostly composed of potsherds. Based on the concentration of the materials, chronology and sensitivity of the people, it is suggested that these have low to high importance.
- **Archaeological site test pits (STPs):** There are 13 STPs found along the proposed transmission line route. Although these sites are not protected by law, these sites have the potential to contain archaeologically, historically and/or culturally important items. These sites will have to be considered when something has been discovered during construction stage.

(5) Road and transportation

1) Road transportation

The Mtwara-Masasi road is the only tarmac road which runs across the district. Bicycles are the major means of transport for local people. Boats also facilitate easy access to Mtwara town by coastal people. The Mtwara District Council has a total of 951 km of roads, out of these, only 36km are tarmac, 25 km gravel, 561 km are earth roads. The Mtwara Municipality is well connected with other places by three basic means of transport, namely Air transport, good tarmac road from Dar es Salaam (560 km) and water transport. The municipality has 202 km of road network (length), of which tarmac road covers 30 km, gravel roads cover 40 km and 123 km are earth road (feeder roads).

2) Marine transportation

There are few cases of local cargo ships/boats operating between Mtwara, Kilwa, Lindi, Dar es Salaam, Zanzibar while other cargo and fishing boats operates between Mtwara and neighboring Mozambique country. During harvesting season, about 4 to 6 cargo ships docks

in the Mtwara Port for transporting agricultural cash crops such as cashew nuts, pigeon peas and sesame to India and Bangladesh. Other foreign marine vessels are cargo ships bringing cargo/supplies to oil and gas companies operating within the Municipality.

Sudi Creek (Kisiwa Bay) is mainly being used by fishermen in the nearby villages. A few number of small handmade wooden fishing boats can be seen in the area. The landing area close to the project site is used as a main dock for these small boats. Since the landing area within Sudi Creek (Kisiwa Bay) will be acquired and used by TANESCO, fishermen will have to seek the use of other landing sites or fishing areas. With this, marine traffic in the area may be reduced significantly. It is highly unlikely that boats from outside use Sudi Creek (Kisiwa Bay) for fishing because the marine ecosystem is more thriving outside Sudi Creek (Kisiwa Bay).

3) Air transportation

The Mtwara Airport has 2,258 meters runway length capable of landing Boeing 737, passenger jets and C130 cargo plane. The current air traffic is 5 times per week, with an average of 200 passengers-inbound and outbound together available between Mtwara and Dar es Salam airports.

(6) Energy

1) Energy use

The main sources of energy for Mtwara are electricity, charcoal, firewood, gas and kerosene. According to household interviews that were conducted in August 2016, the pattern of energy consumption by type was revealed to be 42 % of the respondents use electricity, 68% charcoal, 65% percent firewood, 15% gas and 41% kerosene (Multiple answers were allowed for the question).

2) Electricity

The existing power generation infrastructure in Mtwara Region consists of one gas-fired power station located in the vicinity of the port area, using natural gas which is extracted and processed at Mnazi Bay near Msimbati Village. Mnazi Bay natural gas processing plant is located onshore at the Msimbati Peninsula and can process up to 10 mmscfd and it has an expendable capacity of up to 100 mmscfd. The gas from Mnazi Bay is conveyed to the power plant by an 8" pipe, 27km long from Mnazi Bay to Mtwara. The plant has nine generators with an installed capacity of 18 MW and an existing maximum demand of 14 MW. The power plant has four feeder lines, two 11kV and two 33kV feeder lines. The loads connected to these lines do not have a secure supply as they are not connected to the national transmission grid and are completely dependent on the gas generated from the Mtwara gas power station.

(7) Water supply and sanitation

1) Water supply

The area covered by the Mtwara Master Plan is endowed with numerous and diverse water resources in the form of rivers, wetlands, and productive aquifers. The region of Mtwara falls within the Ruvuma River and Southern Coast Basins. Generally, water services within the Mtwara Master Plan area are provided by three authorities namely Mtwara Urban Water Supply and Sewerage Authority (MTUWASA), Mtwara Mikindani Municipal Council and Mtwara District Council. MTUWASA is a fully self-governing public entity responsible for

the overall operation and management of water supply and sewerage services within the Mtwara - Mikindani Municipality, particularly within central areas of the municipality. Other settlements within the municipality are served by Mtwara-Mikindani Municipal Council through its water department. Most of these areas include newly developing areas and settlements peri-urban areas. These areas are those with low population density and low development. The nine wards which form part of the Mtwara Master Plan area, within Mtwara District Council are served with boreholes, shallow and deep wells managed by Community Owned Water Supply Organization (COWSOS).

a) Existing water supply:

Mtwara/Mikindani Municipality is supplied with water from two main water sources namely, Mtawanya well field and Mchuchu water source. There are eight boreholes at the Mtawanya well field (Table 12-39).

Table 12-39 Existing Water Supply

Borehole number	Depth	Discharge	Pump Capacity		Water Level		Diameter (casing)
					Static	Dynamic	
	(m)	(m ³ /hr)	(m ³ /hr)	(kW)	(m amsl)	(m amsl)	(mm)
05/86	40.2	240	180	(8.5)	2.9	0.2	230
12/78	53.5	72	60	8.5	5.9	-	230
14/86	41.6	72	60	8.5	2.2	0.9	198
18/86	54.5	72	60	12.5	20.4	6.2	198
20/86	63.6	72	60	8.5	10.0	7.8	198
31/86	57.0	180	120	25.4	4.2	1.6	240
63/86	52.2	60	30	8.5	2.3	1.8	240
87/86		72	Not Installed				

Source: MoWI, URT (2011)

Installed source capacity at Mtawanya well field is 13,680 m³/day. The Mchuchu source is situated at Mikindani village and has one spring and one borehole (as medium depth well) each with a capacity of 25 m³/h. Combined source capacity of these Mchuchu water sources is 1,200 m³/d.

The villages near the project site are supplied from shallow wells in Namgogololi, Kisiwa and Mgao and also MTUWASA borehole located at Mbuo village with the capacity of 30 m³/hr. The water is pumped from the MTUWASA borehole at Mbuo to the storage tank in Namgogoli village with the capacity of 225 m³ and then distributed through the gravity system to the villages.

b) Sanitation

There is no centralized sewerage system within the Mtwara Master Plan area. Although MTUWASA has already started the initiatives of building new waste water treatment ponds at Mtawanya area, wastewater and excreta is handled on site. The commonly used on-site sanitation method is the traditional pit latrine. It was noted that 71% households had traditional pit latrines, and 25% had septic tanks and soak away.

2) Storm water drainage

Storm-water management is a critical issue in the area covered by the Mtwara Master Plan. As a whole, the area experiences regular flood. Principally, Mtwara Municipality has two types

of water drains namely, primary drains and secondary drains. While primary drainages drain storm water into the ocean and storage ponds (depressions), secondary drainages empty water into the primary drainages. The Zambia Ring Road and Port Road have been constructed with storm water drainages (secondary) which collect run-off water to Kiangu pond which is among of the storm water collector ponds situated at Shangani. Other recipient ponds include Chuno, Nabwada and Nandope. During field visit, it was observed that many of the existing drainages which drain water to the recipient ponds were blocked with either sand or waste deposits.

(8) Waste management

The main sources of waste generation within the area covered by the Mtwara Master Plan are households, marketplaces, institutions, industries and commercial premises. Waste is approximated 103.77 tonnes generated per day. Out of these 100 tonnes generated within the boundaries of Mtwara Municipality, 3.77 tonnes within the boundaries of 9 wards of Mtwara District Council. Collected waste is transported to the municipal dumping site.

12.1.4 Alternative Analysis

In order to be able to make better and informed decisions, it is important to consider alternatives that can enable achievement of the better results with less adverse effects. The main factors considered in the selection of alternatives include potentiality of the option in terms of economic development, location, magnitude of environmental loss and sensitivity of area. Based on identified project issues and foreseen impacts, the following alternatives are discussed at this preliminary stage for the proposed project.

(1) “No Project” Alternative

The no project alternative entails maintaining current status of power generation sources in Tanzania and that Tanzania continues to struggle with shortage of power, quality of power supplies and stability. The proposed thermal power plant in Mtwara is one of the several candidate thermal power project considered for development under the revised Power System Master Plan of 2016. The proposed project is intended to generate 300MW that is expected to be connected to the national grid to provide electricity. Implementation of the no project alternative will deny this amount of power to the national grid which is required to supply the expanding power demand as forecasted by the Power System Master Plan 2016. Therefore this alternative does not seem viable since the country need power to supply to the expanding demand as the country is implementing and industrialization scheme to middle income country by 2030.

(2) Mtwara power plant

1) Location alternative:

The location alternative means considering different sites for the proposed development. JICA Study Team considered the two alternative sites for the proposed the Mtwara power plant, that are the Mikindani site and the Kisiwa site (Figure 12-31). Since there was no suitable places along the coastal area near Dar es Salaam, JICA Study Team considered these two sites as candidate locations. Details are discussed in Section 2.8.1. Outline of the conditions of alternative locations is as shown in Table 12-40. Both locations are considered the limiting factors for the location of the power plant such as the closeness to the source of cooling water, fuel gas supply (Mnazi bay to Dar es Salaam gas pipeline offering opportunity for gas tapping option), accessibility to the sites, and surrounding environment, etc.

While the Mikindani site faces the Mikindani bay which has wider opening to the Indian Ocean than the Sudi Creek (Kisiwa Bay) and it is advantageous for sea water cooling, the Kisiwa site is designated for power plant area as per Mtwara Master Plan and it is more advantageous to ensure the land for power plant. In addition, it seems more people are expected to be relocated if the power plant is established in the Mikindani site due to the noise emission from power plant. Seawater cooling (once-through cooling) system is considered to be adopted at the Kisiwa site. Therefore, the Kisiwa site is considered as preferred location for the proposed Mtwara power plant.

Table 12-40 Outline of the Conditions of Alternative Locations for Proposed Mtwara Power Plant

Items	Kisiwa Site	Mikindani Site
Overall evaluation	⊙ This area is designated as “power plant site” in the official local regional master plan, and the extent of necessary resettlement is smaller than Mikindani site.	△ Mikindani site is designated as residential area in the Mtwara Master Plan, therefore the master plan is required to be modified to use this site. In addition, the extent of resettlement is larger than Kisiwa site.
Location	<ul style="list-style-type: none"> • Kisiwa village, Naumbu ward, Mayanga division, Mtwara District • Population: 375 HH (1,119 people) 	<ul style="list-style-type: none"> • Naumbu Kusini village, Naumbu ward, Mayanga division, Mtwara District • Population: 322 HH (1,272 people) • Major ethnic group is living in this area is Makonde. Some other groups such as Makau and Mwera are also living here.
Area	150 ha	12.5 ha (expected area)
Land Use	Power Plants should be installed in the power plant site or Industrial area as designated by the Mtwara Master Plan.	
	<ul style="list-style-type: none"> • The site is designated as power plant site in the Mtwara Master Plan. 	<ul style="list-style-type: none"> • The site is designated as residential in the Mtwara Master Plan. (It is needed to change the land use designation for construction of power plant)
Air Pollution /Noise	<ul style="list-style-type: none"> • Since communities are away from the project site and the area is not densely populated, the impact will be less than Mikindani site. 	<ul style="list-style-type: none"> • Since communities are close to the project site and the area is densely populated, the impact will be greater than Kisiwa site.
Land Acquisition	<ul style="list-style-type: none"> • Valuation for the land to be acquired by TANESCO was conducted in 2016 and approved in December 2016. • Land price: According to the valuation in 2016 based on Tanzanian legislation: Land price per acre TZS 7,000,000 	<ul style="list-style-type: none"> • No activities have been conducted for land acquisition in this site. It is necessary to conduct the whole process of the land acquisition including valuation. • Land price: According to Mtwara District Council, the land price of Mikindani site is expected to be about at least double of the price of Kisiwa site since it is near the town.
Resettlement	<ul style="list-style-type: none"> • 2 households (HHs), within the area where the valuation was conducted in 2016. (Affected properties were three structures with 15 people living, according to the interview from the villager.) 	<ul style="list-style-type: none"> • Several households are expected to be relocated because of the land acquisition. • The neighboring settlement, Pemba Pwani, is very close to the site and it seems difficult to meet the noise limit for residential area and therefore this settlement (164 HHs, approximately 900 people) seems to be subjected to relocation and compensation if any mitigation measures are not applicable to meet the noise limit.
Compensation	<ul style="list-style-type: none"> • For the loss of crops, lands, properties, disturbance allowances. • Approved total compensation value based on Tanzanian legislation (Approval date is 29th 	<ul style="list-style-type: none"> • For the loss of crops, lands, properties, disturbance allowances. • Mitigation measure for noise at the settlement (Penba Puan Hamlet of 164 HHs, approximately 900 people)

Items	Kisiwa Site	Mikindani Site
	<p>December, 2016): TZS 3,611,943,872.09</p> <ul style="list-style-type: none"> • Number of people to be compensated: 128 (among them about 15 people are expected to be relocated.) • The payment of the compensation value approved is underway by TANESCO. 	<p>adjacent to the site is expected to be required⁶. (See the explanation of Resettlement above.)</p>
Cultural Heritage	<ul style="list-style-type: none"> • According to the village chairman, no historical and cultural site in the site. • The historical site of Kisiwa village is located north of the Kisiwa site around the baobab tree, where the villagers respect and protect. 	<ul style="list-style-type: none"> • According to the village chairman, no historical and cultural site in the proposed site.
Livelihood	<ul style="list-style-type: none"> • Agriculture and fishery are the main livelihood of the villagers. • Around 150 fishermen are active in the creek, more investigation is needed to confirm the expected impact. • There are 8 fishery groups for Kisiwa and Namgogoli village. 	<ul style="list-style-type: none"> • Fishery is the main livelihood of the villagers. Most of the households in the villages are engaged in fishery. • Around 300 fishermen are active around the site.
Ecosystem	<ul style="list-style-type: none"> • Mangrove: Some of the mangrove trees are expected to be cut down to install intake and outfall facilities in case of seawater cooling. • Coral: According to the village chairman, there are not so many corals in the creek but some corals are existing. • There are two rivers that flow into the creek; Mbuo River and Mambi river. 	<ul style="list-style-type: none"> • Mangrove: There are very limited number of mangrove trees observed near the site. • Coral: According to the village chairman, coral is found along the shore line of the site. Coral might be damaged due to thermal water discharge.

Source: JICA Study Team

⁶ Tanzania Environmental Noise Standards. TZS 932:2006: Acoustics - General Tolerance Limits for Environmental Noise. The maximum limits of noise as per Tanzania regulatory for residential areas is 50 dBA during the day and 35 dBA during the night.



Source: JICA Study Team using background map of Google Earth and Google map

**Figure 12-31 Location of the Alternatives (Kisiwa Site and Mikindani Site)
for the Mtwara Power Plant**

2) Transportation route

Most of the transportation routes for the project are the existing roads. Two alternative routes are considered as the transportation routes to the power plant site as described in Table 12-41. Route 1 is preferred since two third of the route is along the existing paved road and less impact on local communities is expected.

Table 12-41 Alternative Transportation Routes

	Route 1	Route 2
Overall evaluation	⊙ Road condition is better than Route 2 and less impact to local communities are expected.	× Road condition is not good as Route 1 and more impact on local communities are expected.
Brief description	The route is along the trunk road B2 up to Dangote cement factory followed by unpaved road up to near the power plant site. Most of the route is along the existing road.	The route is along the B2 trunk road up to Mikindani followed by the unpaved road up to the power plant site. Most of the route is along the existing road.
Length	Approx. 40 km	Approx. 40 km
Time to the power plant site	Shorter than route 2	Longer than route 1
Environment	No protected or ecologically sensitive area. The area is mainly composed of mixed secondary vegetation and farmland.	No protected or ecologically sensitive area. The area is mainly composed of mixed secondary vegetation and farmland.
Socio-economic	Two third of the route is along the existing trunk road B2 with good condition. The route passes only one settlement area of Kisiwa village near the power plant site.	The route is rather narrow and passes several settlement areas. In the middle of the route is along the settlement area spanning for 2.5km and it is a community road. More impact on local communities is expected than Route 1.



Source: JICA Study Team using background map of Google Earth

Figure 12-32 Transport Route Alternatives

3) Technology alternative

The technology alternative covers a wide range of issues including cooling system, water use efficiency and output maximization. In terms of cooling system for the proposed thermal plant, a once-through cooling system was adopted after the following discussions.

As cooling technology alternatives, seawater cooling (once-through cooling) and air cooled condenser (ACC) are considered. These have implications in terms of water use, energy efficiency, and associated environmental and social impact. Therefore, the impact of thermal water discharge was checked as described later and confirmed that no significant impact will be caused.

Once-through cooling systems withdraw water from Sudi Creek (Kisiwa Bay), diverted through a condenser where it absorbs heat from the steam, and then discharged back to the Creek at higher temperature, expecting 7 degrees higher than the water temperature at intake. On the other hand, ACC does not require such water withdrawals. Without water cooling, ACC has lower vacuum under high ambient temperature compared with water-cooled condensers, decreasing steam turbine efficiency, and thus requiring more fuel consumption for the same generation output. It also results in more GHG emission.

(3) 400kV Transmission line between Mtwara and Somanga

Four alternative routes are considered for the proposed 400kV transmission line between Mtwara and Somanga. The route is divided into seven sections and the alternative routes are compared in each sections. The route alternative consideration criteria is route length, topographical conditions, access road conditions, potential impact by salt from sea, and environmental and social perspectives such as protected areas and potential resettlement impact. Details of the alternatives

for each section are described in below.

1) Route concept

Four (4) candidate routes have been prepared according to each concept described in Table 12-42.

Route_1 was reported by the United States Agency for International Development (USAID) in 2015 but preliminary survey prior to a field investigation suggested that some parts of the route would pass through residential or protected forest areas. These areas would cause to prolong a construction period because of necessity for land negotiations and permit acquisitions. Route_1A based on that Route_1 can avoid passing through restricted areas.

Ensuring smooth traffic for construction vehicles like a concrete mixer or a big crane car is indispensable for promoting a construction securely, promptly and minimizing the project cost. From this point of view, Route_2 along main roads is proposed.

Route_3 is arranged in parallel and proximity along the existing gas pipeline (hereinafter called as “the Pipeline”).

Table 12-42 Concept for Candidate Route

No.	Candidate Route	Concept
1	Route_1	Reported by USAID in 2015
2	Route_1A	Modified Route_1 Avoid residential, high elevation and protected forest areas
3	Route_2	Along the national road Easier access
4	Route_3	Along the gas pipeline, proposed by TANESCO Easier land acquisition

The candidate routes are divided into seven (7) sections and compared with each other on each section. Then the recommended route is composed by connecting the candidate route evaluated as “Good / Superior” for each section as shown in Figure 12-33.

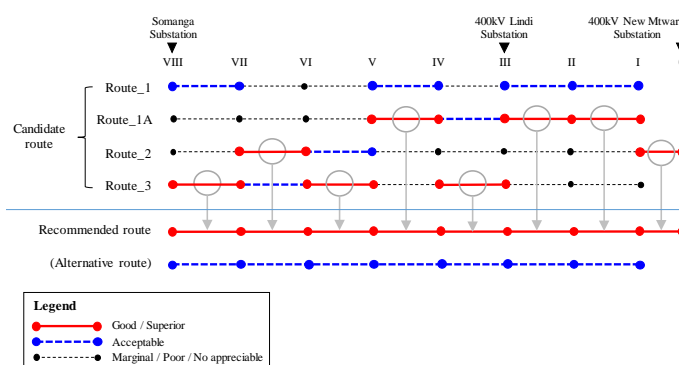
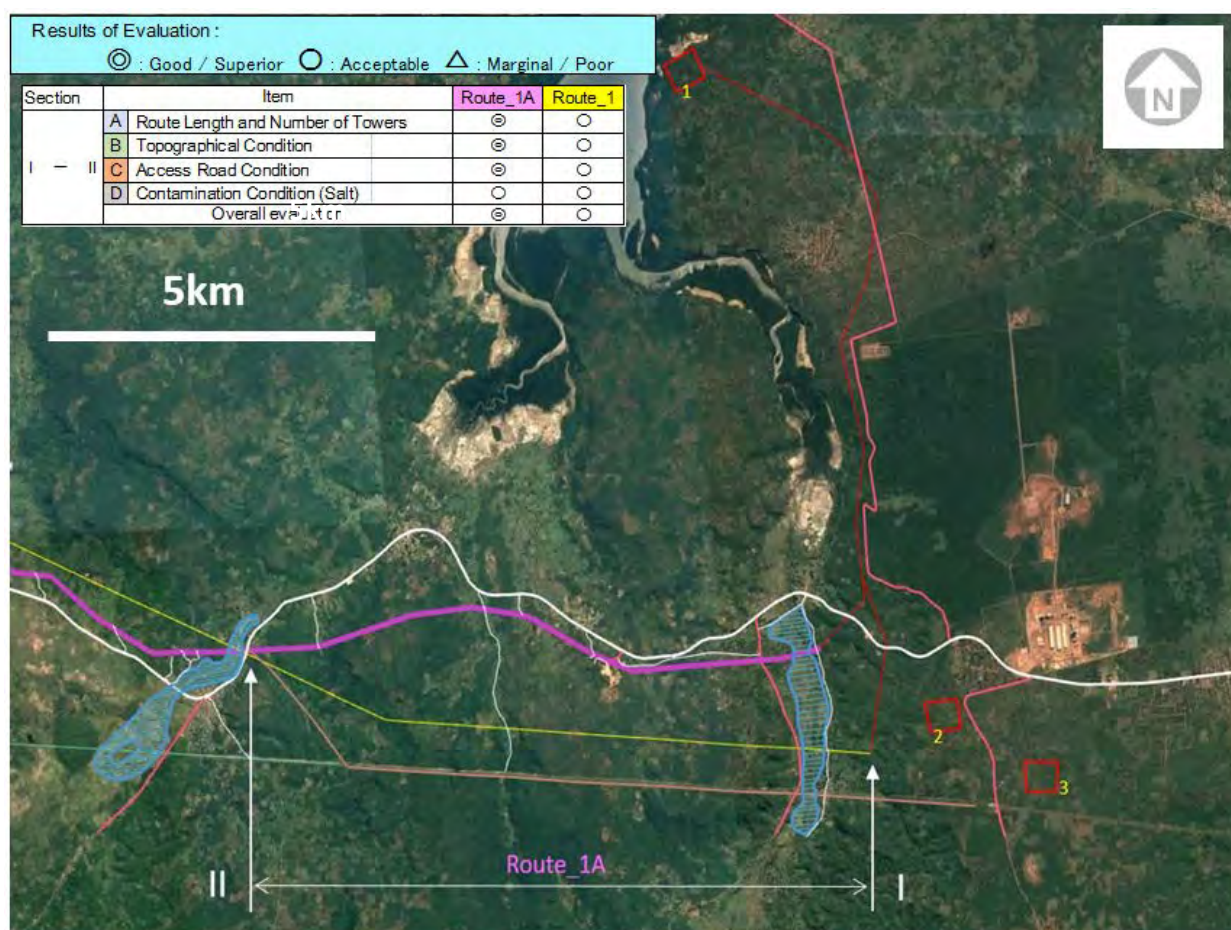


Figure 12-33 Composition of Recommended Route

2) Description of each section

a) Section I-II

The transmission line leaded from the 400 kV New Mtwara substation indicated red square No. 1 goes west and crosses the national highway. Route_1A is distinctly superior in terms of route length and accessibility compared to other candidates as shown in Figure 12-34.



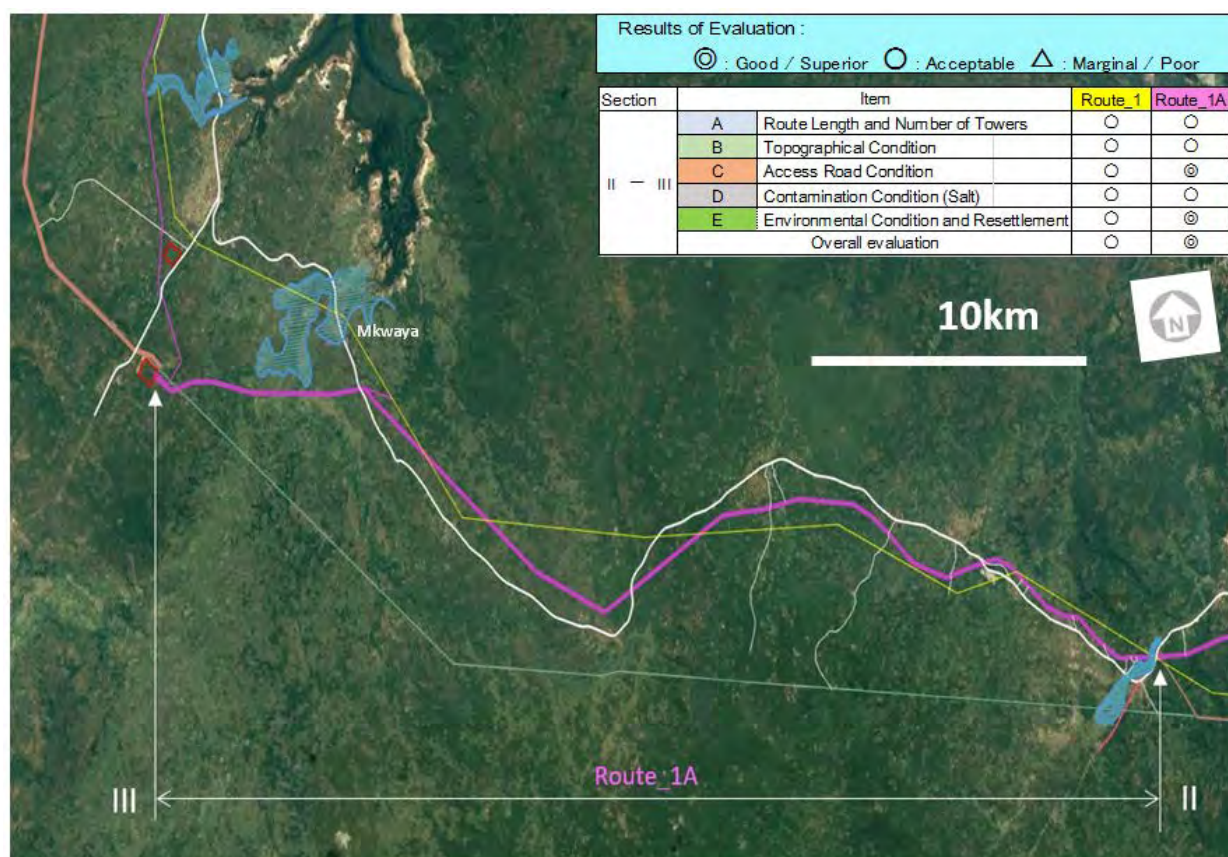
Source: JICA Study Team using background map of Google Earth

Figure 12-34 Route Map in Section I-II

b) Section II-III

Every candidate route has 40km of length, however Route_1 and Route_3 are not suitable for the transmission line, because the former is passing through the residential area, the latter is far from the national highway. Therefore, Route_1A is recommended in this section.

A swamp area appears in rainy season around Mkwaya village. Route_1A avoid crossing this area as well.

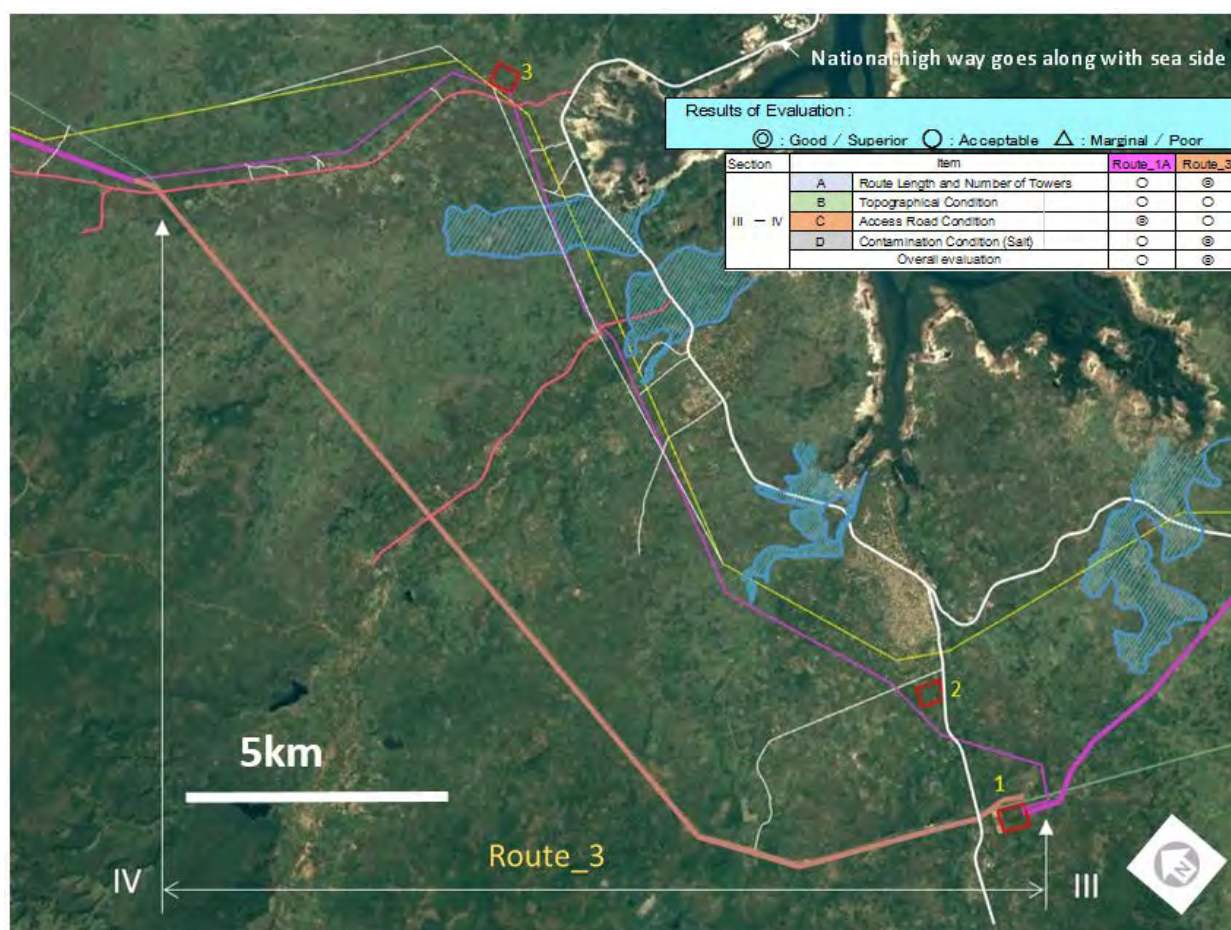


Source: JICA Study Team using background map of Google Earth

Figure 12-35 Route Map in Section II-III

c) Section III-IV

Candidate routes can be categorized two groups which are along the national highway or the Pipeline. Although Route_3 along the Pipeline is several kilometers away from the national highway, the length of this route is 26.3 km which is the shortest avoiding swamp areas. These advantages can compensate for the disadvantage of being far from the national highway in terms of cost, Route_3 is recommended in this section.

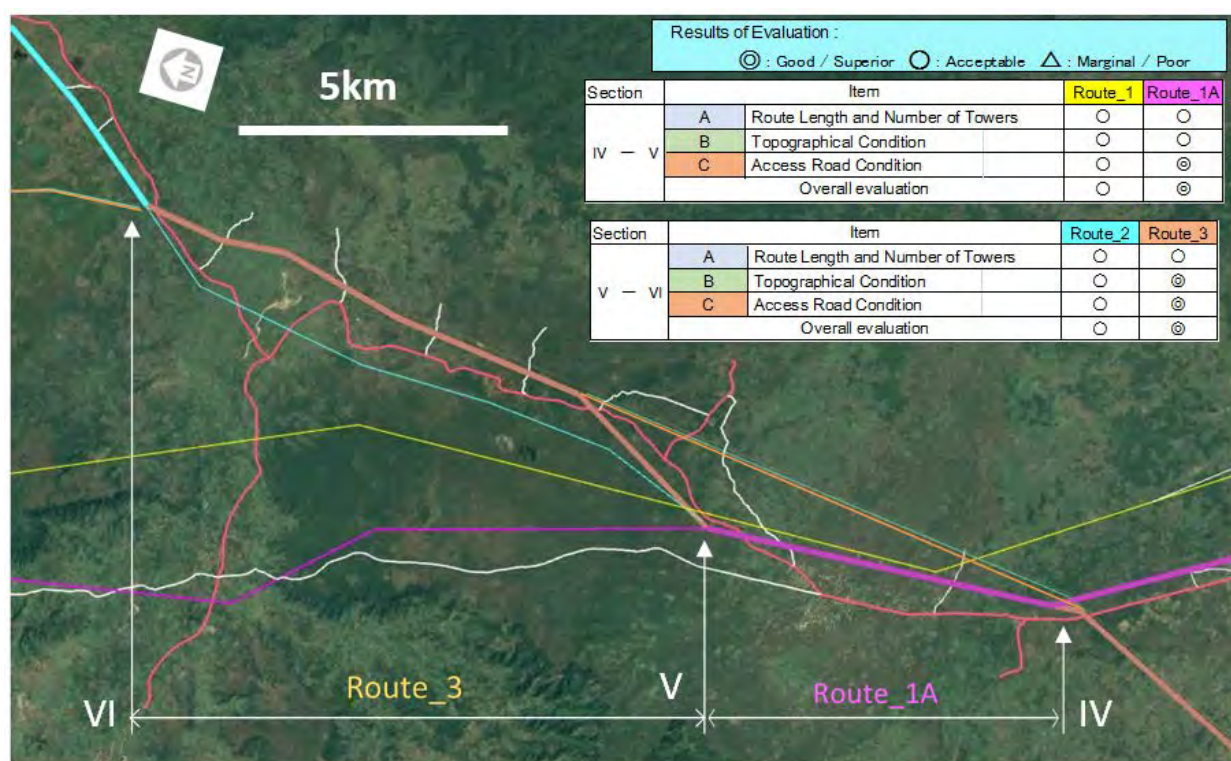


Source: JICA Study Team using background map of Google Earth

Figure 12-36 Route Map in Section III-IV

d) Section IV-V and V-VI

Every candidate route has same length of 6 km in the section IV-V. Route_1A can be recommended because this is close to the main road compared with the others.

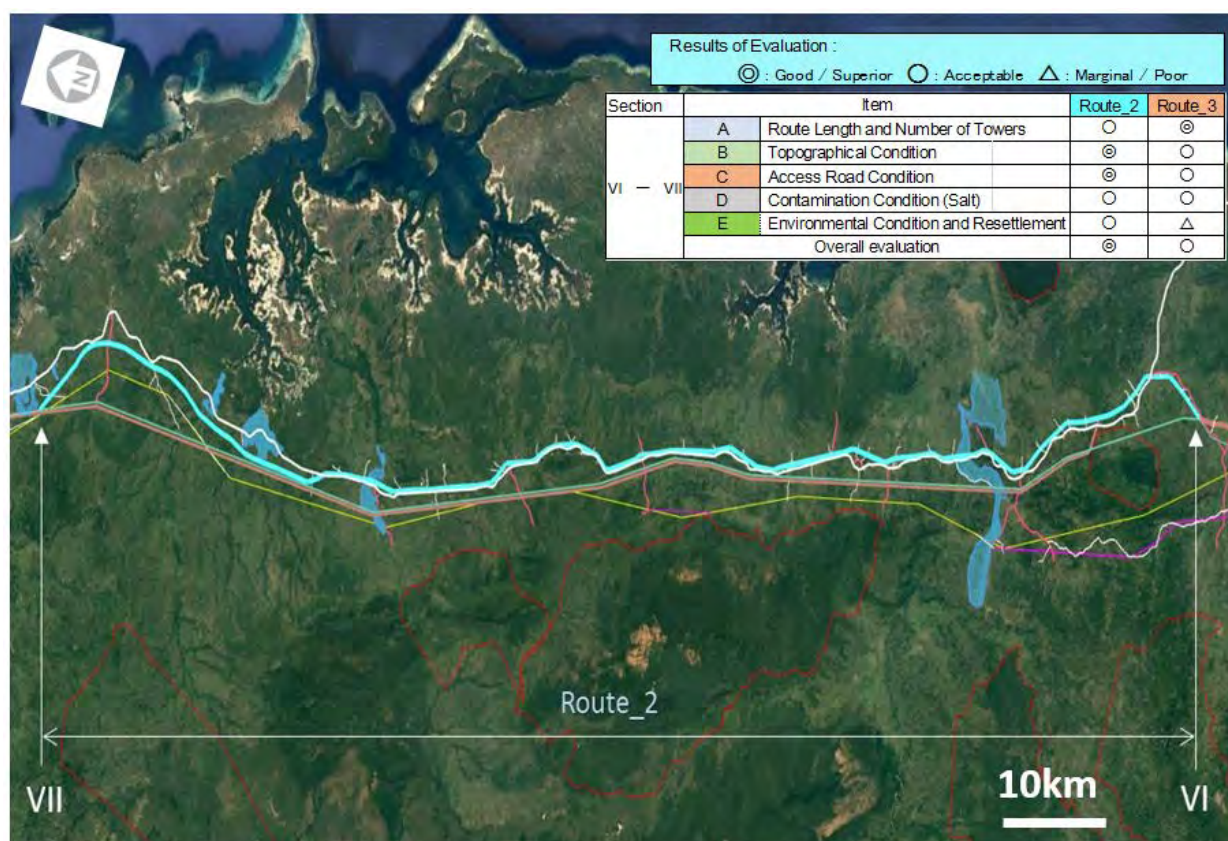


Source: JICA Study Team using background map of Google Earth

Figure 12-37 Route Map in Section IV-V and V-VI

e) Section VI-VII

Candidate routes can be categorized two groups one of which goes along the sea and the other goes on the mountain side of the national highway. Route_2 along the sea is recommended in this section. Although the length of this route is 126 km which is approximately 5 km longer than the others, the route is not only close to the national road, it is the only one not going through the protected forest area. This advantages can compensate for the disadvantage of route length.

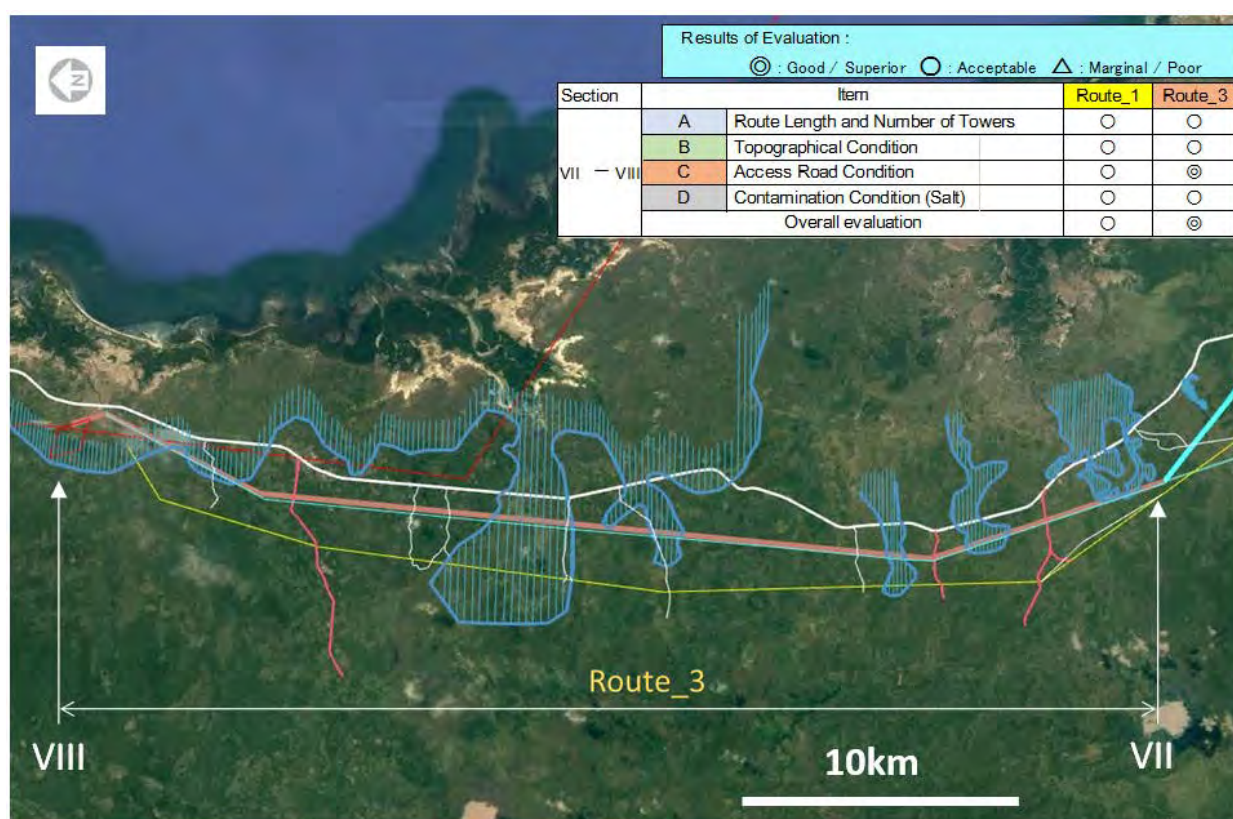


Source: JICA Study Team using background map of Google Earth

Figure 12-38 Route Map in Section VI-VII

f) Section VI-VII

This section, which has a length of 37 km, is in a harsh environment for constructing a transmission line because of many large swamps appearing in the rainy season. Since the existing gas pipeline goes along the topographically advantageous higher hilly areas with the minimum distance to the national highway, Route_3 is recommended in this section.



Source: JICA Study Team using background map of Google Earth

Figure 12-39 Route Map in Section VII-VIII

3) Summary of Analysis

The length of the recommended route is estimated about 270 km based from the result of the route survey. The characteristics of the candidate routes for each section are summarized in Table 12-43 and Table 12-44 and the optimal route is shown in Figure 12-40.

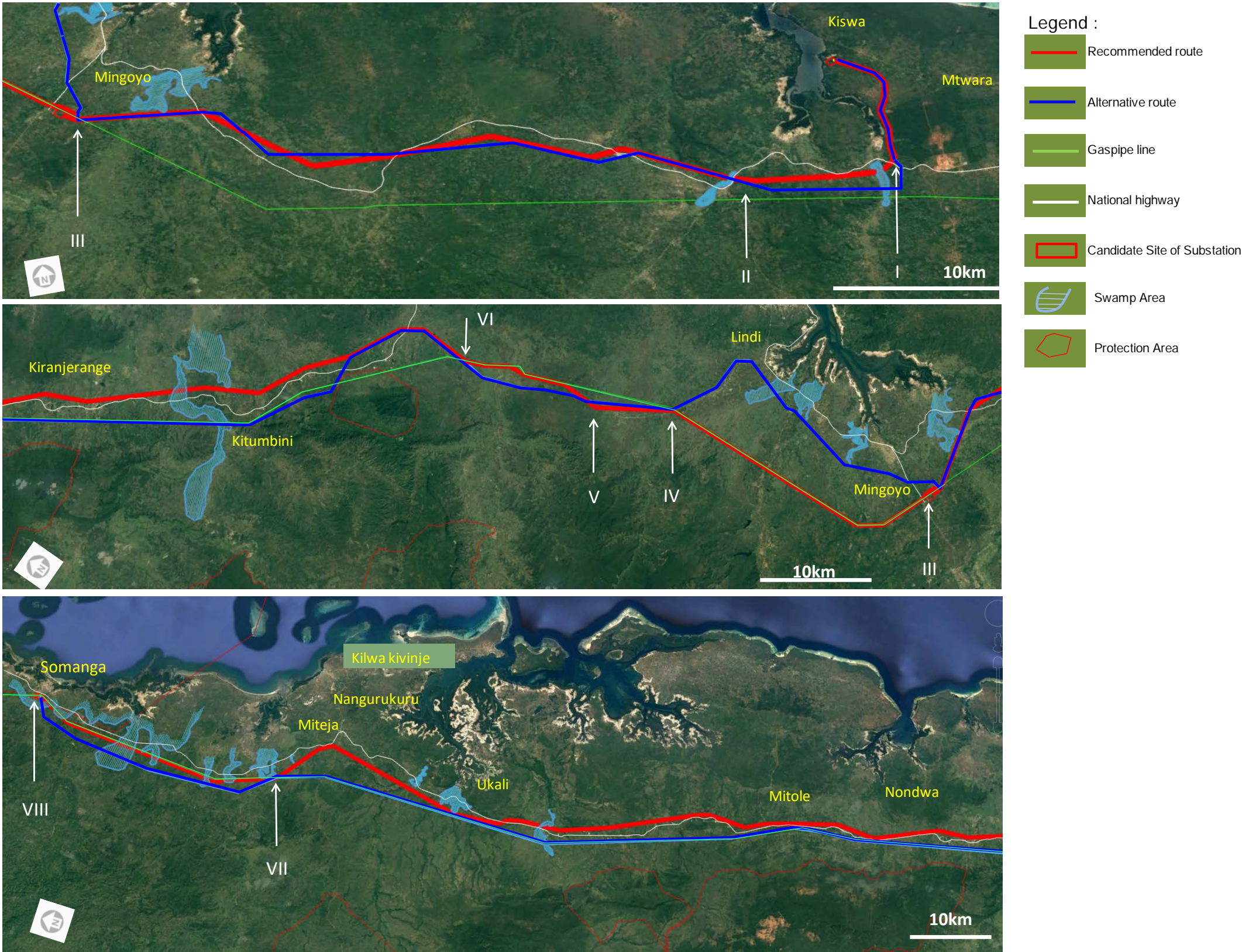
Table 12-43 Summary of Overall Evaluation of the Route Options for Each Section

	Route_1	Route_1A	Route_2	Route_3
Section I-II	Δ Longer (more land take) and access condition is not good	⊙ Shorter and accessibility is most suitable.		
Section II-III	Δ Passes residential area.	⊙ Avoid swamp area and residential area.		
Section III-IV		Δ Longer and more impact by silt from sea is expected.		⊙ Shorter and less impact by silt from sea is expected.
Section IV-V	Δ Far from main road.	⊙ Closer to the main road.		
Section V-VI			Δ Access to the road and topographic condition is not good.	⊙ Access to the road and topographic condition is better than Route 2.
Section VI-VII			⊙ Topographic condition and access to the road is better than Route 3.	Δ Topographic condition and access to road is not good.
Section VII-VIII	Δ Access to the road is not good.			⊙ Access to the road is good.

Note: As summary, explanation focuses on the first and second priority options for each section. Details of the each section evaluation are described in Table 12-44.

Table 12-44 Comparison of the Routes for 400 kV New Mtwara Substation - Somanga Substation 400 kV Transmission Line

				A	Route Length and Number of Towers for angle point (over 30 degree)		C	Access Road Condition Distance from Main Road		E	Environmental Condition and Resettlement		
				B	Topographical Condition Section Length (Mountainous) · Highest Elevation Level		D	Contamination Condition (Salt) · Length of Swamp Area		Results of Evaluation : ◎ : Good / Superior ○ : Acceptable △ : Marginal / Poor			
Route		Route_1			Route_1A			Route_2			Route_3		
		Planned Route 400kV Double Circuit Transmission in reports made by USAID/TANESCO (March 2015)			This is alternative route to minimize areas in mountainous in Route_1 and to make better crossing conditions with river, gas pipe line, housing areas and forest protection area.			This is a new route at the East Side of National Road T7□ to get easy access.			Additional Route is basically parallel to the Gas Pipe Line. Land negotiation is easy.		
Section	Item			Ev aluation			Ev aluation			Ev aluation			
I — II Substation (1 · 2)	A	Not applicable			10.0 km 27 towers (4 points)	◎	Not applicable		Not applicable		Not applicable		
	B		(100 m - 150m) 1.0 km 150 m										
	C		Distance from the national Road T7 : 0.2 km to 1.0 km. The access roads are available by widening existing roads. The construction cost of permanent roads is cheap.										
	D		(Salt) 10.0 km (Swamp) 0.2 km										
I — II Substation (3)	A	11.4 km 31 towers (3 points)	○	Not applicable		Not applicable		Not applicable		◎	12.4 km 34 towers (3 points) (100 m - 150m) 5.5 km 150m Distance from the national Road T7 : 1.5 km to 3.0 km. There are few existing roads available. The cost of permanent roads is high.		
	B	(100 m - 125m) 7.0 km 125 m											
	C	Distance from the national Road T7 : 1.0 km to 1.6 km. There are few existing roads available. The cost of permanent roads is high.											
	D	(Salt) 11.4 km (Swamp) 0.4 km											
II — III	A	41.0 km 111 towers (7 points)	○	Not applicable	◎	Not applicable		Not applicable		△	40.5 km 109 towers (1 points) (200 m - 310m) 10.0 km 310 m Distance from the national Road T7 : 1.0 km to 5.5 km. There are few existing roads available. The cost of permanent roads is high.		
	B	(200 m - 300m) 7.5 km 300 m											
	C	Distance from the national Road T7 : 0.6 km to 2.0 km. The access roads are available by widening existing roads. The construction cost of permanent roads is cheap.											
	D	(Salt) 19.0 km (Swamp) 2.5 km											
	E	(Resettlement) 3 houses											
III — IV Substation (2 · 3)	A	25.0 km 68 towers (5 points)	△	Not applicable	◎	Not applicable		Not applicable			Not applicable		
	B	(over 100 m) 0 km 80 m											
	C	Distance from the national Road T7 : 0.6 km to 1.8 km. The access roads are available by widening existing roads. The cost of permanent roads is cheap.											
	D	(Salt) 10.0 km (Swamp) 1.8 km											
	E	(Resettlement) 10 houses											
III — IV Substation (1)	A	Not applicable		Not applicable	○	Not applicable		Not applicable		◎	26.3 km 70 towers (6 points) (200 m - 230m) 5.0 km 230 m Distance from the national Road T7 : 6.0 km to 7.0 km. There are few existing roads available. The Construction cost of permanent roads will be high.		
	B											31.5 km 85 towers (9 points) (over 100 m) 0 km 80 m	
	C											Distance from the national Road T7 : 1.0 km to 2.3 km. The access roads are available by widening existing roads. The construction cost of permanent roads is cheap.	
	D											(Salt) 7.8 km (Swamp) 1.0 km	
IV — V	A	6.0 km 17 towers (2 points)	○	Not applicable	◎	Not applicable		Not applicable		○	6.0 km 17 towers (2 points) (over 150 m) 0 km 150 m Distance from the national Road T7 : 0.9 km to 1.6 km. There are few existing roads available. The cost of permanent roads is high.		
	B	(over 150 m) 0 km 150 m											
	C	Distance from the main Road : 0.8 km to 1.3 km. There are few existing roads available. The construction cost of permanent roads is cheap.											
V — VI	A	10.0 km 27 towers (1 points)	△	Not applicable	△	Not applicable	○	Not applicable		◎	12.0 km 33 towers (3 points) (150 m - 250m) 6.0 km 250 m Distance from the main Road : 0.2 km to 0.4 km. The access roads are available by widening existing roads. The construction cost of permanent roads will be much less.		
	B	(170 m - 260m) 7.0 km 260 m											
	C	Distance from the main Road : 0.8 km to 1.3 km. There are few existing roads available. The construction cost of perm. roads with the slope is high.											
VI — VII	A	125.0 km 338 towers (9 points)	△	Not applicable	△	Not applicable	◎	Not applicable		△	121.0 km 327 towers (4 points) (150 m - 250m) 3.0 km 250 m Distance from the national Road T7 : 0.4 km to 4.0 km. There are few existing roads available. The cost of permanent roads is high.		
	B	(150 m - 490m) 15.0 km 490 m											
	C	Distance from the national Road T7 : 2.0 km to 7.0 km. There are few existing roads available. The construction cost of perm. roads with the slope is high.											
	D	(Salt) 18.0 km (Swamp) 2.0 km											
	E	A part of route will pass inside the Forest Protection Area "Ngarama".											
VII — VIII	A	37.0 km 100 towers (3 points)	○	Not applicable		Not applicable		Not applicable		◎	37.0 km 100 towers (3 points) (over 150 m) 0 km 70 m Distance from the national Road T7 : 0.5 km to 2.0 km. There are few existing roads available. The construction cost of permanent roads is cheap.		
	B	(over 150 m) 0 km 80 m											
	C	Distance from the national Road T7 : 2.0 km to 4.0 km. There are few existing roads available. The construction cost of permanent roads will be high.											
	D	(Salt) 37.0 km (Swamp) 8.0 km											
Recommended Section		Not applicable (Initial Planning only)			I—II (Substation (1, 2)) III—IV (Substation (2, 3)) II—III IV—V			VI—VII			I—II (Substation (3)) V—VI III—IV (Substation (1)) VII—VIII		



Source: JICA Study Team using background map of Google Earth

Figure 12-40 Optimal Route based on the Result of the First Field Survey

12.1.5 Scoping Results

(1) Scoping results

The environmental and social items in relation to the proposed Mtwara power plant and 400kV transmission line have been identified based on the JICA environmental and social consideration guidelines (April 2010), relevant environmental legislation in Tanzania, and environmental and social conditions in the area concerned.

For each impact item, potential impacts in each stage of development (in planning and construction, and in the operation phase) are divided into negative impacts (－) and positive impacts (+), and the degree of impacts is classified as shown below. Table 12-45 and Table 12-46 shows the scoping result.

- A (+/-) : Major positive / negative impacts are Projected
- B (+/-) : A certain degree of positive / negative impacts is Projected
- C : Impacts are unclear (further investigation is needed. Impacts may become apparent as the survey progresses)
- D : No impacts are Projected

Table 12-45 Scoping Result for the Mtwara Power Plant (including gas pipeline, access road)

Impact item		Assessment		Reason for the assessment and points of attention
		Planning / Construction phase	Operation phase	
Pollution control measures				
1	Air pollution	B-	B-	Construction phase: Sand and fine particles may fly up when carrying in or out construction materials, and conducting civil engineering works. The scope of impacts from such pollutants is expected to be limited to the vicinities of the construction areas. Operation phase: NO _x emission by the operation is anticipated. Measures should be taken to observe the environmental criteria of Tanzania or the values in the IFC EHS guidelines.
2	Water pollution	B-	B-	Construction phase: Influence from the generation of muddy water during construction is anticipated. Operation phase: Heated cooling water, plant wastewater, domestic waste water and oil-containing waste water will be generated. Water treatment with chlorine is expected as a common practice. Measures for effluent discharge should be taken to observe the environmental criteria of Tanzania or the values in the IFC EHS guideline.
3	Waste	B-	B-	Construction phase: The construction work is expected to generate waste, hazardous waste, and construction waste such as surplus soil and scrap wood. Operation phase: General waste and hazardous waste are expected to be generated.
4	Soil / groundwater contamination	B-	B-	Construction phase: The possibility of soil contamination by the spill of oil for construction is anticipated. Operation phase: Spillage of lubrication oil and fuel during operation of the power plant are likely to cause contamination in the soil.

Impact item		Assessment		Reason for the assessment and points of attention
		Planning / Construction phase	Operation phase	
5	Noise and vibration	B-	B-	<p>Construction phase: Noise due to the operation of construction equipment, vehicles is anticipated.</p> <p>Operation phase: Attention should be paid so that noise caused by operation will meet the environmental criteria of Tanzania and the IFC EHS guideline.</p>
6	Ground subsidence	D	D	There is no ground subsidence due to groundwater pumping, because groundwater will not be used on site.
7	Odor	D	D	There are no substances considered to cause a bad smell at the thermal power plant.
Natural environment				
8	Nature reserve	D	D	The project site is not located in the protected area.
9	Ecosystem	C	B-	<p>Construction phase: The land cover in the project site is wood vegetation with human intervention such as farming. The site is not expected to be an ecologically important habitat. However, some mangrove trees are to be cut to install the intake and outfall structure into the creek.</p> <p>Operation phase: There is a possibility that the deterioration of the atmosphere environment and would influence the surrounding ecosystem. Thermal discharge from the power plant might have some influence in the aquatic ecology.</p>
10	Hydrology	B-	B-	<p>Construction phase: As an influence on hydrogeology during construction, it is expected that alteration in the shape and quality of the land may temporarily affect the drainage pattern.</p> <p>Operation phase: There is a possibility that the terrain will be altered, which would affect the surrounding water environment. Measures against alteration of the drainage pattern especially during the rainy season, such as the construction of a drainage path, should be considered. Because cooling water is taken from and discharged to the creek, some changes in flow conditions in the vicinities of the discharged would be expected.</p>
11	Topography and geology	B-	D	<p>Construction phase: The site construction and access road construction are expected to alter the terrain.</p> <p>Operation phase: Operation does not involve the activities that alter the terrain.</p>
Social environment				
12	Involuntary resettlement	B-	D	<p>Before construction work:</p> <ul style="list-style-type: none"> Land acquisition for the power plant complex area of 150ha (excluding the land for the gas pipeline and access road) is expected, which involves physical and economical relocation of the local people. According to the approved valuation report, the number of affected persons is 128. Three households with 15 people are expected to be physically relocated. In addition to this 150ha of land, additional land acquisition is also expected causing acquisition of the fish landing site and physical relocation of 4 households (around 20 people). In order to establish the gas pipeline from the BVS 01 (block valve station) to the Mtwara power plant site, necessary land will be acquired by TPDC. The length is approximately 10km to 16km. Although transportation route is along the existing road and the road planning is based on the Mtwara Master Plan, land acquisition might be involved. Details will be confirmed with the local government (Mtwara District council).
13	Poverty	B-/B+	C	Construction phase: Affected households may need to change their livelihood due to this project. At the same time, there is a possibility that the project can generate job opportunities related to construction work, which would help increase the

Impact item		Assessment		Reason for the assessment and points of attention
		Planning / Construction phase	Operation phase	
				income of local people. Operation phase: Job opportunities may increase for the affected local communities, with the increase of employment related to this project.
14	Ethnic minorities, indigenous people	C	C	Construction and operation phase: Influence on ethnic minorities and indigenous people is not expected. Tanzania has a multi-ethnic population with more than 125 different ethnic communities. Four of these, the Hadzabe, the Akie, the Maasai and the Barabaig, identify themselves as indigenous peoples. The majority of the indigenous peoples live in northern Tanzania, in the Arusha and Manyara regions. In Mtwara District, The dominant ethnic group is the Makonde.
15	Cultural heritage	B-/C	B-/C	According to the local village leader during the preliminary survey, there is no cultural heritage in the proposed site. However, within the piece of the land which is expected to be additionally acquired, there is a grave yard. This is expected to be relocated in accordance with Graves Act. The village historical site is located outside the project site (north of the site).
16	Landscape	B-	B-	Construction and operation phase: The establishment of the power plant is expected to alter the landscape. However, the surroundings of the site have no scenic spots, no impact on such spots is expected.
17	Local economy such as employment and means of livelihood	B-/B+	B-/B+	Construction phase: <ul style="list-style-type: none"> •Affected local communities may need to change their livelihood. At the same time, there is a possibility that employees involved in the construction continue to be hired, and new job opportunities for local communities may be created. •Establishment of gas pipeline might have some influence on livelihood due to the wayleave establishment. Details will be confirmed in the further study with TPDC. •There might be some influence on livelihood and daily life due to the project transportation along the transportation route such as disturbance of livelihood activities. Details will be confirmed in the further study. Operation phase: Job opportunities will increase through this project. Furthermore, the project may contribute to the development of a local economy through a stable power supply.
18	Utilization of land and local resources	B-	B-	Construction / Operation phase: 150ha of land will be acquired by TANESCO and will be used for power plant complex. Farming area within the acquired land is not accessible for local people after the acquisition.
19	Use of water	C	C	Construction phase: Local communities around the project site use groundwater. However, the groundwater will not be used for construction. Operation phase: Cooling water is expected to be withdrawn from the Sudi Creek (Kisiwa Bay), and water for other use is supplied through local water supply entity. Therefore, no significant impact on water use in the area is expected.
20	Existing social infrastructure and social services	B-	B+	Construction phase: There is a possibility that construction work will influence existing social infrastructures due to the influx of construction workers. Operation phase: It is expected that the stable power supply will contribute to the development of the local economy and improvement of social infrastructures and services in the surrounding area.
21	Social capital and social organizations such as decision making organizations	B-/C	B-/C	The power plant complex site was used by local people such as for farming. Therefore, when making decision on relocations and livelihood restoration due to the land acquisition, local social bodies will be involved. Employment opportunities may also affect the social capital in the area.

Impact item		Assessment		Reason for the assessment and points of attention
		Planning / Construction phase	Operation phase	
22	Imbalance of harms and benefits	B-	B-	A sense of unfairness might occur between the local people in the surrounding area who receive the benefits of a stable power supply and those who will lose their means of earning a living by this project.
23	Gender	B-/C	B-/C	As mentioned above, the power plant complex site was used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on gender perspective.
24	Children's rights	B-/C	B-/C	As mentioned above, the power plant complex site was used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on children's rights perspective.
25	Contagious diseases (e.g. HIV ⁷ / AIDS ⁸)	B-	D	Construction phase: An inflow of workers from outside is expected, due to the construction and service scale of this project. There is a risk of the occurrence of infectious diseases, such as HIV/AIDS, caused by the inflow of workers from outside. Operation phase: No influence on infectious diseases, such as HIV/AIDS, is anticipated.
26	Working environment	B-/C	B-/C	Construction and operation phase: Consideration should be given to the working environment for construction workers.
Others				
27	Accident preventive measures	B-/C	B-/C	Construction phase: Consideration should be given to accidents during construction. Operation phase: Fire and traffic accidents are the expected risks by operation of facilities and vehicles.
28	Cross-border impacts and climate change	D	B-/C	Construction phase: It is not anticipated that the construction work will influence climate change. Operation phase: Greenhouse effect gas, such as CO ₂ , is expected to increase due to the increase of vehicles and operation of factories.

Source: Prepared by JICA Study Team

Legend A+/- : Major positive / negative impacts are Projected
 B+/- : A certain degree of positive / negative impacts are Projected
 C : Impacts are unclear - further investigation is needed
 D : No impacts are Projected

7 Human Immunodeficiency Virus (HIV)

8 Acquired Immune Deficiency Syndrome (AIDS)

Table 12-46 Scoping Result for the 400kV Transmission Line between Mtwara and Somanga

Impact item		Assessment		Reason for the assessment and points of attention
		Planning / Construction phase	Operation phase	
Pollution control measures				
1	Air pollution	B-	D	Construction phase: Sand and fine particles may fly up when carrying in or out construction materials, preparing site land and so on. Operation phase: Air pollution will not be generated.
2	Water pollution	B-	D	Construction phase: There is a possibility that muddy water generated in line with banking and cutting works will impact surface water. Operation phase: It is not anticipated that significant water pollution will be generated.
3	Noise/ vibration	B-	D	Construction phase: Noise due to the operation of construction equipment, vehicles, etc., is anticipated. Operation phase: It is not anticipated that significant noise/ vibration will be generated.
4	Wastes	B-	D	Construction phase: It is anticipated that waste materials and soil will be generated by the construction activities. Operation phase: Wastes will not be generated.
Natural environment				
5	Nature reserve	B-	B-	The proposed transmission line route does not pass the nature reserves designated under Tanzanian law. However, there are some forest reserves and Important Bird Areas (IBAs) are located around the proposed route. Details will be studied.
6	Ecosystem	B-	B-	Construction phase: It is expected that the air pollution, water pollution, noise and vibration generated by the construction works will impart temporary impacts on land ecosystems. Operation phase: Bird strikes and other impacts are anticipated.
7	Water environment	B-/ C	B-/ C	Construction and operation phase: In the case where the route crossing river is selected, there is a possibility that the river flow will be temporarily and partially altered.
8	Topography and geology	B-/ C	B-/ C	Construction / Operation phase: In the case where there is banking and/or cutting, there is a possibility that slope failure or landslide will occur.
Social environment				
9	Involuntary resettlement	B-/ C	B-/ C	Before works: The route will be selected with a view to averting or minimizing the involuntary resettlement, however, there is a possibility that the involuntary resettlement will arise. The degree of impacts is unclear at the present time and details will be studied in the EIA and RAP study. In order to establish the wayleave for the 400kV transmission line, the land acquisition of 1,350ha (50m width × 270km) are expected between Mtwara and Somanga. At the time of scoping, expected physical relocation is not more than 200 people.
10	Poor people	B-/ C	B-/ C	Construction / Operation phase: There is a possibility that impacted residents including poor people may need to change their means of livelihood. However, the degree of impacts is unclear at the present time. Details will be studied in the EIA and RAP study.
11	Ethnic minorities and indigenous people	B-/ C	B-/ C	Influence on ethnic minorities and indigenous people is not expected. Tanzania has a multi-ethnic population with more than 125 different ethnic communities. Four of these, the Hadzabe, the Akie, the Maasai and the Barabaig, identify themselves as indigenous peoples. The majority of the indigenous peoples live in northern

Impact item		Assessment		Reason for the assessment and points of attention
		Planning/ Construction phase	Operation phase	
				Tanzania, in the Arusha and Manyara regions.
12	Cultural assets	C	C	Since the route will be selected with a view to averting cultural assets and so on, no impacts are anticipated, however, this is unclear at the present time. Details will be studied in the EIA and RAP study.
13	Landscape	B-	B-	Construction / Operation phase: It is anticipated that construction of transmission line will adversely affect the landscape.
14	Local economy, such as employment and means of livelihood	B-/B+	C	Construction phase: There is a possibility that the construction works will temporarily render farmland useless and cause means of livelihood to be lost. Implementation of the project will create employment for local workers. Operation phase: Following construction, it is possible that land can still be used as farmland, however, the impact of lost means of livelihood is unclear.
15	Utilization of land and local resources	B-	D	Construction phase: The construction works will temporarily render farmland and roads useless. Operation phase: No significant impacts are anticipated.
16	Use of water	D	D	Construction / Operation phase: No significant impacts are anticipated on the use of water.
17	Existing social infrastructure and social services	B-	B+	Construction phase: There is a possibility that the construction works will exert an impact on existing social infrastructure. Operation phase: It is expected that the stable supply of electric power will contribute to local economic development and improvement of local social infrastructure and social services.
18	Society-related capital and social organizations such as decision making organizations	B-/C	B-/C	It is not anticipated that serious impacts will be imparted on the local community.
19	Imbalance of harms and benefits	D	D	No particular impacts are anticipated in terms of imbalance of harms and benefits
20	Gender	B-/C	B-/C	The establishment of transmission line involves acquisition of land used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on gender perspective.
21	Children's rights	B-/C	B-/C	The establishment of transmission line involves acquisition of land used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on children's rights perspective.
22	HIV/ AIDS and other infections	B-	D	Construction phase: In view of the scale of the project construction and operations, there is a risk that HIV/ AIDS and other infections will arise due to the influx of labor from outside the area. Operation phase: No impacts are anticipated regarding HIV/ AIDS and other infections.
23	Working environment	B-/C	B-/C	Construction phase: It will be necessary to pay attention to the working environment for construction workers during the construction. Operation phase: There is a possibility that accidents will occur during maintenance work on the transmission line.
Others				
24	Accident preventive measures	B-/C	B-/C	Construction / Operation phase: There is a possibility that the transmission line system will be damaged by natural disasters such as flooding and strong winds.

Impact item	Assessment		Reason for the assessment and points of attention
	Planning/ Construction phase	Operation phase	
25 Cross-border impacts and climate change	D	D	It is not anticipated that impacts will be imparted on climate change.

Source: Prepared by JICA Study Team

Legend A+/- : Major positive / negative impacts are Projected
B+/- : A certain degree of positive / negative impacts are Projected
C : Impacts are unclear - further investigation is needed
D : No impacts are Projected

(2) Outline of the Environmental and Social Consideration Survey

The scope of the survey is a 10-kilometer radius of the project area. The survey items are as shown in in Table 12-47 and Table 12-48.

In identifying the mitigation measures, IFC EHS standards will be referred and such measures are to be considered to meet the standards. In addition, comparison with BAT standards⁹ is also considered.

**Table 12-47 Environmental and Social Survey Items for the Mtwara Power Plant
(including gas pipeline, access road)**

Environmental Item	Forecast/Assessment Method
Pollution/Contamination Countermeasures	
Air pollution	<ul style="list-style-type: none"> • Implement meteorological survey and a survey of ambient air quality survey. • Implement atmospheric dispersion modelling to project the dispersion of exhaust gases. • NOx emissions will meet the IFC EHS standards.
Water pollution	<ul style="list-style-type: none"> • Conduct measurement of the quality of water bodies including the Sudi Creek (Kisiwa Bay), and other nearby surface water to assess the impact by the project. • Conduct thermal discharge modelling to project the water temperature increase due to the cooling water discharge to the Sudi Creek (Kisiwa Bay).
Wastes	<ul style="list-style-type: none"> • Confirm quantities of construction wastes, industrial wastes and general wastes, final disposal locations and methods, and the capacity for conducting final disposal. • Waste management plan will be established based on the confirmed general waste and hazardous waste as a part of EIA.
Soil pollution	<ul style="list-style-type: none"> • Review the geological structure and assess impacts based on the past boring data.
Noise/ vibration	<ul style="list-style-type: none"> • Conduct ambient noise level at the project site and the potential receptors. • Project noise levels using the noise model. • Assess impacts through surveying existing materials and similar cases.
Natural environment	
Ecosystem	<ul style="list-style-type: none"> • Based on the literature review, field survey, and consultations with related agencies, identify the habitats in and around the project site that are vulnerable to impacts. • Assess potential impacts through surveying existing materials and similar cases. • Conduct consultation with Tanzania Forest Service (TFS) to identify the necessary mitigation

9 http://www.meti.go.jp/policy/safety_security/industrial_safety/sangyo/electric/detail/bat_20140501.html

Environmental Item	Forecast/Assessment Method
	measures to be taken in relation to clearing the vegetation such as mangrove. (Reforestation as a compensation to vegetation clearing is to be instructed by TFS depending on the extent of vegetation clearing.)
Ecosystem	• Interview with NGO such as WWW Tanzania, and experts from University of Dar es Salaam will be conducted to have their view on mangrove and wild life habitat.
Water environment	• Scrutinize construction plans and water channel plans, and forecast impacts based on the results of field survey, existing materials and consultations at related agencies.
Topography and geology	• Scrutinize engineering and construction plans in the project site and assess the potential impacts based on the results of field survey, existing materials.
Social environment	
Involuntary resettlement of residents	<ul style="list-style-type: none"> • Conduct field survey and review existing materials. • Conduct consultations with the agencies that conduct land acquisition. • Conduct consultations with the project affected households. • Survey the contents of compensation made to the project affected households. • If there are any discrepancies with the JICA guidelines, prepare a collective action plan. • Prepare the Resettlement Policy Framework (RPF) • Confirm TPDC's land acquisition plan for the gas pipeline between BVS01 and Mtwara power plant.
Poor people	<ul style="list-style-type: none"> • Review social statistical resources of the target area and conduct consultations with the local residents. • Based on the results of survey with the project affected residents, assess the potential impacts on the livelihoods of poor people. • Conduct focused group discussion (FGD) with vulnerable groups including women.
Ethnic minorities and indigenous people	<ul style="list-style-type: none"> • Review social statistical resources of the target area and conduct consultations with the local residents. • Based on the results of survey with the impacted residents, assess the potential impacts on ethnic minorities and indigenous people.
Landscape	• Review the project plan and assess the impacts based on the field survey results.
Local economy, such as employment and means of livelihood	<ul style="list-style-type: none"> • Review social statistical resources of the target area and conduct consultations with the local residents. • Based on the results of survey with the affected residents, assess the impacts. • Confirm the associated impact on local livelihood by the establishment of gas pipeline by TPDC as well as transportation route.
Utilization of land and local resources	• Based on the field survey, investigation of existing materials and similar cases, and consultations with local residents and related agencies.
Use of water	• Review the water use plan during construction and Operation phase, and assess the potential impacts on water use in the project area.
Existing social infrastructure and social services	• Based on the field survey, investigation of existing materials, consultations with local residents and related agencies, and assess the potential impacts.
Imbalance of harms and benefits	• Based on the field survey, investigation of existing materials, and consultations with local residents and related agencies, assess the potential impacts.
HIV/ AIDS and other infections	• Review statistical resources concerning infectious diseases and conduct consultations with current works officials to assess the potential impacts.
Working environment (including work safety)	• Based on scrutiny of the legal systems that are applicable to the Project, field surveys and consultations with current works officials, assess the potential impacts.
Others	
Accidents	• Review the engineering of the plant assess the potential impacts.
Cross-border impacts and climate change	• Calculate the atmospheric emissions and assess the potential impacts.

Source: Prepared by JICA Study Team

Table 12-48 Environmental and Social Survey Items for the 400kV Transmission Line

Environmental item	Method for confirming environmental and social considerations
Pollution/contamination Countermeasures	
Air pollution	<ul style="list-style-type: none"> Confirm the air pollution mitigation measures during construction.
Water pollution	<ul style="list-style-type: none"> Confirm the water pollution prevention measures during construction. Review the project plan, existing materials and similar cases to confirm the degree of impacts.
Noise/ vibration	<ul style="list-style-type: none"> Confirm the noise countermeasures during construction.
Waste	<ul style="list-style-type: none"> Waste management plan will be established based on the confirmed general waste and hazardous waste as a part of EIA.
Natural environment	
Nature reserve	<ul style="list-style-type: none"> Review existing materials and confirm that impacts on nature reserves will be averted and/or mitigated.
Ecosystem	<ul style="list-style-type: none"> Identify habitats around the transmission line route that are vulnerable to impacts via review of literature, field survey and consultations at related agencies. Survey existing materials and similar cases to confirm the degree of impacts and mitigation measures. Conduct consultation with Tanzania Forest Service (TFS) to identify the necessary mitigation measures to be taken in relation to clearing the vegetation such as mangrove. (Reforestation as a compensation to vegetation clearing is to be instructed by TFS depending on the extent of vegetation clearing. Interview with NGO such as WWW Tanzania, and experts from University of Dar es Salaam will be conducted to have their view on mangrove and wild life habitat.
Water environment	<ul style="list-style-type: none"> Review the project plan and confirm the degree of impacts and mitigation measures based on existing materials and consultations at related agencies, particularly in the case where a route that crosses rivers or wetland area.
Topography and geology	<ul style="list-style-type: none"> Confirm the degree of impacts and mitigation measures based on the project plan and investigation of existing materials.
Social environment	
Involuntary resettlement of residents	<ul style="list-style-type: none"> Conduct field survey and investigation of existing materials to confirm whether or not there will be involuntary resettlement of residents. Confirm and organize land use conditions. Confirm the land acquisition proponent and land acquisition procedures. Prepare the Resettlement Policy Framework (RPF)
Poor people	<ul style="list-style-type: none"> Conduct field survey and review existing materials to confirm whether or not poor people live in impacted areas and organize the findings. Conduct focused group discussion (FGD) with vulnerable groups including women.
Ethnic minorities and indigenous people	<ul style="list-style-type: none"> Conduct field survey and review existing materials to confirm whether or not ethnic minorities and indigenous people live in impacted areas and organize the findings.
Landscape	<ul style="list-style-type: none"> Review the project plan and results of field survey to confirm the degree of impacts.
Local economy, such as employment and means of livelihood	<ul style="list-style-type: none"> Conduct field survey and review existing materials to confirm whether or not there will be temporary loss of means of livelihood and organize the findings.
Utilization of land and local resources	<ul style="list-style-type: none"> Conduct field survey and review existing materials to confirm impacts caused by temporary changes in land use and organize the findings.
Existing social infrastructure and social services	<ul style="list-style-type: none"> Conduct field survey and review existing materials to confirm impacts caused by the construction works on social infrastructure and organize the findings.
HIV/ AIDS and other infections	<ul style="list-style-type: none"> Review statistical materials concerning infectious diseases and conduct consultations with existing works officials to confirm the degree of impacts.
Working environment (including work safety)	<ul style="list-style-type: none"> Survey existing materials and similar cases to confirm the degree of impacts.
Others	
Accidents	<ul style="list-style-type: none"> Conduct field survey and investigation of existing materials to confirm the degree of impacts.

Source: Prepared by JICA Study Team

12.1.6 Result of Survey

(1) Summary result of survey

The following section described summary result of survey. Table 12-49 and Table 12-50 shows surveyed items and result of survey. Some result of survey were described in the following sub-headings for further explanation.

**Table 12-49 Summary of Survey Result for the Mtwara Power Plant
(including gas pipeline, access road)**

Environmental Item	Survey result
Pollution/Contamination Countermeasures	
Air pollution	<p>Construction phase: Air sensitive receptors are located at a distance of more than 2km from the construction site. Measured concentrations of NOx gases in the Project Site were below the detection limit (BDL).</p> <p>Operation phase: Air quality modelling was conducted and detail of it was described in 1) of Section 12.1.6 below. Based on the results, 1-hour and annual NO₂ impacts arising from the combined cycle operation of the Project at the identified ASRs (Air sensitive receptors) have been predicted to be low and well below the applicable air quality standards.</p>
Water pollution	<p>Construction phase: The construction site is located beside Sudi Creek (Kisiwa Bay) which is currently being used as a fishing site by local villagers. Workers (approximately 1,100 people per day during peak period) will be accommodated in a worker camp adjacent to the site, and sanitary wastewater streams from the workers could potentially impact surface water. In addition, construction activities could cause runoff of unconsolidated sediments during rainfall and wastewater may also be generated from washing of equipment and machinery on site, as well as from the concrete batching plant.</p> <p>Operation phase: Thermal water discharge modelling was conducted and detail of it was described in 2) of Section 12.1.6 below. According to the modelling results, the temperature rise due to the thermal discharge is limited by the river creek and will generally disperse slowly out of the creek under the influence of tidal current (as well as river discharge in wet season). This temperature rise is likely to be evident near surface level and becomes less evident in mid-depth level. Also, the area with increase in water temperature, which exceeds the proposed assessment criterion of 3°C (IFC EHS Guidelines), mostly occurs near surface and could reach up to about 500 m away from the outfall (mixing zone). Therefore, the impact of thermal water discharge on marine ecology will be limited to the vicinity of the outfall structure where no endangered species and no sensitive species such as coral reefs are identified within Sudi Creek.</p>
Wastes	<p>Construction phase: Aside from excavated soil (approximately 340,000m³), cleared vegetation, and general wastes (primarily from workers) will be generated. The excavated soil will be utilized as filling material within the site. Other solid wastes would include general waste will be generated from construction activities. There is a certified waste management company in Mtwara area that can handle both general and hazardous waste.</p> <p>Operation phase: Wastes from power plant operation include waste oil, sewage sludge and general wastes.</p>
Soil pollution	<p>Construction phase: The site is a greenfield site. Risk to soil pollution will depend on chemical/material handling and storage. Heavy oil is expected to be used by the power generators.</p> <p>Operation phase: Risk to soil pollution will depend on chemical/material handling and storage. In the operation phase, only natural gas will be used for power generation fuel. No oil will be used for generation fuel.</p>
Noise and vibration	<p>Construction phase: Noise sensitive receptors are located at a distance of more than 2km from the construction site. Result of noise prediction shows that the noise levels at sensitive noise receptors both in Kisiwa and Namgogoli village will comply with the IFC standards (55 dB(A) for Daytime 7:00-22:00 and 45dB(A) for Night time 22:00-7:00) and Tanzanian standards (50dB(A) for Daytime 6:00-22:00).</p>

Environmental Item	Survey result
	<p>Operation phase: Noise modelling was conducted and detail of it was described in of Section 12.1.6 below. Based on the results, it is estimated that noise from the power plant will be 32dB at Kisiwa Village and 24dB at Namgogoli Village. These values are below noise limits for residential area during daytime (50dB) and night time (35dB), set by the Tanzania National Environmental Standards.</p>
Natural environment	
Ecosystem	<p>Construction phase: The Project Site is not located within or close to any protected area or ecologically sensitive area. The Project Site consists mainly of coastal thickets and mangrove vegetation. The Project would require clearing of mangrove area (less than 200m²) along the coast to give way to the outfall pipeline. The Project will be required to obtain a permit prior to clearing mangrove area.</p> <p>Operation phase:</p> <ul style="list-style-type: none"> Fishes are found within Sudi Creek (Kisiwa Bay) but the sea bottom is generally devoid of visible living fauna/flora. On the contrary, a thriving marine environment with occasional sightings of some marine mammals, have been observed outside the mouth of Sudi Creek (Kisiwa Bay). There are no live corals observed at Kisiwa (inside Sudi Creek), probably due to low dissolved oxygen levels and high turbidity of the water in the area. Marine mammals are not found inside Sudi Creek. Also, there are no known turtle nesting sites in the vicinity of the project area. Marine fishes are found inside and outside (near the mouth of) Sudi Creek. However, none of these species is considered to be endangered or threatened. Most of the species have a conservation status of least concern.
Hydrology	<p>Construction phase: Alteration in the shape and quality of the land may affect the drainage pattern to some extent</p> <p>Operation phase: Presence of the power plant will lessen infiltration of storm water in the area.</p>
Topography and geology	<p>Construction phase: The Project Site is characterized by a gentle slope land and is approximately 0 m to 30 m above sea level. Levelling of the area will be required to build the power plant complex.</p>
Social environment	
Involuntary resettlement of residents	Result of survey was described in Section 12.2.
Poverty	Result of survey was described in Section 12.2.
Ethnic minorities and indigenous people	In Mtwara Region, the most dominant group is the Makonde, which made 60% of the population, followed by the Makua and the Yao and there is no indigenous group.
Cultural heritage	A family graveyard, consisting of over 40 graves, is located in between the nose and the Project Site. The graveyard is crossed or rather bisected by the intake port channel. It also contains a ritualistic Baobab tree. The relatives desire not to relocate the family graveyard. Also, certain parts of the Project Site used to be an archaeological excavation and study site, where Rich Iron Age pottery have been discovered. However, this area is not designated as a cultural heritage site under the Antiquities Act of 1979. There is also no cultural and historical site in the site. According to the Kisiwa village chairman, the historical site in Kisiwa village is located north of the Kisiwa site.
Landscape	There are no areas within the Project Site with significant landscape/scenic values.
Local economy, such as employment and means of livelihood	<p>Before and during Construction:</p> <ul style="list-style-type: none"> It is found that Kisiwa villagers have multiple landing sites including the one with the fish market and they will lose one of them. TANESCO arranged a meeting between Kisiwa village leader and Mgao village leader and confirmed the use of Mgao beach as a landing site to keep access to fish market in Mgao. Sudi Creek (Kisiwa Bay) is mainly being used by fishermen in the nearby villages. A few number of small handmade wooden fishing boats can be seen in the area. The landing area close to the project site is used as a main dock for these small boats. Since the landing area within Sudi Creek (Kisiwa Bay) will be acquired and used by TANESCO, fishermen will have to seek the use of other landing sites or fishing areas. It is highly unlikely that boats from outside use Sudi Creek (Kisiwa Bay) for fishing because the marine ecosystem is more thriving outside Sudi Creek (Kisiwa Bay). Since fishery is conducted mainly outside Sudi

Environmental Item	Survey result
	<p>Creek (Kisiwa Bay), no significant impact is expected on fishery.</p> <ul style="list-style-type: none"> Affected local communities may need to change their livelihood. At the same time, there is a possibility that employees involved in the construction continue to be hired, and new job opportunities for local communities may be created. There might be some influence on livelihood and daily life due to the project transportation along the transportation route such as disturbance of livelihood activities. Details will be confirmed in the further study. Approximately more than 1,000 workers will be employed during the peak of construction. There will be increased opportunities for local businesses. <p>Operation phase: Job opportunities will increase through this project. Furthermore, the project may contribute to the development of a local economy through a stable power supply</p>
Utilization of land and local resources	<p>Construction / Operation phase:</p> <ul style="list-style-type: none"> 160ha of land will be acquired by TANESCO and will be used for power plant complex. Farming area within the acquired land will be lost. Within this 160ha area for the power plant complex, approximately 10 ha is expected to be used for the proposed Mtwara power plant. Rest of the area is expected to be used for future development of other power plants and TANESCO's regional base in the southern area of Tanzania.
Use of water	<p>Construction phase: Local communities around the project site use groundwater. Considering the topographic conditions, there is very little chance that the project will influence those wells.</p> <p>Operation phase: Cooling water is expected to be withdrawn from the Sudi Creek (Kisiwa Bay). The Project would require approximately 300m³/day of water supply during operation. The proposed process water supply will be provided by the Mtwara Urban Water Supply and Sewerage Authority (MTUWASA) and they confirmed that the current and planned wells in the area will be more than sufficient to supply Project requirements and water demand in Kisiwa village.</p>
Existing social infrastructure and social services	<p>Construction phase: Existing roads and tracks will be used for material transport. There is a need to upgrade and widen existing roads and build a new access road.</p>
Social capital and social organizations such as decision making organizations	<p>The villages close to the Project Site are Kisiwa Village and Namgogoli Village, which are located at approximately 2-4km away. The social organization such as decision making organization will not be affected.</p>
Imbalance of harms and benefits	<p>There were no concerns raised on imbalance of harms and benefits in the stakeholder consultations. This project considers the power supply for Mtwara region</p>
Gender	<p>Relocations and livelihood restoration due to the land acquisition might have some influence on gender perspective. During the Focus Group Discussion with the project affected women, the concern about the use of fish pond was raised since they will lose access to the fish pond. This issue is addressed in the RAP as identification of alternative fish pond site and compensation for the loss of the fish pond.</p>
Children's rights	<p>Relocations and livelihood restoration due to the land acquisition might have some influence on children's rights perspective. However, risk of child labor is considered to be low.</p>
HIV/ AIDS and other infections	<p>Construction phase: More than 1,000 workers are expected during the peak of construction. The influx of people to the village will influence the change of behaviour of some members in the community due to the interaction of people with different lifestyles and behaviour. This may increase the chances of infection of diseases including HIV/AIDS and Sexual Transmission Diseases (STDs).</p> <p>According to TANZANIA COMMISSION FOR AIDS (TACAIDS), the following are recommended.</p> <ul style="list-style-type: none"> Typically, HIV prevention program consists of distribution of condoms, awareness promotion, counselling and testing. Awareness promotion should be done by BCC (Behavior Change Communication), Peer Education activities and other various ways. It is better to include the local communities as a target group, but no need to include sex workers and drug users, because those groups are managed by the relevant authorities. Counselling and testing should be done by Provincial Medical Director and/or officials in

Environmental Item	Survey result
	<p>charge of HIV.</p> <ul style="list-style-type: none"> It is important communicate with regional TACAIDS.
Working environment (including work safety)	<p>Construction phase & Operation phase:</p> <ul style="list-style-type: none"> The construction workers will be exposed to noise, dust, vibration at source and other occupational hazards related to site preparation and construction works. During operation phase, it is anticipated that approximately 80-90 people will be employed as full-time employees. These workers, particularly those who will be engaged in the operation of equipment and handling of chemicals and other hazardous substances will be exposed in health and safety hazards (e.g. exposure to noise and chemicals). Implementation of TANESCO's Health, Safety and Environmental Guidelines as well as compliance with other safe guard principles and guidelines issued by financier of a particular project will be mandatory.
Others	
Accidents	<p>Construction phase & Operation phase:</p> <ul style="list-style-type: none"> The transport of workers and goods to and from the Project site would impact traffic conditions. Heavy cargo will be transported via main road. Marine transport for transporting heavy equipment is expected during construction phase. With an increase in vehicles, particularly heavy haulage vehicles, comes the increased potential for accidents and inquiries to occur. This is exacerbated by the fact that people living in the local villages typically reside immediately adjacent to roads. Villagers are not accustomed to the presence of large vehicles and heavy traffic. Implementation of TANESCO's Health, Safety and Environmental Guidelines as well as compliance with other safe guard principles and guidelines issued by financier of a particular project will be mandatory. Sudi Creek (Kisiwa Bay) is mainly being used by fishermen in the nearby villages. A few number of small handmade wooden fishing boats can be seen in the area. The landing area close to the project site is used as a main dock for these small boats.
Cross-border impacts and climate change	<p>Operation phase:</p> <ul style="list-style-type: none"> To determine the GHG emission reduction of Project, the methodology from JICA Climate-FIT Version 2.0 for Thermal Power Generation/ Fuel Efficiency Improvement, was adopted. GHG emission reduction of the Project (ERy) is calculated by getting the difference between GHG emissions of a plant with the same electricity generation as the project but uses current technology/facility (Baseline Scenario, BEy) and GHG emission of the Project using its fuel consumption (Project Scenario, PEy). The estimated annual emission reduction of the Project is approximately 423,632 t-CO₂/yr. This is equivalent to approximately 0.3% of the 10% GHG emission reduction target (138MtCO₂e – lower limit), stipulated in Tanzania's INDC.

Source: Prepared by JICA Study Team

Table 12-50 Summary of Survey Result for the 400kV Transmission Line between Mtwara and Somanga

Environmental Item	Survey result
Pollution/Contamination Countermeasures	
Air pollution	<p>Construction phase: Impact on air quality may be potentially caused by the construction activities such as site clearance, site formation and levelling involving excavation and backfilling, and construction of substations and transmission towers. Sand and fine particles may fly up by those activities.</p>
Water pollution	<p>Construction phase: The proposed transmission line route will cross numerous rivers. Workers (approximately 1,800 people per day during peak period) will be accommodated in a worker camp adjacent to the site, and sanitary wastewater streams from the workers could potentially impact surface water. In addition, construction activities could cause runoff of unconsolidated sediments during rainfall and wastewater may also be generated from washing of equipment and machinery on site, as well as from the concrete batching plant.</p>

Environmental Item	Survey result
Noise and vibration	Construction phase: In some locations, work will be done in close proximity to residences or farms located along the ROW. Traffic, as well as the use of construction equipment and machinery, will result in temporary noise emissions. Other than in urbanized areas, there has been minimal noise stress in the project areas prior to the construction.
Waste	Construction phase: Majority of wastes that will be generated during construction will be general wastes and a small portion will be hazardous (e.g. engine oils, hydraulic fluids, waste fuel, spent solvents spent batteries).
Natural environment	
Ecosystem	<p>Construction phase:</p> <ul style="list-style-type: none"> The project is expected to involve acquisition of a wayleave corridor land for the construction of a 400 kV transmission line between Mtwara and Somanga. The planned transmission line (about 270 km) with 52 meter standard width of wayleave (Right-of-Way). However, the proposed transmission line route does not pass the nature reserves including forest reserve designated under Tanzanian law. However, there are some forest reserves and Important Bird Areas (IBAs) located around the proposed route. There is one breeding site of Spotted Ground Thrush (EN) about 7km away from the transmission line and installation of marks/reflectors will be made based on the detailed study. Some trees and fruit trees within the PAP's land may be removed in establishment of the transmission line. Approximately 22 months is adopted as the construction period of the 400kV Transmission Line from Mtwara to Somanga (about 270km) subject to 3 divisions of the transmission line. <p>Operation phase:</p> <ul style="list-style-type: none"> An endangered bird species which has breeding sites in Lindi District Coastal Forest (recognized as an important bird area and key biodiversity area) have been identified. The Spotted Ground-thrush (EN), which is a full migratory bird, has a breeding site, approximately 7km from the proposed transmission line route. The Spotted Ground Thrush has a wide but discontinuous distribution. The breeding ground of this population occurs in some of the Tanzanian coastal forests and probably northern Mozambique. It is confined to the coastal forests. The Rondo Plateau and Litipo Forests reserves are the breeding sites for the East African population of the species, and the bird is a regular passage migrant through the coastal forests of Pande and Dondwe, and those of Kisarawe District. Also an elephant corridor between Kilanjilangi village and Mtandi has been identified, although no signs of elephants were recorded during the field survey.
Hydrology	There is no possibility that the river flow will be temporarily and partially altered by the construction and operation since the transmission towers will not be built in such a way.
Topography and geology	Construction / Operation phase: There is no possibility that slope failure or landslide will occur since the transmission towers will not be built in such a way.
Social environment	
Involuntary resettlement of residents	Result of survey was described in Section 12.2.
Poverty	Result of survey was described in Section 12.2.
Ethnic minorities and indigenous people	In Mtwara Region, the most dominant group is the Makonde, which made 60% of the population, followed by the Makua and the Yao and there is no indigenous group.
Cultural heritage	Cultural heritage sites along the transmission line include graveyards and/ or ritualistic sites in Mandawa and Mandangwa villages, archaeological sites in Mahumbika and Kitomanga, and archaeological site test pits (STPs). None of these are designated as a cultural heritage site under the Antiquities Act of 1979.
Landscape	In Mtwara Region, one antiquities site is listed by the Ministry of Natural Resources and Tourism (MNRT), which is Mikindani Historic Town. The project site is located approximately 10km from this historical town, thus it is unlikely to affect landscape values of the heritage site. There are no areas within the Project Site with significant landscape/ scenic values.
Local economy, such as employment and means of livelihood	<p>Construction phase: Around 100,000 workers in cumulative total number are expected during the construction. During the peak period of construction, around 100 to 200 workers on daily basis would be required. There will be increased opportunities for local businesses. However, some livelihood will be lost due to land acquisition of the project site</p> <p>Operation phase: The wayleave of the transmission line will be cleared, maintained and will not be available for agricultural use.</p>

Environmental Item	Survey result
Utilization of land and local resources	Construction phase: Agricultural areas need to be acquired.
Existing social infrastructure and social services	Construction phase: A football ground used by the pupils at Mirumba village in Kilwa district might be affected. The discussion with school management revealed the land was allocated by village government to be used as a playing ground for the Mirumba primary school pupils. It is be considered to avoid during the course of the detail determination of route alignment after this JICA study.
Social capital and social organizations such as decision making organizations	Existing villages will be avoided by the transmission line. Impact on existing social capital and organization will not be significant.
Imbalance of harms and benefits	No particular concerns were raised regarding imbalance of harms and benefits at the stakeholder meetings.
Gender	Relocations and livelihood restoration due to the land acquisition might have some influence on gender perspective. During the Focus Group Discussion with the project affected women, concerns about HIV, STDs, Security due to the influx of construction workers, loss of farmland and cashew nuts trees, employment opportunities during construction, grievance mechanism were raised. TANESCO assured that it will properly deal with these issues as described in the RAP and EIA.
Children's rights	Relocations and livelihood restoration due to the land acquisition might have some influence on children's rights perspective. According to Bureau of International Labor Affairs, U.S. Department of Labor (2018) ¹⁰ , majority of child labor in Tanzania is mainly in agricultural sector (94.1%) and child labor in industry sector including quarrying, mining, manufacturing and construction consisted only 1%. Therefore, child labor risk of the Project is considered to be low.
HIV/ AIDS and other infections	<p>Construction phase:</p> <ul style="list-style-type: none"> • Around 100,000 workers in cumulative total number are expected during the construction. During the peak period of construction, around 100 to 200 workers on daily basis would be required. Since the transmission line construction will occur on a rolling section-by-section basis and construction site moves along the route as it proceeds, temporary demographic changes during construction are not likely to be significant. • Influx of workers may increase risks to infectious diseases including HIV/ AIDS although the construction team is likely to remain in contact with the local area for a short time. <p>Operation phase: The number of workers that will be employed during operation of the transmission line and substations will be very limited compared to during construction phase. Therefore, the risks to infectious diseases including HIV/ AIDS is low.</p>
Working environment (including work safety)	<p>Construction phase & Operation phase:</p> <ul style="list-style-type: none"> • The construction workers will be exposed to noise, dust, vibration at source and other occupational hazards related to site preparation and construction works. In particular, the construction of transmission towers would require work at considerable heights. • During operation phase, it is anticipated that approximately 50 people will be employed. These workers, particularly those who will be engaged in the maintenance of substations, ROW, and inspection of transmission lines and towers will be exposed in health and safety hazards (e.g. exposure to high voltage facilities). • Implementation of TANESCO's Health, Safety and Environmental Guidelines as well as compliance with other safe guard principles and guidelines issued by financier of a particular project will be mandatory.
Others	
Accidents	<p>Construction phase & Operation phase:</p> <ul style="list-style-type: none"> • During the construction phase, the transport of workers and goods to and from the Project site will also impact traffic conditions. Heavy cargo will be transported via main road. With an increase in vehicles, particularly heavy haulage vehicles, comes the increased potential for accidents and inquiries to occur. • During operation phase, there are safety issues with the establishment of new infrastructure such as community members being in contact with transmission towers and substations. There is a risk of non-workers wandering into project site (e.g. transmission towers and substations) and being exposed to the hazards and knowledge of the dangers of these sites. This can lead

¹⁰ "2018 Findings on the Worst Forms of Child Labor" Bureau of International Labor Affairs, U.S. Department of Labor (2018) https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2018/Tanzania.pdf (Accessed on 16th December 2019)

Environmental Item	Survey result
	<p>to onsite accidents and injuries.</p> <ul style="list-style-type: none"> Implementation of TANESCO's Health, Safety and Environmental Guidelines as well as compliance with other safe guard principles and guidelines issued by financier of a particular project will be mandatory.

Source: Prepared by JICA Study Team

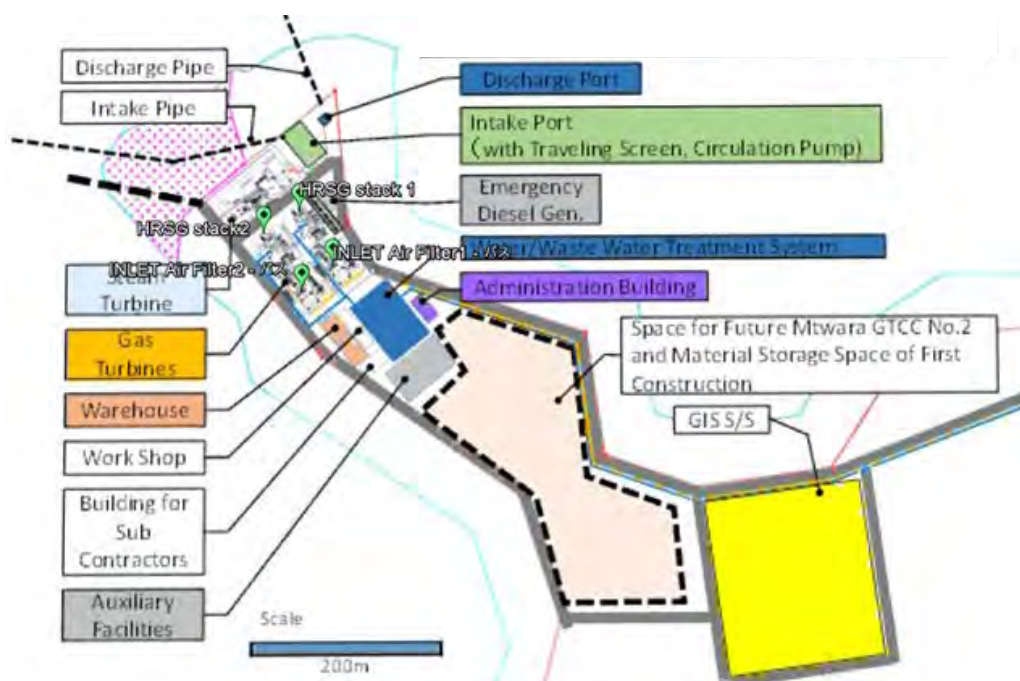
(2) Detailed survey result

1) Air Quality modelling

The potential air quality impacts arising from the Project during the operation phase have been predicted to be negligible relative to the relevant WHO Ambient Air Quality Guidelines as recommended in the IFC Guidelines and the Tanzania air quality standard. It should be noted that the baseline data are all below detection limit. The significance of impact during the operation phase of the Project would be considered negligible even if the background concentration were taken into account, given the remoteness. No significant adverse air quality impact during the operation phase is anticipated. The projection results are described as follows.

The key emission source associated with the operation of the Project is stack emissions from the combustion of natural gas during combined cycle and simple cycle operation. The key air pollutant of concern is NO₂.

The Project consists of two sets of gas turbine generating units and heat recovery steam generators (HRSG). The Project will be designed to operate continuously throughout the year in either simple cycle or combine cycle mode. Each set of gas turbine and HRSG is equipped with one bypass stack for simple cycle mode and one main stack for combined cycle mode. The stack locations are shown in Figure 12-41 (refer to green tags).



Source: JICA Study Team, 2018

Figure 12-41 Location of Stacks

The contributions of stack emissions from the Project during operation phase have been quantitatively assessed using an air dispersion model, AERMOD (version 18081)¹¹. The modelling input data for the main stacks and bypass stacks are presented in Table 12-51.

Table 12-51 Point Source Emission Inventory

Input Parameter	HRS Main Stacks	Bypass Stacks
Operation mode	Combined-cycle	Simple-cycle
Number of stacks	2	2
Coordinates of stack (X, Y)	11_MS: 608462, 8874336 12_MS: 608424, 8874312	11_BS: 608484, 8874311 12_BS: 608450, 8874284
Stack height (m above ground)	40	40
Diameter of each stack (m)	5	5
Flue gas exit temperature (°C)	87.75	541.9
Flue gas exit velocity - wet (m/s)	35.7	36.1
Flue gas exit flow rate under operating condition (m ³ /hr)	2.52 × 10 ⁶	2.55 × 10 ⁶
NO _x Emission rate (per stack) (@ 15% O ₂)(g/s)	24.9 ppm (@ 15% O ₂)	24.9ppm (@ 15% O ₂)

Source: JICA Study Team, 2018

As the representative ASRs are generally low-rise village houses, ground level concentrations (GLCs) at 1.5m above ground (breathing level of human receptors) of these ASRs have been modelled. These ASRs, which are residents in Kisiwa and Namgogoli Villages, are located 2-3km from the project site (refer to blue dots in Figure 12-62).

For the purpose of this assessment, it was assumed that either combined cycle or simple cycle mode will be operated continuously throughout the year. Main stacks and bypass stacks will not be operational concurrently.

NO₂ is assumed to be 50% of NO_x for short-term averages (i.e., hourly and daily averaged) and 100% of NO_x for long-term average (annual average) as a conservative approach. This assumption made reference to the air quality modelling guidelines recommended by the *Air Quality Modelling and Assessment Unit of UK Environmental Agency* ⁽¹²⁾.

Quantitative assessment has been conducted for stack emissions of NO₂ at the identified air sensitive receptors and the area within 10km from the centre of the stack locations.

The 1-hour and annual NO₂ impacts arising from the combined cycle operation of the Project at the identified ASRs have been predicted to be low and well below the relevant air quality standards as shown in Table 12-52. The highest project contribution at the ASRs is about 4% of the relevant air quality standard (1-hour average NO₂).

Contour plots of maximum 1-hour average and annual average NO₂ concentrations at ground

¹¹ AERMOD is an internationally recognized model, and is one of the preferred and recommended models of the US Environmental Protection Agency (US EPA).

¹² UK EA, Air Modelling Guidelines on conversion ratio for NO_x to NO₂ : http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for_NOx_and_NO2_.pdf

level for the five assessment years (i.e. 2013 to 2017) under combined cycle operation are shown in Figure 12-42 and Figure 12-43. The highest project contribution at off-site locations that are not existing ASRs within an area of 10km from the Project site is about 35ug/m³ (1-hour average NO₂), which is about 17.5% of the relevant air quality standard.



Source: JICA Study Team, 2018

Figure 12-42 NO2 Concentration Dispersion (1-Hr Ave)



Source: JICA Study Team, 2018

Figure 12-43 NO₂ Concentration Dispersion (Annual Ave)

Table 12-52 Predicted Maximum Ground Level Concentrations at Representative Air Sensitive Receptors (ASR) during Combined Cycle and Simple Cycle Operation (Project Only)

ASR	Description	Maximum Ground Level Concentration ($\mu\text{g m}^{-3}$)							
		Combined Cycle Operation				Simple Cycle Operation			
		International Standards		Tanzania Standards		International Standards		Tanzania Standards	
		Max 1-hr NO ₂	Annual NO ₂	Max 8-hr NO _x	Max 24-hr NO _x	Max 1-hr NO ₂	Annual NO ₂	Max 8-hr NO _x	Max 24-hr NO _x
ASR1	Kisiwa Village	7.69	0.04	2.09	0.75	2.02	0.02	1.14	0.40
ASR2	Namgogoli Village	5.78	0.05	3.89	1.53	1.81	0.02	0.66	0.28
Assessment Criteria		200	40	120	150	200	40	120	150
Max % of Project contribution to criteria		3.85%	0.12%	3.24%	1.02%	1.01%	0.05%	0.95%	0.27%

Source: Prepared by JICA Study Team

2) Thermal water discharge modelling

The modeling for onshore thermal discharge operations was performed using the hydrodynamic 3-D surface water modeling software, DELFT3D, to compute the hydrodynamics of the site and the dispersion of thermal discharge from onshore facilities. DELFT3D is driven primarily by tidal boundary condition from the predicted water level from the TOPEX/Poseidon Global Inverse Solution.

Data for simulation and field measurement

Data consist of followings were collected to set up the hydrodynamic model.

- Bathymetry and shoreline data
- Meteorological conditions, tidal elevation and current data
- Cooling water effluent discharge location and configuration, flow rates, discharge temperature and discharge salinity

Major data / information for the modelling exercise and the potential sources are summarized below.

Table 12-53 Data Sources for Thermal Discharge Modelling

Data / Information	Source
Bathymetry	Field measurement in the Sudi Creek (Kisiwa Bay) by JICA Study Team The bathymetric data developed by the Tanzania Port Authority (TPA)
Coastline	Based map provided from the Institute of Marine Science of University of Dar es Salaam (USDM)
Meteorology Data	Tanzania Meteorological Agency
Tide conditions	Field measurement in the Sudi Creek (Kisiwa Bay) by JICA Study Team Harmonic tide components derived from the TOPEX/Poseidon Global Inverse Solution Model
Salinity and water temperature	Field measurement in the Sudi Creek (Kisiwa Bay) by JICA Study Team Hybrid Coordinate Ocean Model (HYCOM)
Current velocity and direction	Field measurement in the Sudi Creek (Kisiwa Bay) by JICA Study Team
Effluent temperature and flow rate	JICA Study Team
Outfall and intake location, depth and design	JICA Study Team

In order to set-up the hydrodynamic model, field measurement was conducted at three locations as shown in the Table below.

Table 12-54 Location and Depth of Analysis Points

Location	Location: UTM (Arc1960)		Sensor height from sea bed (tide level and current, temperature, salinity)
	Easting	Northing	
Mgao point	607403	8880151	0.7 meter
Kisiwa point	607900	8874340	0.7 meter
Namgogoli point	608044	8873051	0.7 meter

The result of the measurement of tidal level is as shown in Figure 12-44.

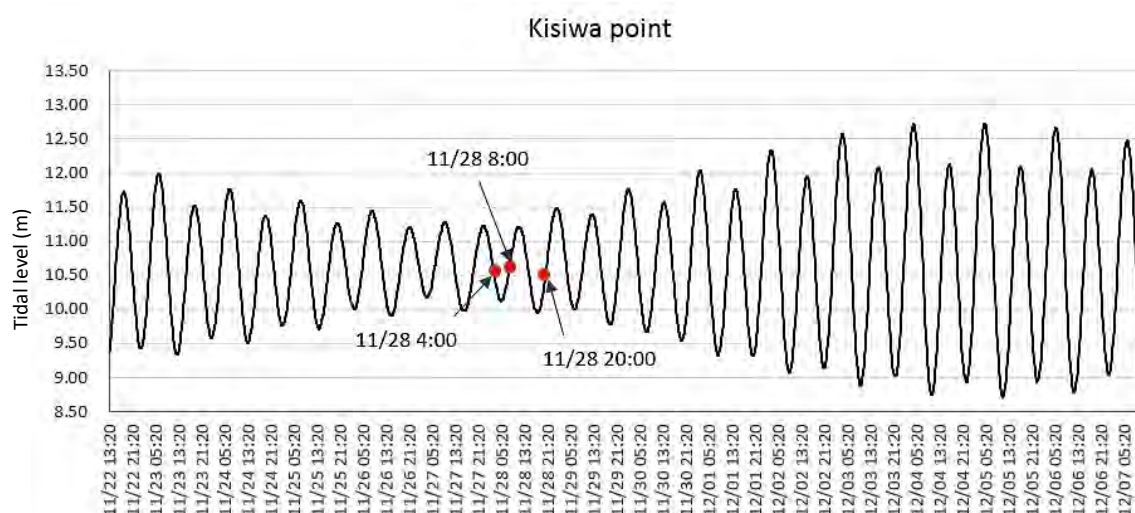


Figure 12-44 Tidal Measurements at Kisiwa Point

Model construction

Delft3D with CORMIX, which is also referred by IFC EHS Guidelines, was used to compute the hydrodynamics of the site and the dispersion of thermal discharge from onshore facilities. The baseline model is tidally-driven based on harmonic tide info extracted from the Water Level (WL) survey data from Mgao.

The modelled water level match well with the surveyed water level at all three locations (Figure 12-45).

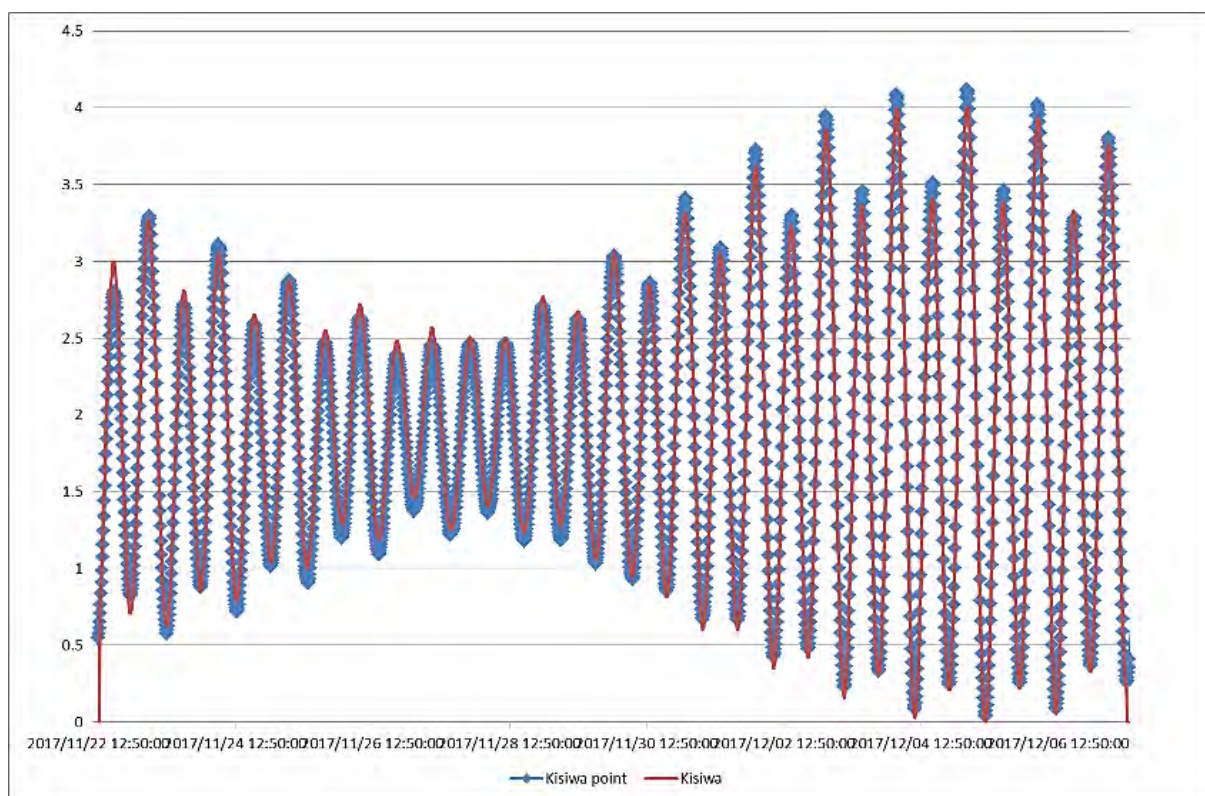


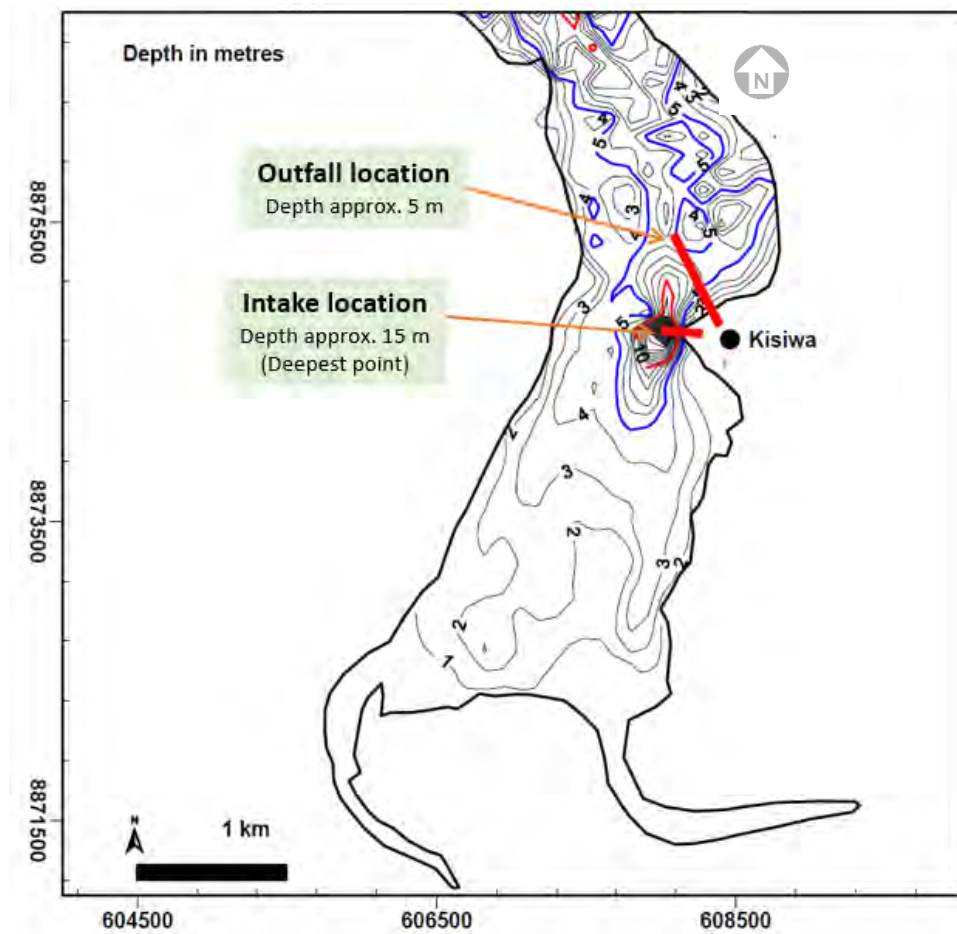
Figure 12-45 Modelled (Blue) vs. Surveyed (Red) Water Level at Kisiwa Point

The modelled current velocity matches quite well with survey data at low current velocity. Discrepancy with field measurement arises as current velocity increases. This is expected to be a result of smaller control volume modelled in the creek (due to insufficient depth data coverage deep in the creek). In general, smaller modelled control volume would mean more significant change in water temperature within the creek, hence more conservative in terms of predicted water temperature elevation. In terms of water temperature, the model is driven by a combination of (1) water temperature at model boundary, (2) air temperature and (3) solar irradiation. (1) is derived from the survey data at Mgao, (2) is derived from the weather data during the survey period and (3) is obtained from NASA website¹³. The modelled water temperature matches well with the survey observations. Average deviation is about 0.3 deg.C.

Configuration of Project Case

The thermal discharge simulation was conducted for the 300MW project case. The location of the intake and outfall is same for both project case as shown in Figure 12-46. The depth is from MLLW.

¹³ <https://eosweb.larc.nasa.gov/cgi-bin/sse/retscreen.cgi?email=rets%40nrcan.gc.ca&step=1&lat=-10.1695&lon=39.985568&submit=Submit>



Source: JICA Study Team

*Figure 12-46 Location of Intake and Outfall Points***Configuration of the 300 MW Case**

The simulation for 300MW project case is based on the configuration shown in Figure 12-47. Temperature difference between intake and outfall is 7 degrees celsius.

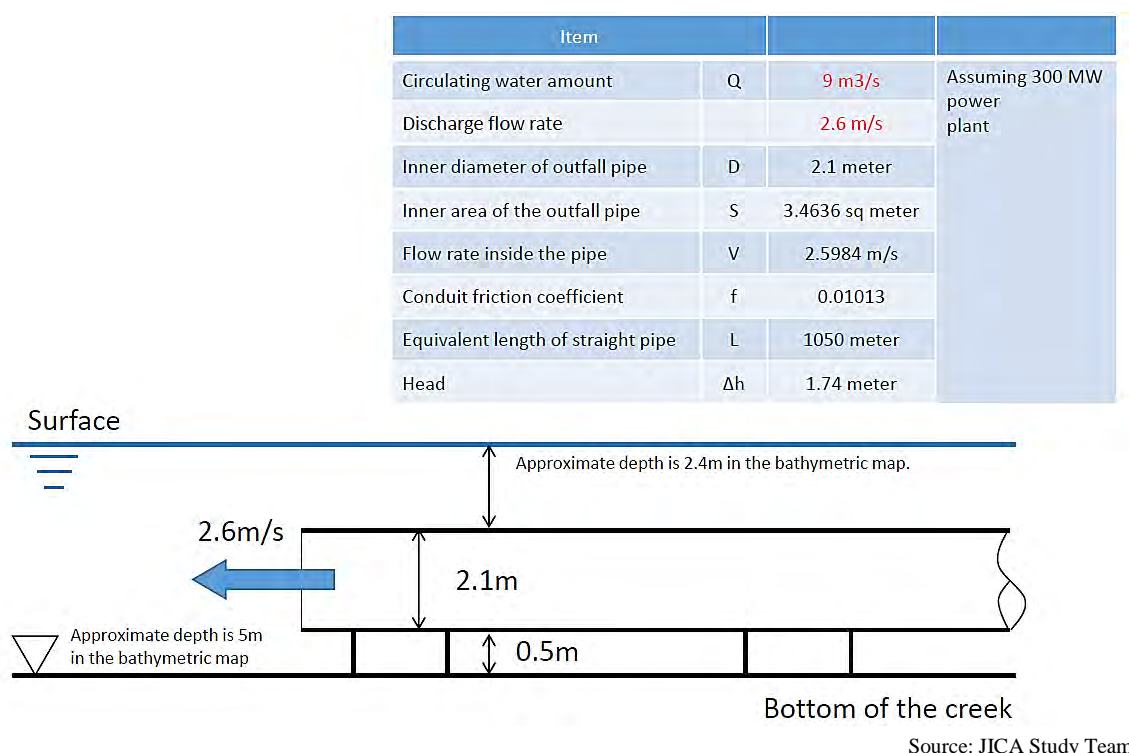
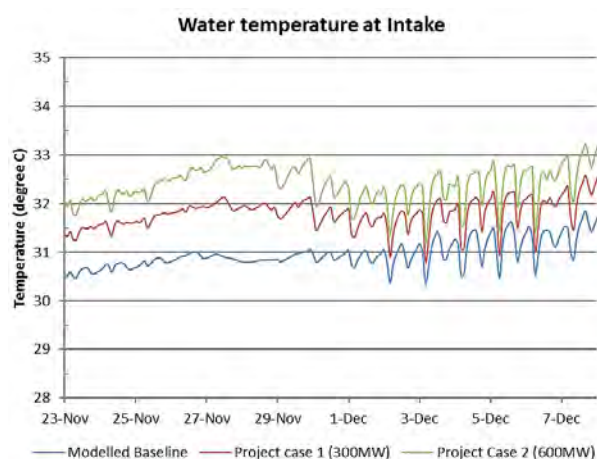


Figure 12-47 Outfall Configuration for 300MW Case

Simulation results

300MW Project case assumed thermal discharge of 9 m³/s with temperature differential of 7 degree celsius. Predicted temperature elevation above baseline scenario indicated thermal plume could travel quite a long distance. Some level of recirculation is predicted.

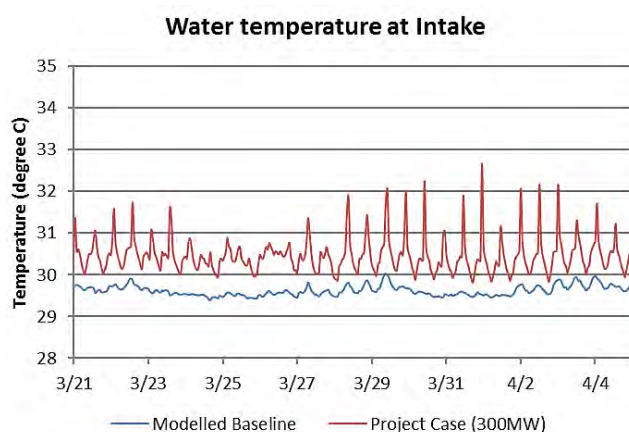
The average 0.83 degree celsius increase in dry season and wet season at intake is predicted for the 300MW case (Table 12-55 and Table 12-56). Contour plots showing instantaneous temperature elevation are as shown Figure 12-48 and Figure 12-49. The water measurement was undertaken in dry season in 2017 and in wet season in 2018.



Source: JICA Study Team

**Table 12-55 Water Temperature at Intake
(Dry Season)**

	Modeled baseline (Without project)	Project case (300MW)	Project case (600MW)
Average	30.96	31.79	32.40
Maximum	31.85	32.56	33.21
Minimum	30.33	30.79	31.18

Figure 12-48 Water Temperature at Intake (Dry Season)

Source: JICA Study Team

**Table 12-56 Water Temperature Intake
(Wet Season)**

	Modeled baseline (Without project)	Project case (300MW)
Average	29.62	30.45
Maximum	30.02	32.65
Minimum	29.39	29.81

Figure 12-49 Water Temperature at Intake (Wet Season)**Applicable Standard**

In Tanzania, there is no specific national standards or regulation on thermal discharge at the time of writing of this report. In the absence of specific national thermal mixing zone guidelines, IFC standards will be referred to within this assessment. The IFC recommends that for all mixing zones an assessment should be carried out based on an understanding of the specific sensitivities of the site and a prediction of the location, severity and extent of the resulting mixing zone. The outfall should be designed in order to minimise the impacted area through adequate dilution.

The IFC Guidelines for Thermal Power specifies the following requirements in relation to the temperature increase due to discharge from cooling systems:

- Site specific requirement to be established by the local environmental regulator; and
- Elevated temperature areas due to discharge of once-through cooling water (e.g., 1°C

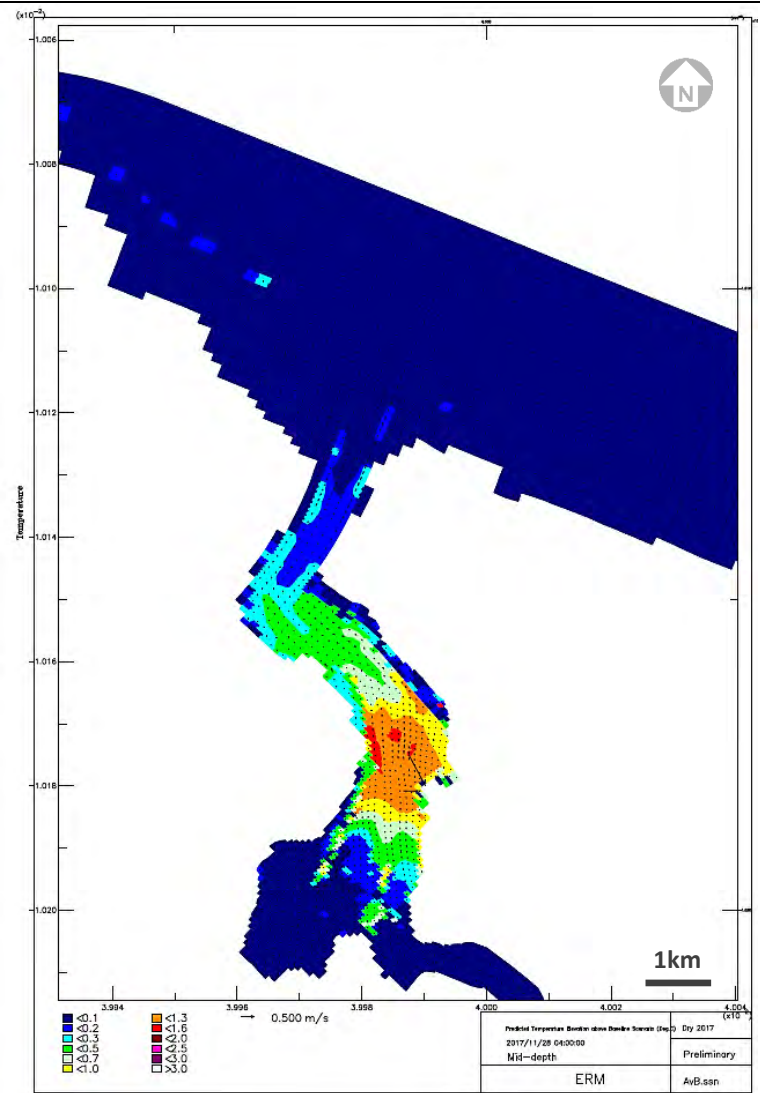
above, 2°C above, 3°C above ambient water temperature) should be minimized by adjusting intake and outfall design through the project specific EA depending on the sensitive aquatic ecosystems around the discharge point.

The IFC General EHS Guidelines states that the thermal wastewater discharge does not result in an increase greater than 3°C of ambient temperature at the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use and assimilative capacity among other considerations.

Modelling Analysis Results

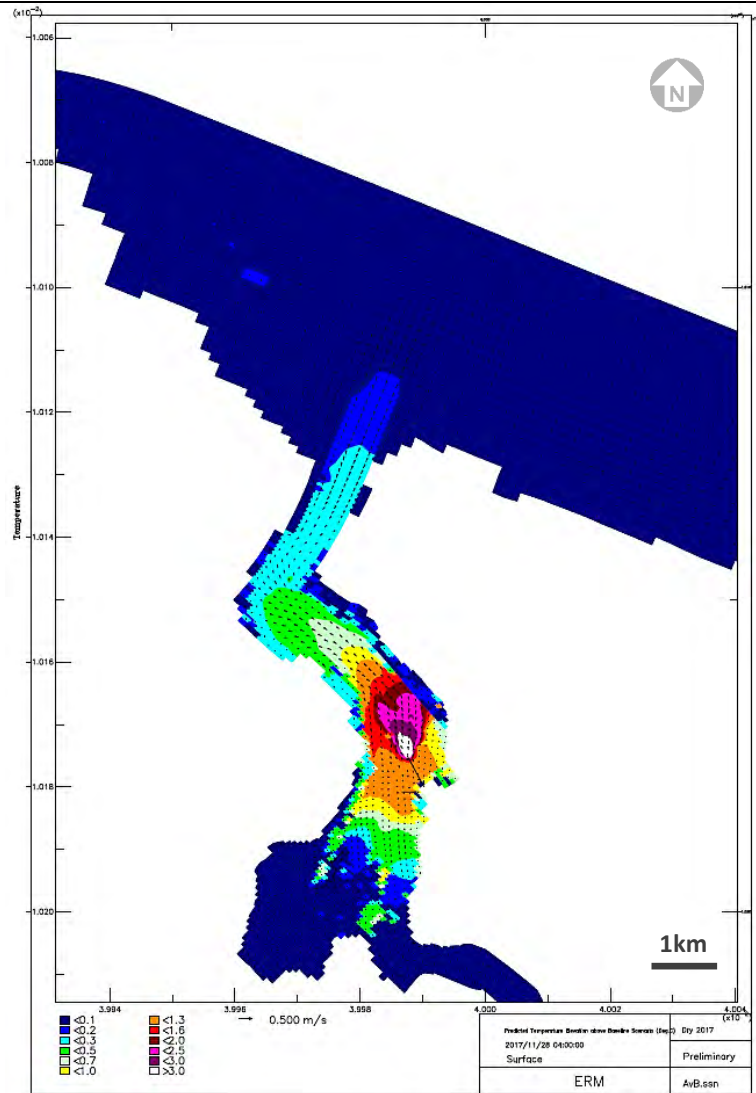
According to the modelling results, the temperature rise due to the thermal discharge is limited by the river creek and will generally disperse slowly out of the creek under the influence of tidal current (as well as river discharge in wet season). This temperature rise is likely to be evident near surface level and becomes less evident in mid-depth level. Also, the area with increase in water temperature, which exceeds the proposed assessment criterion of 3°C (IFC EHS Guidelines), mostly occurs near surface and could reach up to about 500 m away from the outfall (mixing zone). The expected temperature increase is less than 0.2 to 0.3 degrees where coral habitat is observed outside the creek, which is not within the mixing zone. Most of the mangrove habitat is also outside the mixing zone.

Therefore, the impact of thermal water discharge on marine ecology will be limited to the vicinity of the outfall structure where no endangered species and no sensitive species such as coral reefs are identified within Sudi Creek (Kisiwa Bay). Since fishery is conducted mainly outside Sudi Creek (Kisiwa Bay), no significant impact is expected on fishery. Also, the impact will be varied due to natural factors such as tidal movements and rainfall that can reduce this impact. The impact on mangrove is also expected to be minimized by locating the intake in the middle of the Sudi Creek (Kisiwa Bay), and limiting the temperature difference between intake water and discharged water up to 7 degrees. Through the mitigation measures, only small part of the mixing zone edge is touching the mangrove temporarily. Thus, the impact in terms of the carbon sink is also considered to be small.



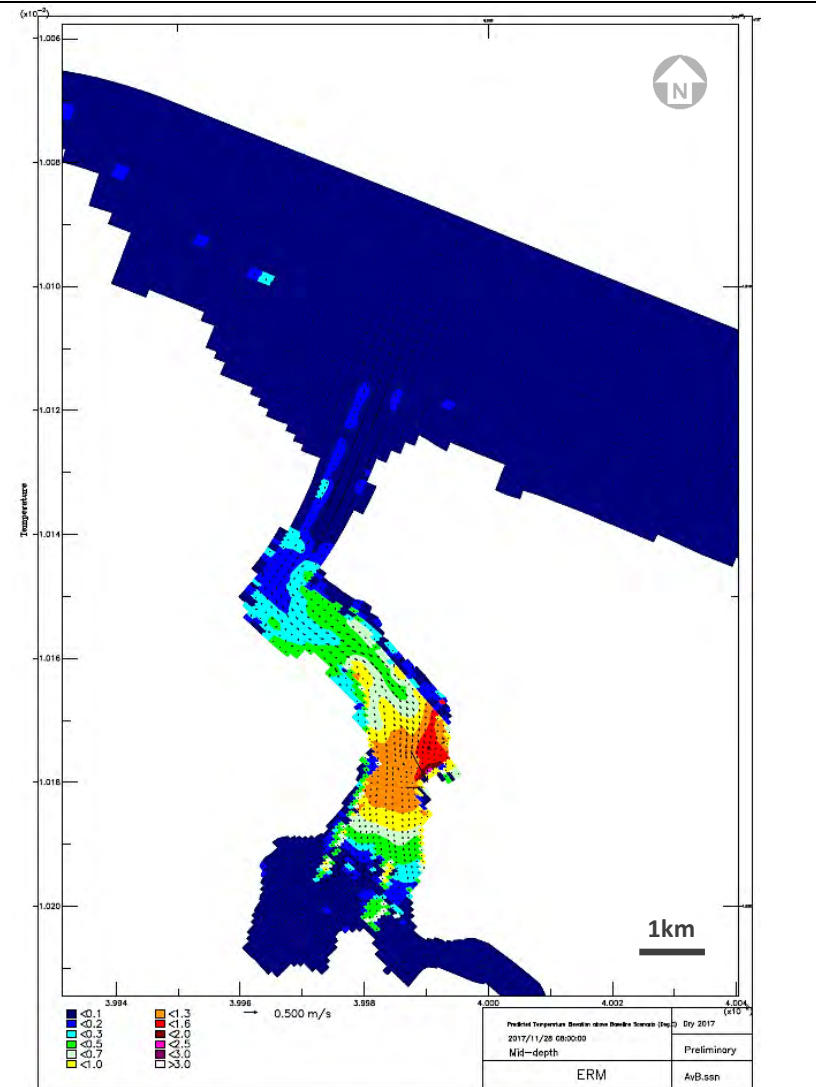
Source: JICA Study Team

Figure 12-51 Temperature Rise at Mid-depth
(Dry Season, Nov 28 04:00)



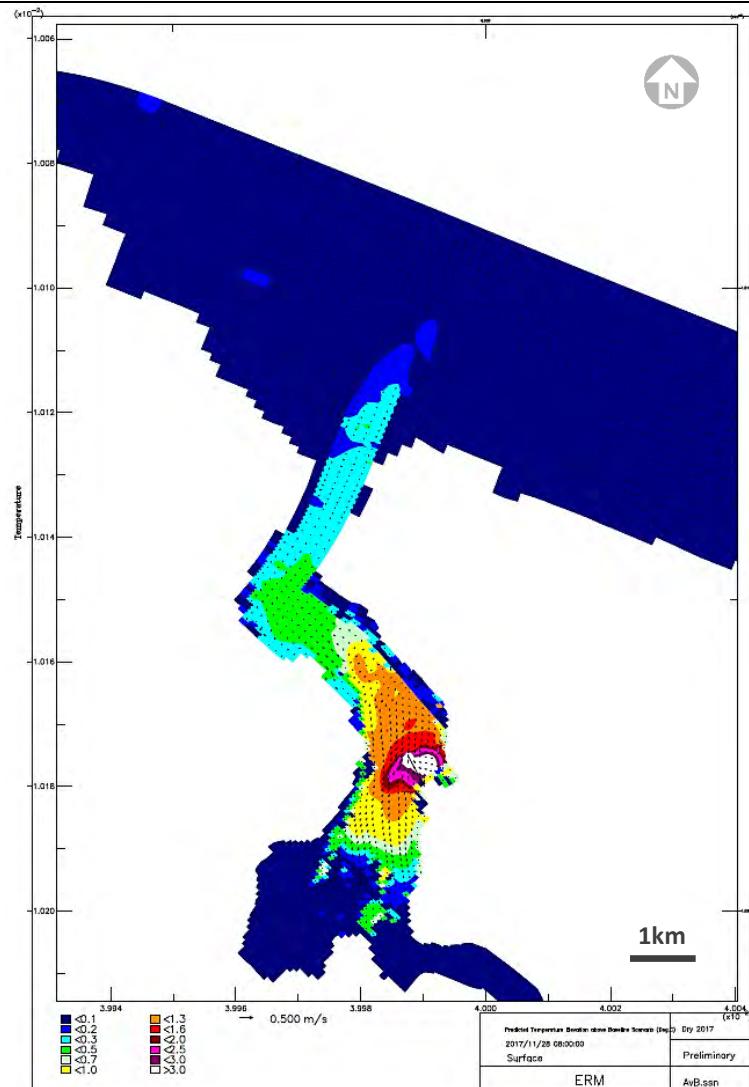
Source: JICA Study Team

Figure 12-50 Temperature Rise at Surface
(Dry Season, Nov 28 04:00)



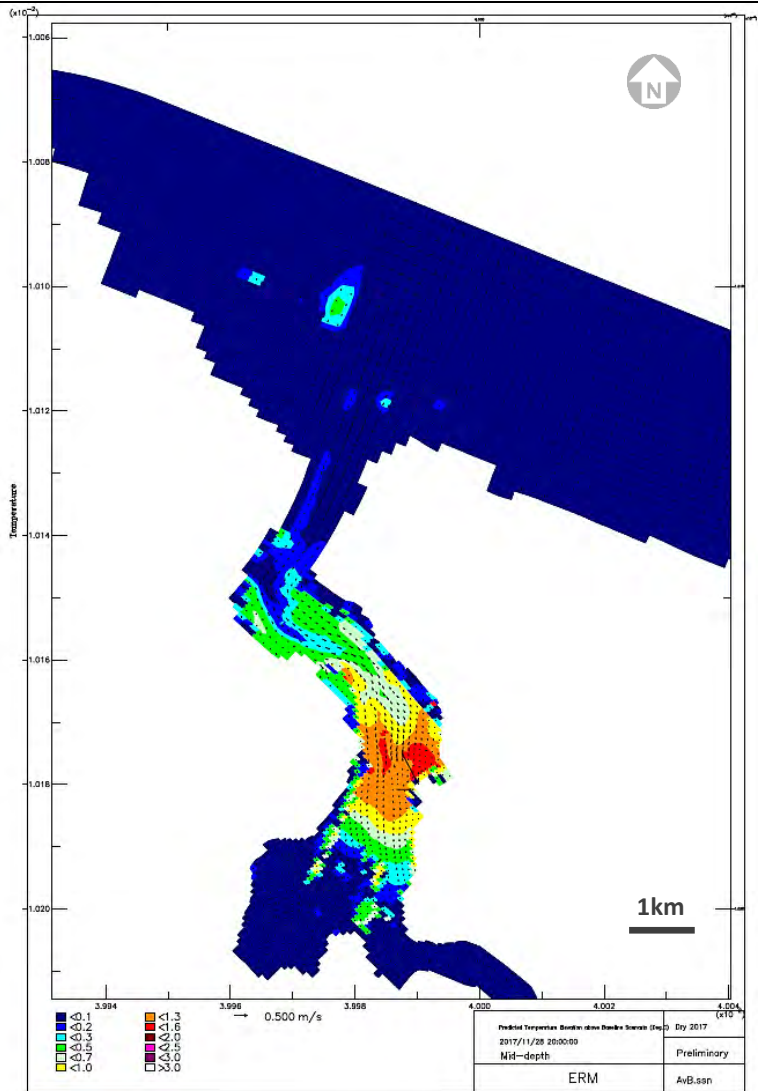
Source: JICA Study Team

Figure 12-53 Temperature Rise at Mid-depth
(Dry Season, Nov 28 08:00)



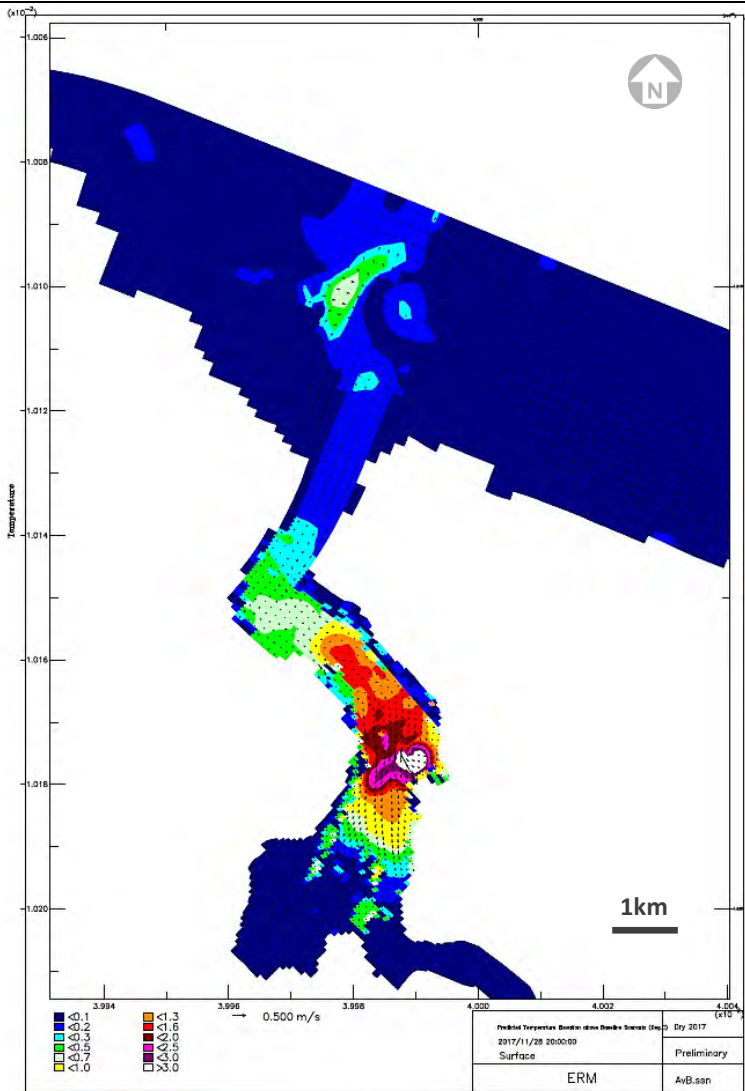
Source: JICA Study Team

Figure 12-52 Temperature Rise at Surface
(Dry Season, Nov 28 08:00)



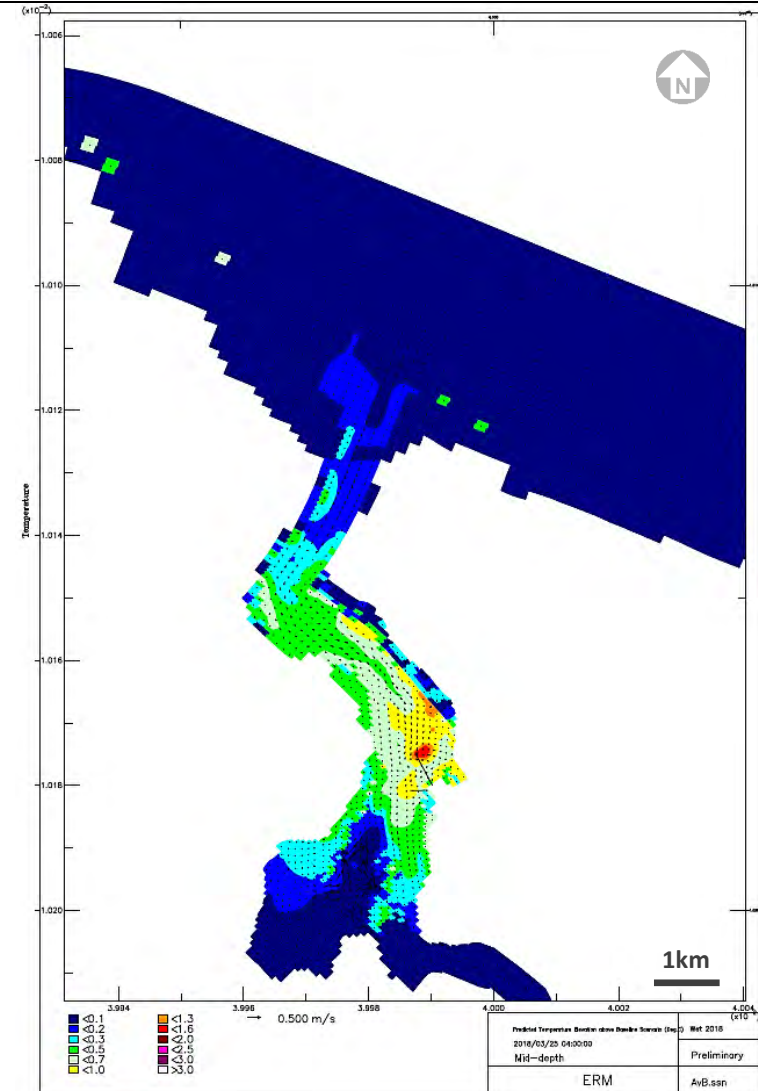
Source: JICA Study Team

Figure 12-55 Temperature Rise at Mid-depth
(Dry Season, Nov 28 20:00)



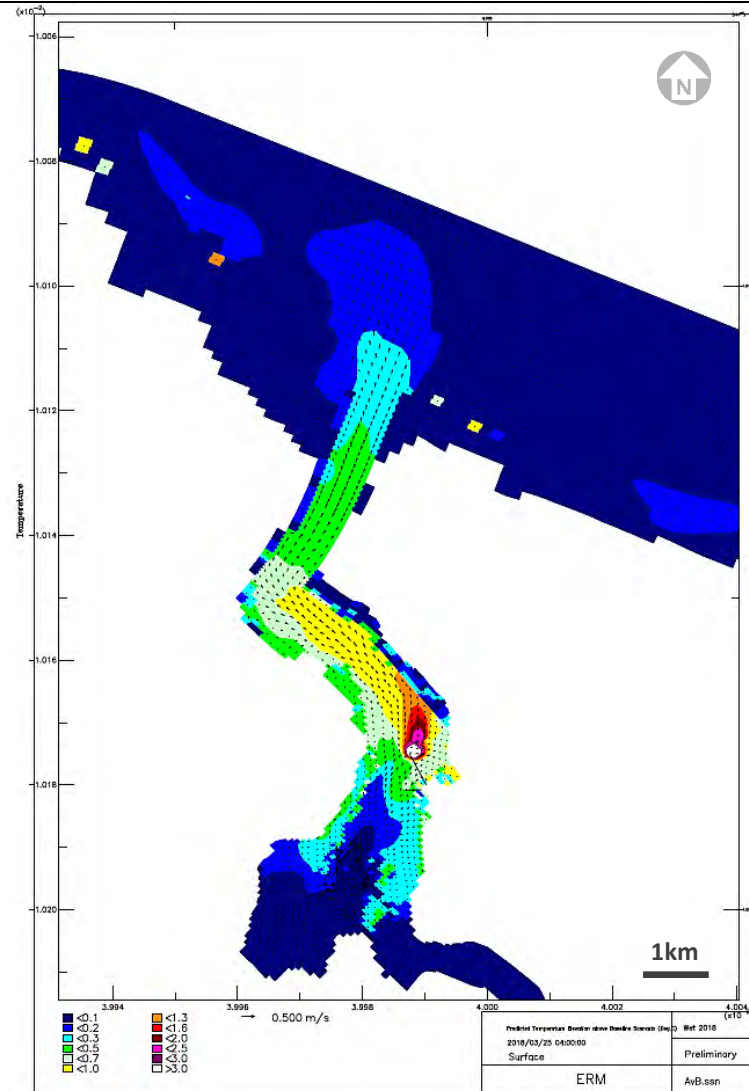
Source: JICA Study Team

Figure 12-54 Temperature Rise at Surface
(Dry Season, Nov 28 20:00)



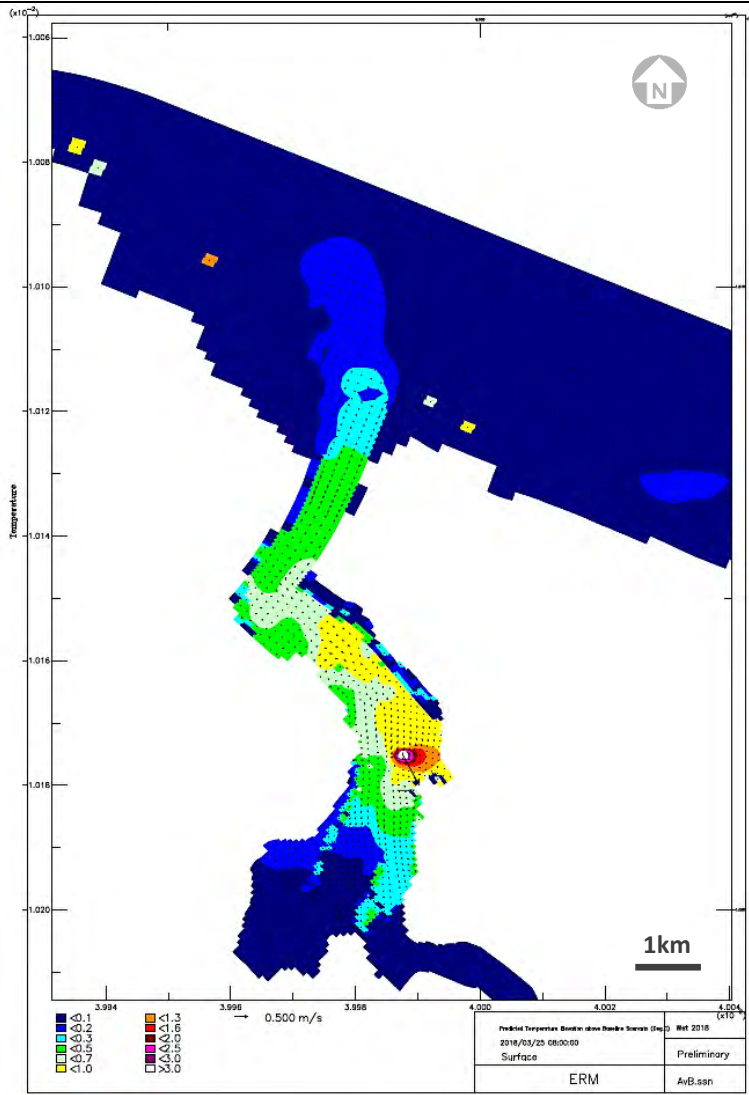
Source: JICA Study Team

Figure 12-57 Temperature Rise at Mid-Depth
(Wet Season, Mar 25 04:00)



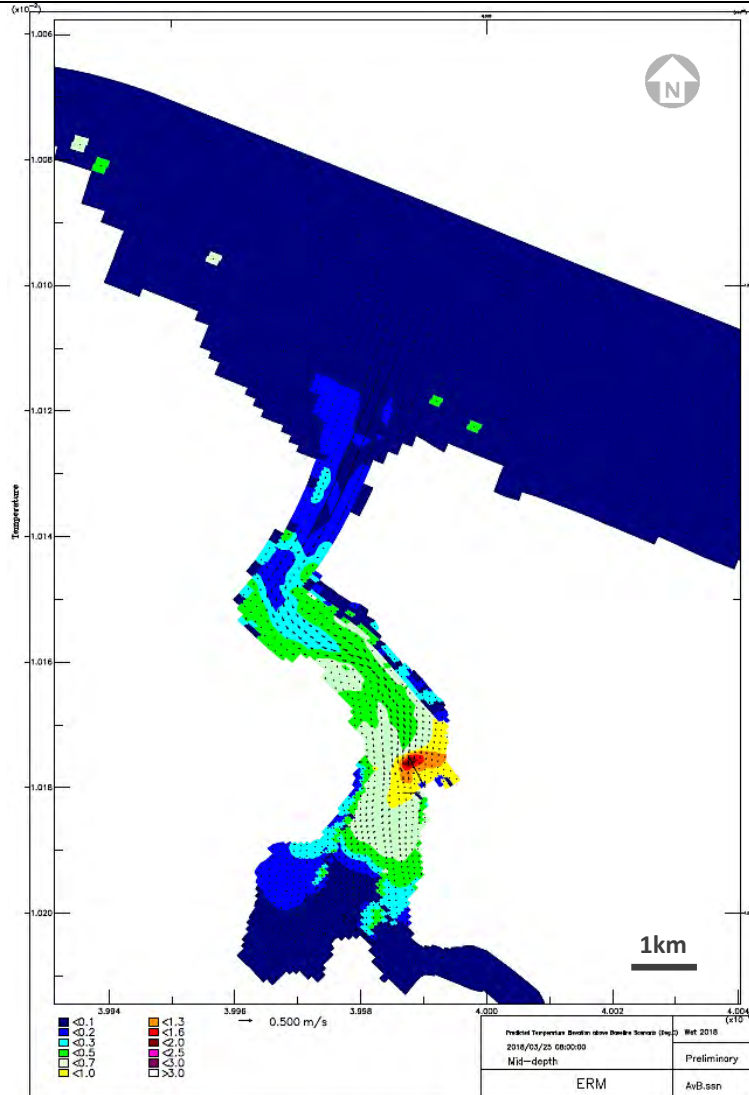
Source: JICA Study Team

Figure 12-56 Temperature Rise at Surface
(Wet Season, Mar 25 04:00)



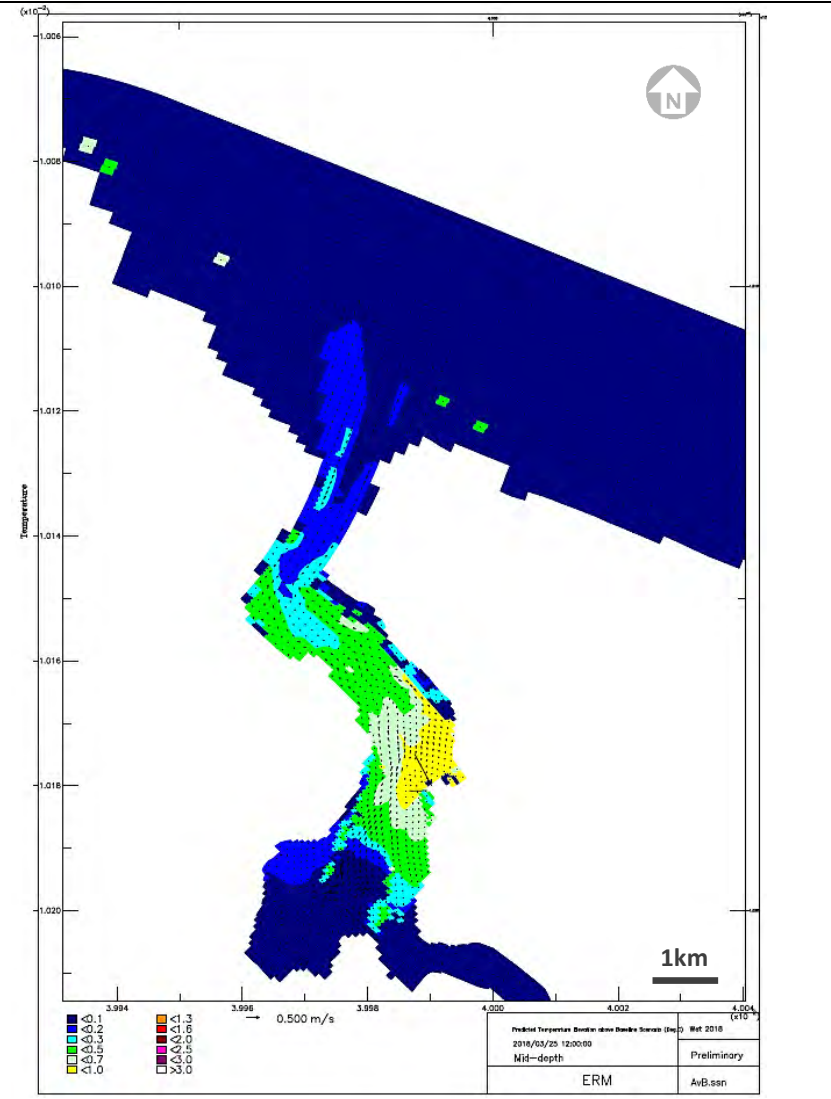
Source: JICA Study Team

Figure 12-58 Temperature Rise at Surface
(Wet Season, Mar 25 08:00)



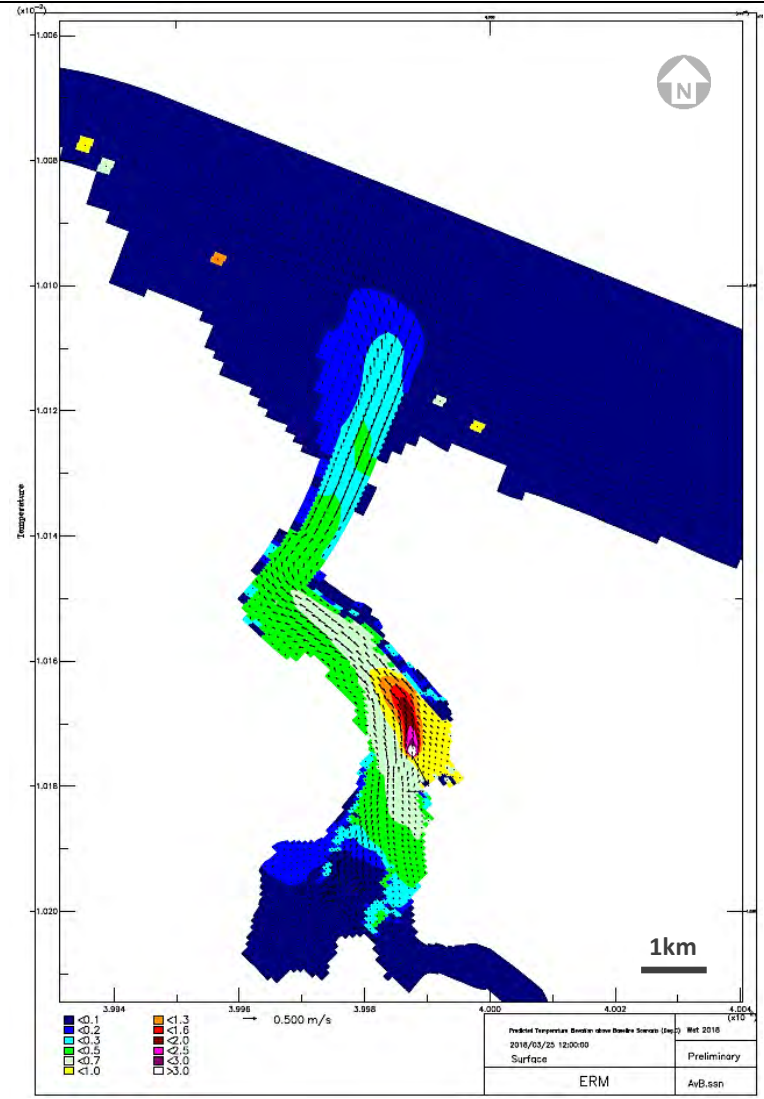
Source: JICA Study Team

Figure 12-59 Temperature Rise at Mid-Depth
(Wet Season, Mar 25 08:00)



Source: JICA Study Team

**Figure 12-61 Temperature Rise at Mid-Depth
(Wet Season, Mar 25 12:00)**



Source: JICA Study Team

**Figure 12-60 Temperature Rise at Surface
(Wet Season, Mar 25 12:00)**

3) Noise modelling

The operational noise levels at the representative Noise Sensitive Receptors were predicted based on the plant inventory. The predicted operation noise levels have been compared to the noise limit values under IFC EHS Guidelines and Tanzania National Environmental Standards as summarised in Table 12-57 and Table 12-58. The noise level in operation phase will satisfy both national and international standards. Location N1 and N2 are as shown in Figure 12-62.



Figure 12-62 Noise Contour (Operation Phase)

Source: JICA Study Team, 2018

**Table 12-57 Predicted Operational Noise Levels at Representative Noise Sensitive Receptors
(against IFC EHS Guidelines)**

NSR	Predicted Noise Level (A), dB(A)	Background Noise Level (B), dB(A)	Cumulative noise level (C), dB(A) (a)	Increase in Background Noise (b), dB(A)	IFC EHS Guidelines One Hour LAeq, dB(A)		Compliance (Yes/No)
					Daytime (07:00 - 22:00)	Night-time (22:00 - 07:00)	
N1	32	37	38	1	55	45	Yes/Yes
N2	24	38	38	0			Yes/Yes

Notes: Cumulative Noise Level (C) = $10 \times \log (10(A/10) + 10(B/10))$
Noise assessment criterion: maximum increase in background levels of not more than 3 dB(A).

**Table 12-58 Predicted Operational Noise Levels at Representative NSRs
(against Tanzania National Environmental Standards)**

NSR	Predicted Noise Level, dB(A)	Tanzania National Environmental Standards (a)		Compliance (Daytime / Night-time) (Yes/No)
		Daytime (06:00 - 22:00), dB(A)	Night-time (22:00 - 06:00), dB(A)	
N1	32	50	35	Yes / Yes
N2	24			Yes / Yes

Note: The noise criteria is based on guideline values under “Residential Area” according to Tanzania National Environmental Standards.

4) Greenhouse Gas (GHG) Emission Reduction Potential of the Project

To determine the GHG emission reduction of Project, the methodology from JICA Climate-FIT Version 2.0 for Thermal Power Generation/ Fuel Efficiency Improvement, was adopted. GHG emission reduction of the Project (ER_y) is calculated by getting the difference between GHG emissions of a plant with the same electricity generation as the project but uses current technology/facility (Baseline Scenario, BE_y) and GHG emission of the Project using its fuel consumption (Project Scenario, PE_y).

$$ER_y = BE_y - PE_y$$

where, ER_y : Emission reduction through the Project in a year y (t-CO₂e/y)
 BE_y : GHG emission from the baseline scenario in a year (t-CO₂e/y)
 PE_y : GHG emission from the project scenario in a year (t-CO₂e/y)

For the Project, the amount of electricity that will be generated in a year is approximately 2,396,285 MWh/yr. By using the fuel consumption of existing gas-fired power plants in Tanzania (e.g. Kynerezi I, Ubungo II) as baseline, GHG emission from the baseline scenario in a year is equivalent to 1,258,280 t-CO₂/yr. The calculated GHG emission from the project scenario in a year is equivalent to 858,330 t-CO₂/yr as calculated below.

Therefore, the estimated annual emission reduction of the Project is approximately 399,950 t-CO₂/yr. This is equivalent to approximately 0.28% of the 10% GHG emission reduction target (138MtCO₂e – lower limit), stipulated in Tanzania’s INDC.

As for the Mtwara-Somanga transmission line project, the estimated total amount of GHG emission reduction for 25 years is 3,938,359 t-CO₂ as calculated below.

- Estimation of GHG emission reduction (annual amount): Mtwara power plant

Emission Reduction

		Value	Unit
ER _y	Emission reduction	399,950	tCO ₂ /year
BE _y	Baseline emission	1,258,280	tCO ₂ /year
PE _y	Project emission	858,330	tCO ₂ /year

Inputs

*Input only orange cell

Parameter	Description	Value	Unit
EG _{PJ,y}	Amount of electricity generated by the project in a year y	2,396,285	MWh/year
GE _{BL}	Specific fuel consumption of the baseline facilities	0.208	t/MWh
NCV _i	Net caloric value of the fuel i used for power generation	0.045	TJ/t
EF _{fuel,i}	CO ₂ emission factor of the fuel i used for power generation	56.1	tCO ₂ /TJ
FC _{PJ,i,y}	Consumption of the fuel i used for power generation in the project	340,000	t/year

- Estimation of GHG emission reduction (total amount for 25 years): Transmission line

The calculation was conducted in accordance with the JICA Climate-FIT “12. Energy /Transmission System Efficiency Improvement” The emission reduction from the project activity is determined as the differences between the GHG emission of baseline scenario (transmission system with low efficiency) and project scenario (transmission system with high efficiency).

Baseline GHG emission is calculated based on the amount of electricity to the transmission system in the project, transmission loss of the baseline transmission system and CO₂ emission factor the electricity generation system.

$$BE_y = TE_{PJ,y} \times TLR_{BL,y} \times EF_{elec}$$

TE_{PJ,y} : Amount of electricity to the transmission system in the project in a year y (MWh/y)
 TLR_{BL,y} : Transmission loss rate of the baseline transmission system in a year (%)
 EF_{elec} : CO₂ emission factor of the electricity (t-CO₂/MWh)

Project GHG emission is calculated based on the electricity loss of the project transmission system and CO₂ emission factor of the electricity generation system.

$$PE_y = TL_{PJ,y} \times EF_{elec}$$

TL_{PJ,y} : Electricity loss of the project transmission system in a year y (MWh/y)
 EF_{elec} : CO₂ emission factor of the electricity (t-CO₂/MWh)

Section: Mtwara-Lindi

Emission Reduction

		Value	Unit
ER _y	Emission reduction	1,514,844	tCO ₂
BE _y	Baseline emission	1,527,483	tCO ₂
PE _y	Project emission	12,639	tCO ₂

Note: Total amount for 25 years

Inputs

*Input only orange cell

Parameter	Description	Value	Unit
TE _{PJ,y}	Amount of electricity to the transmission system in the project in year y	49,107,000	MWh
TLR _{BL,y}	Transmission loss rate of the baseline transmission system in a year y	5.88	%
TL _{PJ,y}	Electricity loss of the project transmission system in a year y	23,893	MWh
EF _{elec}	CO ₂ emission factor of electricity	0.529	tCO ₂ /MWh

Section: Lindi-Somanga

Emission Reduction

		Value	Unit
ER _y	Emission reduction	2,396,176	tCO ₂
BE _y	Baseline emission	2,491,371	tCO ₂
PE _y	Project emission	95,195	tCO ₂

Note: Total amount for 25 years

Inputs

*Input only orange cell

Parameter	Description	Value	Unit
TE _{PJ,y}	Amount of electricity to the transmission system in the project in year y	80,095,000	MWh
TLR _{BL,y}	Transmission loss rate of the baseline transmission system in a year y	5.88	%
TL _{PJ,y}	Electricity loss of the project transmission system in a year y	179,953	MWh
EF _{elec}	CO ₂ emission factor of electricity	0.529	tCO ₂ /MWh

12.1.7 Assessment of Environmental and Social Impacts

(1) Summary of Impact Assessment

Table 12-59 Assessment Result of the Mtwara Power Plant

Impact item		Scoping Stage		DFR stage		Reason for the assessment and points of attention
		Construction	Operation	Construction	Operation	
Pollution control measures						
1	Air pollution	B-	B-	B-	B-	Construction phase: Sand and fine particles may fly up when carrying in or out construction materials, and conducting civil engineering works. The scope of impacts from such pollutants is expected to be limited to the vicinities of the construction areas. Operation phase: NO _x emission by the operation is anticipated. However, modelling results show that NO ₂ concentration around the power plant will meet the environmental criteria of Tanzania and the IFC EHS guidelines.
2	Water pollution	B-	B-	B-	B-	Construction phase: Influence from the generation of muddy water during construction is anticipated and Sedimentation pond will be installed. Operation phase: Heated cooling water, plant wastewater, domestic waste water and oil-containing waste water will be generated. The impact of thermal water discharge will be limited and significant impact will not be caused. Other waste water will be treated and discharged in line with the National and International Standards.
3	Waste	B-	B-	B-	B-	Construction phase: The construction work is expected to general waste, hazardous waste (used oil, used batteries, used fluorescent tubes etc.), and construction waste such as surplus soil and scrap wood. The waste will be transported, treated, and dumped by the licensed companies. Hazardous wastes will be stored in the project site and they will be transported and treated by the licensed waste management company in Mtwara region in accordance with Environmental Management (Hazardous Waste Control and Management) Regulations, 2009. Operation phase: General waste and hazardous waste are expected to be generated. The waste will be transported, treated, and dumped by the licensed companies.
4	Soil / groundwater contamination	B-	B-	B-	B-	Construction phase: The possibility of soil contamination by the spill of oil for construction is anticipated and training will be provided to the

Impact item		Scoping Stage		DFR stage		Reason for the assessment and points of attention
		Construction	Operation	Construction	Operation	
						workers for the conservation of the marine environment. Heavy oil is expected to be used by the power generators and spillage management will be conducted as described in the ESMP. Operation phase: Spillage of lubrication oil and fuel during operation of the power plant are likely to cause contamination in the soil. Training will be provided to the workers for the conservation of the marine environment. In the operation phase, only natural gas will be used for power generation fuel. No oil will be used for generation fuel and lubricant will be handled to prevent spillage as the ESMP.
5	Noise and vibration	B-	B-	B-	B-	Construction phase: Noise due to the operation of construction equipment, vehicles is anticipated. However, settlements are away from the site and impact from the site will be negligible. Road Construction will have temporary impact and the villagers will be notified about this. Operation phase: Attention should be paid so that noise caused by operation will meet the environmental criteria of Tanzania and the IFC EHS guidelines.
6	Ground subsidence	D	D	D	D	There is no ground subsidence due to groundwater pumping, because groundwater will not be used.
7	Odor	D	D	D	D	There are no substances considered to cause a bad smell at the thermal power plant.
Natural environment						
8	Nature reserve	D	D	D	D	The project site is not located in the protected area.
9	Ecosystem	C	B-	B-	B-	Construction phase: The land cover in the project site is wood vegetation with human intervention such as farming. The site is not expected to be an ecologically important habitat. However, some mangrove trees are to be cut to install the outfall structure, but this will be compensated by replanting or paying fees for Mangrove conservation. Operation phase: <ul style="list-style-type: none"> The expected temperature increase is less than 0.2 to 0.3 degrees where coral habitat is observed outside the creek, which is not within the mixing zone. Most of the mangrove habitat is also outside the mixing zone. Therefore, impact of thermal water discharge on marine ecology will be limited to the vicinity of the outfall structure. As described in the summary result of the survey, there are no live corals observed at Kisiwa (inside Sudi Creek), probably due to low dissolved oxygen levels and high turbidity of the water in the area. Marine mammals are not found inside Sudi Creek. Also, there are no known turtle nesting sites in the vicinity of the project area. The impact on mangrove is also expected to be minimized by locating the intake in the middle of the Sudi Creek (Kisiwa Bay), and limiting the temperature difference between intake water and discharged water up to 7 degrees. Through the mitigation measures, only small part of the mixing zone edge is touching the mangrove temporarily. Mangrove live in intertidal zone and can survive even if it is exposed to high temperature during low tide. Thus, the impact would be limited in terms of time and area. Since there is no existing scientific data on marine fauna available and due to the complexity of marine ecosystem, regardless of the efforts mentioned above, uncertainty still remain to assess the impact of the project on the ecosystem. Therefore, monitoring of fish catch

Impact item		Scoping Stage		DFR stage		Reason for the assessment and points of attention
		Construction	Operation	Construction	Operation	
						and sea water temperature is planned to take necessary actions.
10	Hydrology	B-	B-	B-	B-	Construction phase: As an influence on hydrogeology during construction, it is expected that alteration in the shape and quality of the land may affect the drainage pattern to some extent. Operation phase: There is a possibility that the terrain will be altered, which would affect the surrounding water environment. Measures against alteration of the drainage pattern especially during the rainy season, such as the construction of a drainage path will be done.
11	Topography and geology	B-	D	B-	D	Construction phase: The site construction will alter the terrain. But the alternation will be minimized and designed not to cause land slide by following technical guidelines. Operation phase: Operation does not involve the activities that alter the terrain.
Social environment						
12	Involuntary resettlement	B-	D	B-	D	Before construction work: <ul style="list-style-type: none">Land acquisition for the power plant complex area of approx..160ha is expected, which involves physical and economical relocation of the local people. According to the approved valuation report, 11 households are expected to be relocated. Compensation will be made for the loss of land, structure and others. Within this 160ha area for the power plant complex, approximately 10 ha is expected be used for the proposed Mtwara power plant. Rest of the area is expected to be used for future development of other power plants and TANESCO's regional base in the southern area of Tanzania.In order to establish the associated facilities, necessary land will be acquired. Compensation will be made for the loss of land, structure and others as necessary.
13	Poverty	B-/B+	C	B-/B+	B+	Construction phase: Affected households may need to change their livelihood due to this project. At the same time, there is a possibility that the project can generate job opportunities related to construction work, which would help increase the income of local people. Operation phase: Job opportunities may increase for the affected local communities, with the increase of employment related to this project. And the village road to the national road will be improved.
14	Ethnic minorities, indigenous people	C	C	C	C	Construction and operation phase: Influence on ethnic minorities and indigenous people is not expected. Tanzania has a multi-ethnic population with more than 125 different ethnic communities. Four of these, the Hadzabe, the Akie, the Maasai and the Barabaig, identify themselves as indigenous peoples. The majority of the indigenous peoples live in northern Tanzania, in the Arusha and Manyara regions. In Mtwara District, The dominant ethnic group is the Makonde.
15	Cultural heritage	B-/C	B-/C	B-	D	According to the Kisiwa village chairman, there is no cultural heritage in the proposed site and the historical site in Kisiwa village is located north of the Kisiwa site. However, within the piece of the land which is expected to be additionally acquired, there is a grave yard. The graveyard will be within the project site and the local people may lose access to it. In case the local people want to relocate graves, TANESCO will move such graves and in other cases, TANESCO will secure access to the local people on occasions.

Impact item		Scoping Stage		DFR stage		Reason for the assessment and points of attention
		Construction	Operation	Construction	Operation	
16	Landscape	B-	B-	D	B-	Construction and operation phase: The establishment of the power plant is expected to alter the landscape. However, the power plant will not be visible from nearby villages and there are no scenic spots around the project site.
17	Local economy such as employment and means of livelihood	B-/B+	B-/B+	B-/B+	B-/B+	<p>Before and during Construction:</p> <ul style="list-style-type: none"> It is found that Kisiwa villagers have multiple landing sites including the one with the fish market and they will lose one of them. TANESCO arranged a meeting between Kisiwa village leader and Mgao village leader and confirmed the use of Mgao beach as a landing site to keep access to fish market in Mgao. Sudi Creek (Kisiwa Bay) is mainly being used by fishermen in the nearby villages. A few number of small handmade wooden fishing boats can be seen in the area. The landing area close to the project site is used as a main dock for these small boats. Affected local communities may need to change their livelihood. At the same time, there is a possibility that employees involved in the construction continue to be hired, and new job opportunities for local communities may be created. Establishment of gas pipeline might have some influence on livelihood due to the wayleave establishment. There might be some influence on livelihood and daily life due to the project transportation along the transportation route (on roads and within Sudi Creek (Kisiwa Bay)) such as disturbance of livelihood activities. Details will be confirmed in the further study. Approximately more than 1000 workers will be employed during the peak of construction. There will be increased opportunities for local businesses. <p>Operation phase:</p> <ul style="list-style-type: none"> Job opportunities will increase through this project. Furthermore, the project may contribute to the development of a local economy through a stable power supply. Since fishery is conducted mainly outside Sudi Creek (Kisiwa Bay), no significant impact is expected on fishery. It is highly unlikely that boats from outside use Sudi Creek (Kisiwa Bay) for fishing because the marine ecosystem is more thriving outside Sudi Creek (Kisiwa Bay).
18	Utilization of land and local resources	B-	B-	B-	B-	Construction / Operation phase: 160ha of land will be acquired by TANESCO and will be used for power plant complex. Farming area within the acquired land will be lost. Within this 160ha area for the power plant complex, approximately 10 ha is expected to be used for the proposed Mtwara power plant. Rest of the area is expected to be used for future development of other power plants and TANESCO's regional base in the southern area of Tanzania.
19	Use of water	C	C	D	D	<p>Construction phase: Local communities around the project site use groundwater. Considering the topographic conditions, there is very little chance that the project will influence those wells.</p> <p>Operation phase: Cooling water is expected to be withdrawn from the Sudi Creek (Kisiwa Bay), and water for other use is supplied through local water supply entity. Therefore, no significant impact on water use in the area is expected. It is expected that TANESCO will allow local people to use some water.</p>

Impact item		Scoping Stage		DFR stage		Reason for the assessment and points of attention
		Construction	Operation	Construction	Operation	
20	Existing social infrastructure and social services	B-	B+	B+	B+	<p>Construction phase: The road from the national road to the site will be improved.</p> <p>Operation phase: It is expected that the stable power supply will contribute to the development of the local economy and improvement of social infrastructures and services in the surrounding area as TANESCO make it a voluntary activity to share some water with nearby villagers.</p>
21	Social capital and social organizations such as decision making organizations	B-/C	B-/C	D	D	Since the settlements of the closest village Kisiwa is concentrated away from the project site, the social organization such as decision making organization will not be affected.
22	Imbalance of harms and benefits	D	D	D	D	There were no concerns raised on imbalance of harms and benefits in the stakeholder consultations. This project considers the power supply for Mtwara region and it is expected to benefit local economy and quality of life through the stable power supply. Therefore, no significant impact on imbalance of harms and benefits.
23	Gender	B-/C	B-/C	B-	B-	As mentioned above, the power plant complex site was used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on gender perspective. During the Focus Group Discussion with the project affected women, the concern about the use of fish pond was raised since they will lose access to the fish pond. This issue is addressed in the RAP as identification of alternative fish pond site and compensation for the loss of the fish pond.
24	Children's rights	B-/C	B-/C	B-	B-	As mentioned above, the power plant complex site was used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on children's rights perspective. However, risk of child labor is considered to be low.
25	Contagious diseases (e.g. HIV ¹⁴ / AIDS ¹⁵)	B-	D	B-	D	<p>Construction phase: An inflow of workers from outside is expected, due to the construction and service scale of this project. There is a risk of the occurrence of infectious diseases, such as HIV/AIDS, caused by the inflow of workers from outside.</p> <p>Operation phase: Little influence on infectious diseases, such as HIV/AIDS, is anticipated.</p>
26	Working environment	B-/C	B-/C	B-	B-	<p>Construction phase: Consideration should be given to the working environment for construction workers. The construction workers will be exposed to noise, dust, vibration at source and other occupational hazards related to site preparation and construction works. It is important to note that construction period will only last for approximately 22 months. Operation of construction machineries will also be intermittent. Thus, these impacts will be temporary and intermittent. In order to ensure the protection of health and safety of all the workers, mitigation and management measures will be implemented in accordance with applicable laws and regulations.</p> <p>Operation phase: The workers engaged in the operation of equipment and handling of chemicals and other hazardous substances will be exposed in health and safety hazards such as exposure to noise and chemicals.</p>

14 Human Immunodeficiency Virus (HIV)

15 Acquired Immune Deficiency Syndrome (AIDS)

Impact item		Scoping Stage		DFR stage		Reason for the assessment and points of attention
		Construction	Operation	Construction	Operation	
Others						
27	Accident preventive measures	B- /C	B- /C	B-	B-	<p>Construction phase: Consideration should be given to accidents during construction. Marine transport for transporting heavy equipment to Kisiwa site is expected during the construction phase. By conduct consultations and information dissemination to villagers (fishermen groups) regarding the use of Sudi Creek (Kisiwa Bay) during transport of materials, the accident risks in relation to marine transport will be reduced.</p> <p>Operation phase: Fire and traffic accidents are the expected risks by operation of facilities and vehicles. Community safety and security impacts result from increase in traffic, establishment of onsite infrastructure and the management of wastes and hazardous materials.</p>
28	Cross-border impacts and climate change	D	B- /C	B-	B-	<p>Construction phase: The construction work will have much less impact on climate change than in operation stage.</p> <p>Operation phase: Greenhouse effect gas, such as CO₂, is expected to increase due to the increase of vehicles and operation of factories though this project will contribute to the CO₂ reduction in line with the national policy.</p>

Source: Prepared by JICA Study Team

Table 12-60 Assessment Result of the 400kV Mtwara-Somanga Transmission Line and Substations (Mtwara and Lindi)

Impact item		Scoping stage		DFR stage		Reason for the assessment and points of attention
		construction	Operation	construction	Operation	
Pollution control measures						
1	Air pollution	B-	D	B-	D	Construction phase: Sand and fine particles may fly up when carrying in or out construction materials, preparing site land and so on. Operation phase: Air pollution will not be generated from the operation of the transmission line and substations.
2	Water pollution	B-	D	B-	B-	Construction phase: There is a possibility that muddy water generated during construction. Operation phase: Water pollution will not be caused by the operation of transmission line, however, the substations will need precautions for oil leakage.
3	Noise/ vibration	B-	D	B-	B-	Construction phase: Noise due to the operation of construction equipment, vehicles, etc., is anticipated. Operation phase: It is not anticipated that significant noise/ vibration will be generated. The operation of the substations will cause some noise, but no houses are in the vicinity of those substations.
4	Wastes	B-	D	B-	B-	Construction phase: It is anticipated that waste materials and soil will be generated by the construction activities.

Impact item		Scoping stage		DFR stage		Reason for the assessment and points of attention
		construction	Operation	construction	Operation	
						Operation phase: Wastes will not be generated from the transmission line. Transformers may need to be replaced, but TANESCO stopped using those with PCBs.
Natural environment						
5	Nature reserve	B-	B-	D	B-	<ul style="list-style-type: none">• The proposed transmission line route does not pass the nature reserves designated under Tanzanian law. However, there are some forest reserves and Important Bird Areas (IBAs) located around the proposed route. There is one breeding site of Spotted Ground Thrush (EN) about 3km away from the transmission line and installation of marks/reflectors will be made based on the detailed study.• There is a designated Ramsar site, Rufiji- Mafia - Kilwa Ramsar site near the proposed Somanga Substaion, at the end of this TL project. However, Ramsar site is used by local people as farm land in the vicinity of the proposed substation, i.e. the other side of the highway, and major habitats of birds are far away from the project site, at least several kilometres away. Considering the land use in the vicinity, it is not anticipated that the project will pose significant impacts on the birds, but the project will take due consideration in line with the comments from NGOs.
6	Ecosystem	B-	B-	D	B-	Construction phase: <ul style="list-style-type: none">• It is expected that the air pollution, water pollution, noise and vibration generated by the construction works will have temporary impacts on land ecosystems only during the certain construction period for each section of the route. Approximately 22 months is adopted as the construction period of the 400kV Transmission Line from Mtwara to Somanga (about 270km) subject to 3 divisions of the transmission line. The temporary impact on land ecosystem is mitigated by the landscaping and re-vegetation after completion of construction using native species, where possible.• The proposed transmission line route does not have any impact on forest area since it does not pass the nature reserves including forest reserve designated under Tanzanian law. Limited number of trees and fruit trees within the PAP's land may be removed in establishment of the transmission line. Therefore, no significant impact on climate change is expected. Operation phase: <ul style="list-style-type: none">• Bird strikes and other impacts are anticipated. Installation of marks/reflectors will be made where necessary. In the EIA study, it was found that Spotted Ground-thrush (<i>Geokichla guttata</i>), which is a migratory species designated "EN" by IUCN, inhabit in Lindi District Coastal Forests IBA site 7 km away from the proposed transmission line. Additional long term survey will be conducted during the D/D stage to make the bird conservation plan in this area. Comments on this matter from NGO are attached to the EIA report.• Based on the survey, there are no significant impacts that will be posed to the sported ground thrush. This is because of its nature to utilize different habitat locations through migrations, also due to its feeding mode that they spend much of their time flicking on the leaf litters search for invertebrates.• To avoid the collision with African Elephant, keep necessary space to allow them to pass and install fences around the transmission towers.• The proposed transmission line will not pass through the Rufiji-Mafia - Kilwa Ramsar site. The closest distance between the border

Impact item		Scoping stage		DFR stage		Reason for the assessment and points of attention
		construction	Operation	construction	Operation	
						of the Ramsar Site and the proposed transmission line is approximately 800m.
7	Water environment	B-/C	B-/C	D	D	Construction and operation phase: There is no possibility that the river flow will be temporarily and partially altered by the construction and operation since the transmission towers will not be built in such a way.
8	Topography and geology	B-/C	B-/C	D	D	Construction / Operation phase: There is no possibility that slope failure or landslide will occur since the transmission towers will not be built in such a way.
Social environment						
9	Involuntary resettlement	B-/C	B-/C	B-	B-	Before works: In order to establish the wayleave for the 400kV transmission line, the land acquisition is expected between Mtwara and Somanga even after minimizing the impact.
10	Poor people	B-/C	B-/C	B-	B-	Construction / Operation phase: Poor people may need to change their means of livelihood due to the resettlement.
11	Ethnic minorities and indigenous people	B-/C	B-/C	D	D	Influence on ethnic minorities and indigenous people is not expected because there are no indigenous communities in the project areas.
12	Cultural assets	C	C	B-	D	Some grave yards will be affected and those are to be compensated for relocation. Chance find procedure will be applied during construction.
13	Landscape	B-	B-	B-	B-	Construction / Operation phase: In Mtwara Region, one antiquities site is listed by the Ministry of Natural Resources and Tourism (MNRT), which is Mikindani Historic Town. The project site is located approximately 10km from this historical town, thus it is unlikely to affect landscape values of the heritage site.
14	Local economy, such as employment and livelihood	B-/B+	C	B-	B-	Construction / Operation phase: The project will need farmland which will result in the loss of livelihood. Livelihood restoration measures will be taken for this.
15	Utilization of land and local resources	B-	D	B-	B-	Construction / Operation phase: The project will need farmland which will result in the loss of livelihood. Livelihood restoration measures will be taken for this.
16	Use of water	D	D	D	D	Construction / Operation phase: No significant impacts are anticipated on the use of water because the project will not require large amount of water.
17	Existing social infrastructure and social services	B-	B+	B-	D	Construction / Operation phase: One sport ground will be affected, but this will be replaced with new one.
18	Society-related capital and social organizations	B-/C	B-/C	D	D	Construction / Operation phase: It is not anticipated that serious impacts will be imparted on the local community since the transmission line will partially affect some village only.
19	Imbalance of harms and benefits	D	D	D	D	No particular concerns were raised regarding imbalance of harms and benefits at the stakeholder meetings.
20	Gender	B-/C	B-/C	B-	B-	The establishment of transmission line involves acquisition of land used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on gender perspective. During the Focus Group Discussion with the project affected women, concerns about HIV, STDs , Security due to the influx of construction workers, loss of farmland and cashew nuts trees, employment opportunities

Impact item	Scoping stage		DFR stage		Reason for the assessment and points of attention
	construction	Operation	construction	Operation	
					during construction, grievance mechanism were raised. TANESCO assured that it will properly deal with these issues as described in the RAP and EIA.
21	Children's rights	B- /C	B- /C	B- /C	The establishment of transmission line involves acquisition of land used by local people such as for farming. Relocations and livelihood restoration due to the land acquisition might have some influence on children's rights perspective. However, risk of child labor is considered to be low.
22	HIV/ AIDS and other infections	B- /C	D	B- /C	Construction phase: In view of the scale of the project construction and operations, there is a risk that HIV/ AIDS and other infections will arise due to the influx of labor from outside the area. Prevention measures will be taken. Since the transmission line construction will occur on a rolling section-by-section basis and construction site moves along the route as it proceeds, temporary demographic changes during construction are not likely to be significant. The construction team is likely to remain in contact with the local area for a short time. Operation phase: No impacts are anticipated regarding HIV/ AIDS and other infections. Once constructed, the transmission line require only periodic maintenance during operations. There will be no large workforce moving to areas to operate and maintain the transmission line.
23	Working environment	B- /C	B- /C	B- /C	Construction phase: It will be necessary to pay attention to the working environment for construction workers during the construction. The construction workers will be exposed to noise, dust, vibration at source and other occupational hazards related to site preparation and construction works. In particular, the construction of transmission towers would require work at considerable heights. Operation of construction machineries will also be intermittent. Thus, these impacts will be temporary and intermittent. In order to ensure the protection of health and safety of all the workers, mitigation and management measures will be implemented in accordance with applicable laws and regulations. Operation phase: There is a possibility that accidents will occur during maintenance work on the transmission line. These workers, particularly those who will be engaged in the maintenance of substations, ROW, and inspection of transmission lines and towers will be exposed in health and safety hazards (e.g. exposure to high voltage facilities). In order to ensure the protection of health and safety of all the workers, mitigation and management measures will be implemented in accordance with applicable laws and regulations.
Others					
24	Accident preventive measures	B- /C	B- /C	B- /C	Construction phase: <ul style="list-style-type: none"> The transport of workers and goods to and from the Project site will also impact traffic conditions. Heavy cargo will be transported via main road. With an increase in vehicles, particularly heavy haulage vehicles, comes the increased potential for accidents and inquiries to occur. This is exacerbated by the fact that people living in the local villages typically reside immediately adjacent to roads. However, villagers are not accustomed to the presence of large vehicles and heavy traffic. The construction of transmission towers will only take a couple of months. Thus, the presence of workers in a particular area will be local and temporary. Given the existing management measures, the local extent and scale of the impact, the impact was assessed as Minor and negative.

Impact item		Scoping stage		DFR stage		Reason for the assessment and points of attention
		construction	Operation	construction	Operation	
						<ul style="list-style-type: none">• The project will require security. Security personnel will be employed during construction phase. <p>Operation phase:</p> <ul style="list-style-type: none">• During operation phase, there are safety issues with the establishment of new infrastructure such as community members being in contact with transmission towers and substations. There is a risk of non-workers wandering into project site (e.g. transmission towers and substations) and being exposed to the hazards and knowledge of the dangers of these sites. This can lead to onsite accidents and injuries. Therefore, it is important to create awareness on all security and safety issues and hazards associated with transmission line towers and substations as a mitigation measure.• There is a possibility that the transmission line system will be damaged by natural disasters such as flooding and strong winds.
25	Cross-border impacts and climate change	D	D	D	D	It is not anticipated that impacts will be caused on climate change.

Source: Prepared by JICA Study Team

12.1.8 Environmental and Social Impact Management Plan

Mitigation planning involves undertaking activities during the design, implementation and operation phases of a project to eliminate, offset, or reduce adverse environmental impacts to acceptable levels. The proposed impact mitigation/enhancement plan for the project is summarized in Table 12-61 and Table 12-62.

Table 12-61 Environmental and Social Management Plan (ESMP) for the Proposed Mtwara Thermal Power Plant

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
Site Preparation and Construction Phase					
Water resources	<ul style="list-style-type: none"> Wastewater Discharges and Runoff Excavation of soil for building and equipment foundations 	<ul style="list-style-type: none"> Impaired quality of water resources (surface/subsurface water, groundwater) Reduced surface water infiltration 	<ul style="list-style-type: none"> Adequate sanitary facilities will be provided for the construction workforce. Septic tanks will be provided to treat sanitary discharge. Liquid effluents arising from construction activities will be treated to the applicable IFC guideline prior to discharge. Use methods for minimising sediment runoff, as appropriate to the conditions on-site. Design drainage for the controlled release of storm flows. Regularly, and particularly following rainstorms, inspect and maintain drainage and erosion control and silt removal measures to ensure proper and efficient management at all times. Mulch to stabilise exposed areas, where practicable and appropriate. Re-vegetate areas promptly, where practicable and appropriate. Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage of open stockpiles of construction materials. Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into sanitary sewers via grease traps. Oil-contaminated water will be collected and handled by local licensed wastewater sub-contractors. Until the wastewater treatment facilities are installed, as necessary, they are transported by trucks etc. and then treated by sub-contractors. 	TANESCO	50,000 USD
	<ul style="list-style-type: none"> Waste Storage and Disposal 	<ul style="list-style-type: none"> Impaired quality of water resources (surface/subsurface water, groundwater) 	<ul style="list-style-type: none"> Implement the same mitigation measures to minimize impacts to Waste Management. Provide training to labourers for waste disposal in designated areas and use of sanitation facilities. Implement proper storage of the construction materials and wastes to minimise the potential damage or contamination of the materials. Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type. Store waste systematically to allow inspection between containers to monitor leaks or spills. Ensure that storage areas have impermeable floors and containment. Dispose of waste by licensed contractors. 	TANESCO	5,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
	<ul style="list-style-type: none"> Accidental Spills and Leaks 	<ul style="list-style-type: none"> Impaired quality of water resources (surface/subsurface water, groundwater) 	<ul style="list-style-type: none"> Disposal sites to be designed for hazardous and non-hazardous waste, including sludge disposal. Hazardous waste storage areas will comply with best practice/ international standards. Mitigation measures/ monitoring programme with regard to accidental events/ spills shall be communicated to TANESCO at the early stages of the Project implementation. Contractor will prepare unloading and loading protocols and train staff to prevent spills and leaks. Contractor will prepare guidelines and procedures for immediate clean-up actions following any spillages of oils, fuels or chemicals. Use of spill or drip trays to contain spills and leaks. The storage areas for oil, fuel and chemicals will be surrounded by bunds or other containment devices to prevent spilled oil, fuel and chemicals from percolating into the ground or reaching the receiving waters. Contractor will implement a training program to familiarise staff with emergency procedures and practices related to contamination events. Provide dedicated storage areas for construction materials to minimise the potential for damage or contamination of the materials. Segregate hazardous and non-hazardous waste and provide appropriate containers for the waste types generated. Store wastes in closed containers away from direct sunlight, wind and rain. Provide enough space to allow for inspection between waste containers so as to identify any leaks or spills. Ensure storage areas have impermeable floor and containment. Oil-contaminated water will be collected and handled by local licensed wastewater sub-contractors (if available, to be determined at a later stage). 	TANESCO	10,000 USD
Air Quality	<ul style="list-style-type: none"> Site preparation, filling and levelling. Excavation of soil for building and equipment foundations. Pile driving for the equipment foundation. Concrete works. Transportation related activities 	<ul style="list-style-type: none"> Dust Generation 	<ul style="list-style-type: none"> Water spraying of or covering all exposed areas and stockpiles. Specifying transport networks and locating stockpiles as far away from the site boundary which is close to the air sensitive receptors, as practicable to minimize the impact of air pollutants and dust. Minimizing the size of exposed areas and material stockpiles and the periods of their existence. Temporary stockpiles of dusty materials will be either covered entirely by impervious sheets or sprayed with water to maintain the entire surface wet all the time. Covering the construction materials transported by trucks or vehicles entirely to 	TANESCO	30,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
			<ul style="list-style-type: none"> prevent dust emissions. • Cleaning the entire construction work site, as necessary. • Controlling the height of unloading the fill materials during filling as far as possible. Where possible, this should be well below the height of the hoardings along the Project site boundary. • Watering the main haul road regularly to suppress dust emissions during truck movement. • Prohibiting the burning of waste or vegetation on site. • Compacting the reclaimed land immediately to avoid fugitive dust emissions. 		
	<ul style="list-style-type: none"> • Operation of heavy machinery and transport vehicles • Operation of DG sets 	<ul style="list-style-type: none"> • Vehicle exhaust 	<ul style="list-style-type: none"> • Maintaining and checking the construction equipment regularly. • Switching off engines when idling. 	TANESCO	30,000 USD
Noise	<ul style="list-style-type: none"> • Heavy machinery operations for construction works. • Piling for equipment foundation • Transportation related activities 	<ul style="list-style-type: none"> • Increased noise disturbance/ vibration 	<ul style="list-style-type: none"> • Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components. • Shut down or throttled down machines and equipment when not in use. • Reduce the number of equipment operating simultaneously as far as practicable. • Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors far as practicable. • Locate noisy plant (such as hydraulic hammer and lorry mounted concrete pump) as far away from receptors as practicable. • Avoid transportation of materials on- and off-site through existing community areas. • Use material stockpiles and other structures, where practicable, to screen noise sensitive receptors from on-site construction activities. 	TANESCO	30,000 USD
Waste	<ul style="list-style-type: none"> • General Construction works • Construction workers camp 	<ul style="list-style-type: none"> • Generate solid and hazardous wastes • Spillage of oil and any hazardous material 	<ul style="list-style-type: none"> • Prior to construction commencing, a waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse during the construction and operation phases for all the waste streams identified. • Engage with local authorities and other stakeholders to determine the capacity of the local waste management network to absorb the waste streams during construction and operation. • Education to workers on site shall be undertaken to avoid, reduce and reuse wastes generated. • Waste disposal facilities shall be sited and signposted in the project site. Solid waste generated by daily operations at the site should be collected using on-site bins before being disposed appropriately. • All waste collected should be managed and disposed of in accordance with the 	TANESCO	10,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
			<p>required regulations.</p> <ul style="list-style-type: none"> Contractors employed to manage the waste should clearly identify within their bidding documents how the collected waste will be managed. All end points for collected waste are to be inspected and audited and noted to be developed such that all wastes is able to be disposed of in an environmental responsible manner and in accordance with prevailing regulations. Monitoring of appointed waste contractors for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with prevailing regulations. The appointed waste contractors shall report on regular basis on any cross-boundary transport of waste. 		
Soil	<ul style="list-style-type: none"> Site clearing, sand filling and site preparation 	<ul style="list-style-type: none"> Loss of Soil due to improper management during site clearance activities 	<ul style="list-style-type: none"> Delineation of clearance boundaries to limit the areas to be cleared. Scheduling clearance activities, if possible to avoid extreme weather events such as heavy rainfall, extreme dry and high winds. Revegetation areas with temporary land use, conducting progressive rehabilitation. Demarcate routes for movement of heavy vehicles to minimise disturbance of exposed soils and compaction of sub-surface layers. Reuse topsoil as much as possible within rehabilitation activities. Control erosion through diversion drains, sediment fences, and sediment retention basins. 	TANESCO	20,000 USD
	<ul style="list-style-type: none"> Storage, handling and disposal of construction waste 	<ul style="list-style-type: none"> Soil contamination due to potential leaks, spills and importation of contaminated fill material during construction 	<ul style="list-style-type: none"> Fuel tanks and chemical storage areas will be sited on sealed hardstand areas. Secondary containment, with appropriate drainage connection and/or provision for removal of spilled liquids, will be provided around places of fuel and hazardous materials storage such as oil filled transformers, oil pumps and tanks, generators, chemical storage houses etc. to contain any hazardous spills and to exclude surface water run-off from entering the contained area. Any refuelling activities will only take place within a designated hard stand area with spill kits present. A dedicated storage area for construction material will be developed to minimise the potential for damage or contamination of the material. Sufficient space will be left between all waste containers so as to identify any spills or leaks. A training program will be implemented to familiarise staff with measures to be taken to prevent spills and leaks, and for emergency procedures and practices related to contamination events. Appropriate management, storage and disposal of all waste streams will be implemented. 	TANESCO	30,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
Terrestrial Ecology	<ul style="list-style-type: none"> Site preparation and related activities Construction and transportation related activities 	<ul style="list-style-type: none"> Loss of vegetation Loss of vulnerable species, local terrestrial biodiversity and wild life 	<ul style="list-style-type: none"> Vegetation clearance should be confined only to necessarily designated sites. The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing. Measurements required for monitoring mangroves and other terrestrial vegetation include ecological surveys where sampling on various ecological characteristics in terms of species composition change over time will be recorded/reported while comparing with the baseline data collected on permanently established monitoring plots as stated in mitigation measures for loss of local marine and terrestrial biodiversity. The measurements are taken based on the number of indicators outlined to demonstrate any likely change over time following implementation of the project. Valuable timber removed from woody biomass be made available for public consumption where possible. For construction areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible. The project shall implement landscaping and re-vegetation (replanting and rebuilding the soil of disturbed land) after completion of construction using native species where possible. Weed and pest management measures should be implemented to avoid introduction of invasive weeds to natural and modified habitat areas. Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licenced waste management contractors. Construction materials and chemicals will be appropriately secured and locked down during flood season to avoid accidental release to the natural environment. Appropriate speed limits for construction vehicles will be enforced to limit noise and dust generation and to minimise potential for fauna strike. Compensate for the loss of Mangrove by replanting where applicable. Compensation should be paid to TFS as stipulated in the GN. 255, of THE FOREST (AMENDMENTS) REGULATIONS, 2017. 	TANESCO	50,000 USD
Marine Ecology	<ul style="list-style-type: none"> Site preparation and related activities Construction and transportation related activities 	<ul style="list-style-type: none"> Destruction of corals 	<ul style="list-style-type: none"> In transporting the materials by ship, avoid the coral habitat area near the mouth of Sudi Creek (Kisiwa Bay). Prevent leakage from ships for material transportation. Conduct visual inspection of coral and measurement of water temperature around the mouth of Sudi Creek (Kisiwa Bay) to monitor any changes. Conduct visual inspection of mangrove inside Sudi Creek (Kisiwa Bay) 	TANESCO	5,000 USD
Land acquisition and Resettlement	<ul style="list-style-type: none"> Land acquisition for the power plant complex area by TANESCO 	<ul style="list-style-type: none"> Physical and economical displacement of 	<ul style="list-style-type: none"> Conduct land acquisition process in accordance with the Resettlement Policy Framework Provide income restoration for those who will lose their livelihood due to land 	TANESCO	

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
		people in the proposed project site • Complains regarding land acquisition and resettlement	acquisition. • Keep constant and open communication with PAPs and other stakeholders • Provide assistance to vulnerable groups on how to go through the compensation process. • Setting up of a grievance mechanism to address any concern from the affected population. • Obtain necessary permit prior to clearing of mangrove area		
Community infrastructure and public services	• Increased construction worker • Transportation of personnel and use of road network	• Increased pressure on social services	• Provide appropriate amenities at the worker camp. This will help reduce the need for workers to utilize local infrastructure and services. • Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the project. • Develop and implement a site safety management plan. This plan will need to ensure appropriate and adequate health care services are provided on site and at the worker camp to address/ manage worker illnesses and injuries.	TANESCO	10,000 USD
Employment and economy	• General Construction activities	• Increased local market opportunities • Increased local employment	• Develop and implement a local recruitment and procurement management plan. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers. • Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the project. • Inform local villagers of job opportunities in a timely manner. • Inform local businesses of contracting opportunities in a timely manner such as awareness on forthcoming investment and employment opportunities, including sensitization of farmers for production of required quality of foods such as vegetables.	TANESCO	10,000 USD
Community Health and safety	• Influx of construction workers	• Increased risk of HIV/AIDS and other STDs among works and local people	• Training for all workers on the transmission routes and common symptoms of communicable diseases • Sensitization of enforcement of HIV/AIDS law and regulations. • Establish amenities at the worker camp to that help minimize the interaction between the workforce (particularly temporary construction workers) and local villagers. • Establish a workforce code of conduct. Include in the code specific measures on anti-social behaviour. • Vector management procedures, including consideration of whether pesticides will be utilized to reduce the presence of vectors onsite. • Provision of onsite health care, to ensure that medical attention can be sought • HIV prevention awareness promotion for local communities.	TANESCO	10,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
Community safety and security, Occupational Health and Safety	<ul style="list-style-type: none"> Influx of construction workers Heavy traffic movement 	<ul style="list-style-type: none"> Increased crime and insecurity Increase risks, hazards and accidents 	<ul style="list-style-type: none"> Explore opportunities to work with local stakeholders to increase awareness within local villages about the hazards associated with traffic. Conduct consultations and information dissemination to villagers (fishermen groups) regarding the use of Sudi Creek (Kisiwa Bay) during transport of materials. Equip the first aid kit in the project site. Provide appropriate training for security personnel and monitor implementation of the training over time Create awareness on all security issues including activities the community police (<i>polisi jamii</i>) in the area. Provide and enforce the proper use of PPEs. 	TANESCO	5,000 USD
Cultural heritage	<ul style="list-style-type: none"> General Construction activities 	<ul style="list-style-type: none"> Loss of heritage artifacts if discovered in the project site 	<ul style="list-style-type: none"> Implement a Chance Find Procedure in accordance with IFC Standard 8, if something has been discovered. In case of such discovery during the construction activities, it is to be reported to the relevant authorities such as Mtwara District Council and the Antiquities division of the Ministry of Natural Resource and Tourism (MNRT). Ensure no cultural site, when notified prior to works, is disturbed without community agreement. 	TANESCO	20,000 USD
		<ul style="list-style-type: none"> Impact on graveyard 	<ul style="list-style-type: none"> Coordinate closely with the family members/ owners of the graveyard Relocate graves when requested by local people. Take precautions not to disturb the area particularly during transfer of heavy equipment Provide access to the area during special religious and/or family events when graves are not moved. 	TANESCO	2.5million USD
Land Acquisition and Resettlement	<ul style="list-style-type: none"> Acquisition of land and properties 	Physical and economic displacement of people in the proposed project site	<ul style="list-style-type: none"> Conduct land acquisition process in accordance with the RAP (DDR). Provide income restoration for those who will lose their livelihood due to land acquisition. Fishing activity is not the only means of livelihood of the PAPs, they are also engaged in other activities such as farming and livestock keeping, therefore, the PAPs will be supported in improving agriculture and livestock keeping. Also, it should be noted that they have access to other fishing site in nearby village where they can continue with their fishing activities. Keep constant and open communication with PAPs and other stakeholders Provide assistance to vulnerable groups on how to go through the compensation process. Set up a grievance mechanism to handle concerns from the affected population 	TANESCO	Included in the Land Acquisition Cost

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
Operation Phase					
Water resources	• Wastewater Discharges and Runoff	<ul style="list-style-type: none"> • Impaired quality of water resources (surface/subsurface water, groundwater) • Reduced surface water infiltration 	<ul style="list-style-type: none"> • Domestic wastewater will be discharged into septic tanks. • Provide adequate sanitary facilities for onsite personnel. • Design drainage culverts for the controlled release of storm flows. • Chemical drains are treated in a wastewater treatment system after the neutralization treatment. Drains that may contain oil is treated in a wastewater treatment system after being treated with an oil separation system. • Treated effluent will comply with WB/IFC EHS Guidelines. The wastewater discharged will be monitored in accordance with the Environmental and Social Monitoring Plan as described in Section 9.2. 	TANESCO	50,000 USD
	• Accidental Spills and Leaks	<ul style="list-style-type: none"> • Impaired quality of water resources (surface/subsurface water, groundwater) 	<ul style="list-style-type: none"> • The storage areas for oil, fuel, chemicals and waste will be surrounded by containment/spill control measure to prevent spilled oil, fuel and chemicals from percolating into the ground or reaching the receiving waters. • All drainage/tanks, etc. will be positioned on concrete hard standing to prevent any seepage into ground. • Use of spill or drip trays to contain spills and leaks. • Guidelines and procedures should be established for immediate clean up actions following any spillages of oil, fuel or chemicals. • SOPs will be prepared to manage any oil spills, leaks and/or seepages. SOPs will cover transport, handling, storage, use and disposal of oil/ oil wastes/ empty drums etc. Operating personnel will be trained on the SOPs. 	TANESCO	20,000 USD
Air quality	• Stack emissions	<ul style="list-style-type: none"> • Impact on ambient air quality 	<ul style="list-style-type: none"> • Install continuous emission monitoring system (CEMS) to monitor the NO_x emission concentrations and other relevant parameters at the main stacks and bypass stacks. 	TANESCO	30,000 USD
	• Stack emissions	<ul style="list-style-type: none"> • GHG generation 	<ul style="list-style-type: none"> • Conduct annual pollutant release inventory to monitor the GHG emissions from the Project. The GHGs emission shall be reported as CO₂e unit. 	TANESCO	10,000 USD
Noise	• Plant operations	<ul style="list-style-type: none"> • Increased noise disturbance/ vibration 	<ul style="list-style-type: none"> • Well-maintained equipment to be operated on-site; • Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components; • Reduce the number of equipment operating simultaneously as far as practicable; • Avoid transportation of materials on- and off-site through existing community areas • Installing silencers, mufflers or acoustic enclosures to reduce sound power level of noisy equipment such as GT, ST, HRSG, etc. at all times if necessary. 	TANESCO	30,000 USD
Waste	• Plant operations	<ul style="list-style-type: none"> • Waste Generation 	<ul style="list-style-type: none"> • A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse during operation phase for all 	TANESCO	20,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
			<p>the waste streams identified.</p> <ul style="list-style-type: none"> • Education to workers on site shall be undertaken to avoid, reduce and reuse wastes generated. • Waste disposal facilities shall be sited and signposted in the project site. Solid waste generated by daily operations at the site should be collected using on-site bins before being disposed appropriately. • All waste collected should be managed and disposed of in accordance with the required regulations. • Contractors employed to manage the waste should clearly identify within their bidding documents how the collected waste will be managed • Monitoring of appointed waste contractors for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with prevailing regulations. 		
Soil	<ul style="list-style-type: none"> • Storage, handling and disposal of waste in operation 	<ul style="list-style-type: none"> • Soil contamination due to potential leaks and spills 	<ul style="list-style-type: none"> • All drainage/tanks, etc. will be positioned on concrete hard standing to prevent any seepage into ground. • Standard Operation Procedures (SOPs) will be prepared to manage any oil spills, leaks and/or seepages. SOPs will cover transport, handling, storage, use and disposal of oil/ oil wastes/ empty drums etc. Operating personnel will be trained on the SOPs. 	TANESCO	10,000 USD
Terrestrial ecology	<ul style="list-style-type: none"> • Plant operations 	<ul style="list-style-type: none"> • Impact on vulnerable species, local terrestrial biodiversity and wild life 	<ul style="list-style-type: none"> • Vehicles and machinery will be maintained in accordance with industry standard to minimise unnecessary noise generation. • For areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible. • Appropriate speed limits for vehicles will be enforced to minimise potential for fauna strike. 	TANESCO	10,000 USD
Marine Ecology	<ul style="list-style-type: none"> • Thermal Water Discharge 	<ul style="list-style-type: none"> • Impact on marine species and ecosystem 	<ul style="list-style-type: none"> • Monitor temperature of thermal water discharge at discharge point and at the mouth of the Sudi Creek (Kisiwa Bay) ,other 3 points, and monitor the fish catch. In case, decrease of fish catch due to the project is confirmed additional measures such as income restoration measures will be discussed and implemented as necessary with the local communities and relevant authorities. • Thermal wastewater from the steam turbine is discharged after flowing into discharge pit, and treated wastewater with high temperature is discharged after lowering its temperature. • Conduct visual inspection of coral around the mouth of Sudi Creek (Kisiwa Bay) and mangrove inside the Sudi Creek (Kisiwa Bay) to monitor any changes. • Conduct visual inspection of mangrove to monitor any changes. 	TANESCO	10,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost (USD)
	<ul style="list-style-type: none"> Operation of the water intake facility 	<ul style="list-style-type: none"> Impact on marine species and ecosystem (e.g. impingement and entrainment) 	<ul style="list-style-type: none"> Design the outfall structure that can minimize impact on marine species, as possible Consider existing marine ecology in Sudi Creek (Kisiwa Bay) in the planning such as siting and design of the water intake facility. Employ design and technology(ies) that lessen impact on marine species, as practical 	TANESCO	10,000 USD
Community infrastructure and public services	<ul style="list-style-type: none"> Operation of the project and development of the neighbouring communities 	<ul style="list-style-type: none"> Increased pressure on social services 	<ul style="list-style-type: none"> Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the project. Develop and implement a site safety management plan. This plan will need to ensure appropriate and adequate health care services are provided on site and at the worker camp to address/ manage worker illnesses and injuries. 	TANESCO	5,000 USD
Employment and economy	<ul style="list-style-type: none"> Operation of the project and development of the neighbouring communities 	<ul style="list-style-type: none"> Increased local market opportunities Increased local employment 	<ul style="list-style-type: none"> Develop and implement a local recruitment and procurement management plan. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers. Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the project. Inform local villagers of job opportunities in a timely manner. Inform local businesses of contracting opportunities in a timely manner such as awareness on forthcoming investment and employment opportunities, including sensitization of farmers for production of required quality of foods such as vegetables. 	TANESCO	5,000 USD
Community safety and security, Occupational Health and Safety	<ul style="list-style-type: none"> Operation of the project and increased populations in the neighbouring communities 	<ul style="list-style-type: none"> Increased crime and insecurity Increase risks, hazards and accidents 	<ul style="list-style-type: none"> Provision and enforcement of the proper use PPEs such as hard hats and industrial boots. Provide appropriate training for security personnel and monitor implementation of the training over time and create awareness on all security issues including activities the community police in the area. Fencing of the Project Site with barbed wire Putting up of safety signs 	TANESCO	5,000 USD

Table 12-62 Environmental and Social Management Plan (ESMP) for the Proposed Mtwara –Somanga Transmission Line and Substations

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost
Site Preparation and Construction Phase					
Terrestrial Ecology	<ul style="list-style-type: none"> Site preparation activities (e.g. vegetation clearing) 	<ul style="list-style-type: none"> Habitat loss, habitat fragmentation/degradation, disturbance of native species; fauna mortality 	<ul style="list-style-type: none"> Vegetation clearance should be confined only to necessarily designated sites. The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing. Implement landscaping and re-vegetation after completion of construction using native species where possible. Weed and pest management measures shall be implemented to avoid introduction of invasive weeds to natural and modified habitat areas. Maintenance of ROW (vegetation clearing) (Investigation & transplanting of 2VU species(Vitex zanzibarensis, and Dialium holtzii)) Construction materials and chemicals will be appropriately secured and locked down during flood season to avoid accidental release to the natural environment. Conduct bird survey and install reflectors/marks, as necessary, to reduce risk of bird collision with the transmission line. Keep appropriate height to allow elephants to pass safely and install fence where necessary. Information of Elephants will be shared with TAWA(Tanzania Wildlife Management Authority). 	TANESCO	750,000 USD
Soil	<ul style="list-style-type: none"> Site clearance, site formation and levelling involving excavation and backfilling; Construction of substations and transmission towers. 	<ul style="list-style-type: none"> Increase of soil erosion 	<ul style="list-style-type: none"> Delineation of clearance boundaries to limit the areas to be cleared. Scheduling clearance activities, if possible to avoid extreme weather events such as heavy rainfall, extreme dry and high winds. Revegetation areas with temporary land use, conducting progressive rehabilitation. Demarcate routes for movement of heavy vehicles to minimise disturbance of exposed soils and compaction of sub-surface layers. Reuse topsoil as much as possible within rehabilitation activities. Control erosion through diversion drains, sediment fences, and sediment retention basins. 	TANESCO	20,000 USD
	<ul style="list-style-type: none"> Accidental spillage, leakage 	<ul style="list-style-type: none"> Soil and groundwater contamination 	<ul style="list-style-type: none"> Fuel tanks and chemical storage areas will be sited on sealed hardstand areas, provided. Secondary containment, with appropriate drainage connection and/or provision for removal of spilled liquids, will be provided around places of fuel and hazardous materials storage 	TANESCO	50,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost
			<ul style="list-style-type: none"> • Provision of spill kits on site • Unloading and loading protocols will be developed to ensure that staff are able to undertake these tasks in a manner that minimises the risks of spills occurring. • A training program will be implemented to familiarise staff with measures to be taken to prevent spills and leaks, and for emergency procedures and practices related to contamination events. • Appropriate management, storage and disposal of all waste streams will be implemented. 		
Water Resources	<ul style="list-style-type: none"> • Wastewater and storm water runoff 	<ul style="list-style-type: none"> • Impact on surface water quality 	<ul style="list-style-type: none"> • Adequate sanitary facilities will be provided for the construction workforce. Septic tanks will be provided to treat sanitary discharge. • Contaminated storm/rainwater runoff from the substation will pass through oil separator prior to discharge • Design drainage for the controlled release of storm flows. • Regularly, and particularly following rainstorms, inspect and maintain drainage and erosion control and silt removal measures to ensure proper and efficient management at all times. • Mulch to stabilise exposed areas, where practicable and appropriate. Re-vegetate areas promptly, where practicable and appropriate. • Construct sediment collection basin. • Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into septic tanks. • Oil-contaminated water will be collected and handled by local licensed wastewater sub-contractors. 	TANESCO	25,000 USD
Wastes	<ul style="list-style-type: none"> • Wastes generated from construction sites 	<ul style="list-style-type: none"> • Solid waste management 	<ul style="list-style-type: none"> • Pursue the policy of Four R's – Reduce, Reuse, Recycle, Recover – to manage its waste. • Provide training to labourers for waste disposal in designated areas and use of sanitation facilities. • Implement proper storage of the construction materials and wastes to minimise the potential damage or contamination of the materials. • Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type. • Store waste systematically to allow inspection between containers to monitor leaks or spills. • Ensure that storage areas have impermeable floors and containment. • Dispose of waste by licensed contractors. 	TANESCO	30,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost
Air	<ul style="list-style-type: none"> • Site clearance, site formation and levelling involving excavation and backfilling; • Construction of substations and transmission towers. 	<ul style="list-style-type: none"> • Impact on local air quality 	<ul style="list-style-type: none"> • Specifying transport networks and locating stockpiles as far away from the site boundary which is close to the air sensitive receptors, as practicable • Minimizing the size of exposed areas and material stockpiles and the periods of their existence; • Temporary stockpiles of dusty materials will be either covered entirely by impervious sheets or sprayed with water; • Covering the construction materials transported by trucks or vehicles entirely; • Cleaning wheels and the lower body parts of trucks at all exits of the construction site; • Controlling the height of unloading the fill materials during filling as far as possible; • Prohibiting the burning of waste or vegetation on site; • Compacting the reclaimed land immediately to avoid fugitive dust emissions; • Maintaining and checking the construction equipment regularly; • Switching off engines when not in use 	TANESCO	40,000 USD
Noise and Vibration	<ul style="list-style-type: none"> • Operation of construction equipment and machineries 	<ul style="list-style-type: none"> • Generation of noise and vibration 	<ul style="list-style-type: none"> • Maintaining equipment and vehicles to manufacturers' standards; and • Limiting operating times to daylight hours; • Information of blasting incidence, time should be available either written or disposed on local gathering areas. 	TANESCO	10,000 USD
Community and Occupational health and safety	<ul style="list-style-type: none"> • Introduction of workers into the area 	<ul style="list-style-type: none"> • Potential increase in communicable diseases among works and local people 	<ul style="list-style-type: none"> • Training for all workers on the transmission routes and common symptoms of communicable diseases as well as sensitization of enforcement of HIV/AIDS law and regulations. Regular BCC (Behaviour Change Communication) and Peer Education activities will be done on a weekly basis. Counselling and testing will be done with Provincial Medical Directors semi-annually. This can help reduce the potential for workers to unknowingly transmit communicable diseases. HIV prevention plan will be prepared. • Establish amenities at the worker camp to that help minimize the interaction between the workforce (particularly temporary construction workers) and local villagers. • Establish a workforce code of conduct. Include in the code specific measures on anti-social behaviour. • Vector management procedures, including consideration of whether pesticides will be utilized to reduce the presence of vectors onsite. • Emergency management procedures, should a health issue escalate and require a rapid response. • Create awareness on all security, safety issues, and hazards on site 	TANESCO	100,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost
			<ul style="list-style-type: none"> • Provide safety signs • HIV prevention awareness promotion for local communities. 		
Social infrastructure and services	<ul style="list-style-type: none"> • Influx of workers 	<ul style="list-style-type: none"> • Impact on existing social infrastructure and services 	<ul style="list-style-type: none"> • Provide appropriate amenities at the worker camp. This will help reduce the need for workers to utilize local infrastructure and services. • Develop and implement a traffic management plan to minimize the impact of transporting construction materials and equipment 	TANESCO	10,000 USD
Cultural Heritage	<ul style="list-style-type: none"> • Site preparation and construction activities 	<ul style="list-style-type: none"> • Impact on potential artefacts, graves/ graveyard; • Changes on cultural values 	<ul style="list-style-type: none"> • Employ cultural heritage expert, as necessary • Closely coordinate with necessary government agency upon discovery of an artefact • Implement a Chance Finds Procedure according to IFC standard 8 • Communicate closely with the affected families. • Abide by the necessary cultural and legal procedures. • Provide compensation as stipulated in the Resettlement Action Plan 	TANESCO	30,000 USD
Land Acquisition and Resettlement	<ul style="list-style-type: none"> • Acquisition of land and properties 	<ul style="list-style-type: none"> • Physical and economic displacement of people in the proposed project site 	<ul style="list-style-type: none"> • Conduct land acquisition process in accordance with the Resettlement Policy Framework • Provide income restoration for those who will lose their livelihood due to land acquisition. • Keep constant and open communication with PAPs and other stakeholders • Provide assistance to vulnerable groups on how to go through the compensation process. • Setting up of a grievance mechanism to address any concern. 	TANESCO	3million USD
Operation Phase					
Terrestrial Ecology	<ul style="list-style-type: none"> • Presence of transmission towers; ROW maintenance and inspection activities; 	<ul style="list-style-type: none"> • Potential bird strike or elephant collision 	<ul style="list-style-type: none"> • Vegetation clearance should be confined only to necessarily designated sites. • Weed and pest management measures shall be implemented to avoid introduction of invasive weeds to natural and modified habitat areas. • Appropriate speed limits for maintenance vehicles will be enforced to limit noise and dust generation and to minimise potential for fauna strike • Information of Elephants will be shared with TAWA(Tanzania Wildlife Management Authority). 	TANESCO	100,000 USD
Soil	<ul style="list-style-type: none"> • Maintenance of ROW (vegetation clearing) 	<ul style="list-style-type: none"> • Soil erosion 	<ul style="list-style-type: none"> • Delineation of clearance boundaries to limit the areas to be cleared. • Scheduling clearance activities, if possible to avoid extreme weather events such as heavy rainfall, extreme dry and high winds. • Demarcate routes for movement of heavy vehicles to minimise disturbance of 	TANESCO	100,000 USD

Affected Aspect	Project Activity and Affected Area	Potential Impacts	Proposed Mitigation Measures (If applicable)	Overall responsible Entity	Cost
			<ul style="list-style-type: none"> exposed soils and compaction of sub-surface layers. Reuse topsoil as much as possible within rehabilitation activities. Control erosion through diversion drains, sediment fences, and sediment retention basins. 		
Water	<ul style="list-style-type: none"> Accidental releases from operational activities 	<ul style="list-style-type: none"> Impact on surface and groundwater qualities 	<ul style="list-style-type: none"> The storage areas for batteries and waste in substations and other storage areas will be surrounded by containment/spill control measure to prevent spilled oil, fuel and chemicals from percolating into the ground or reaching the receiving waters. All drainage/tanks, etc. will be positioned on concrete hard standing to prevent any seepage into ground. Use of spill or drip trays to contain spills and leaks Guidelines and procedures should be established for immediate clean up actions following any spillages of oil, fuel or chemicals. SOPs will be prepared to manage any oil spills, leaks and/or seepages. SOPs will cover transport, handling, storage, use and disposal of oil/ oil wastes/ empty drums etc. Operating personnel will be trained on the SOPs. Regularly check and replace oil separators. 	TANESCO	20,000 USD
Wastes	<ul style="list-style-type: none"> Wastes from control room and substations 	<ul style="list-style-type: none"> Generate solid and hazardous wastes 	<ul style="list-style-type: none"> Education to workers on site shall be undertaken to avoid, reduce and reuse wastes generated. Waste storage facilities shall be sited and signposted in the project site. Solid waste generated by daily operations at the site should be collected using on-site bins before being disposed appropriately. All waste collected will be managed and disposed of in accordance with the required regulations. Dispose waste through licensed waste contractors 	TANESCO	5,000 USD/year
Community and Occupational Health and Safety	<ul style="list-style-type: none"> Presence of new infrastructure 	<ul style="list-style-type: none"> Onsite accidents and injuries 	<ul style="list-style-type: none"> Provision and enforcement of the proper use PPEs Provide appropriate training for security personnel and maintenance employees Monitor implementation of the training over time Create awareness on all security and safety issues associated with transmission line towers and substations Construct fence around transmission towers and substations. Provide safety signs 	TANESCO	500,000 USD

12.1.9 Environmental and Social Monitoring Plan

Draft monitoring plan for construction and operational stages are shown in Table 12-63 and Table 12-64.

The reporting system will ensure regular flow of information from the project site to the project headquarters/TANESCO head office and, as necessary, to regulatory authorities and financing entities. The reporting system will provide a mechanism to ensure that the measures proposed in the project's ESMPs are implemented.

Table 12-63 Environmental and Social Monitoring Plan for the Proposed Gas-fired Thermal Power Plant at Mtwara

Project Stage/ Affected Component	Potential Impact	Parameters to be monitored	Location	Measurements	Frequency	Overall Responsibility	Cost (USD)
Site Preparation and Construction Phase							
General	Inspection of mitigation compliance	General compliance with mitigation measures presented in the ESMP and as specified in EPC Contractor document/ manual	Project activity areas and construction workers camp	Visual inspection of all active work areas	Daily	TANESCO	10,000 USD
Water	Impact on surface water quality	Turbidity, oil & grease	Project activity areas	Standard analytical methods	Weekly	TANESCO	20,000 USD
	Impact on groundwater quality	pH, temperature, EC, TDS, turbidity, total hardness, Cl, SO ₄ ⁺ , NO ₃ ⁻ , BOD, COD, Total Coliforms and heavy metals (As and Pb)	Neighbouring wells and boreholes	Standard analytical methods	Upon request from villagers	TANESCO	20,000 USD
Ambient Air	Dust Generation	Dust	• Within the construction site • Site described in the request	Visual inspection	• Within the site: Several times during construction • Other locations: Upon request/ complaint	TANESCO	5,000 USD
Noise	Noise Generation	Noise levels	• Within the construction site • Site described in the request	Noise level measurement	• Within the construction site: several times during construction • Other locations: Upon Request	TANESCO	5,000 USD
Waste	Solid waste management	Adequacy of solid waste management measures (e.g. appropriate storage, collection and disposal)	Waste storage areas, workers camp	Visual inspection of all waste collection sites, and confirmation of proper disposal	Daily	TANESCO	5,000 USD
Soil	Acceleration of soil erosion	Adequacy of measures to prevent soil erosion	Project activity areas	Visual inspection	After every rainy season	TANESCO	5,000 USD
Terrestrial Ecology	Loss of mangrove areas	Area of vegetation loss and re-vegetation if applicable (to ensure that no other areas will be disturbed)	Mangrove areas	Visual inspection	Weekly	TANESCO	5,000 USD
	Degradation of mangrove	Mangrove vegetation	Mangrove areas near the Kisiwa site	Visual inspection	Weekly	TANESCO	
Marine Ecology	Destruction of corals	Extent of destruction of corals	Coral habitat area near the mouth of Sudi Creek (Kisiwa Bay)	Visual inspection	Weekly	TANESCO	5,000 USD

Project Stage/ Affected Component	Potential Impact	Parameters to be monitored	Location	Measurements	Frequency	Overall Responsibility	Cost (USD)
Local Economy	Increased local market opportunities	local market opportunities	Affected communities and neighbouring communities	Interviews with local people and relevant authorities	During stakeholder engagement activities	TANESCO	3,000 USD
	Increased local employment	local employment	Affected communities and neighbouring communities	Interviews with local people and relevant authorities	During stakeholder engagement activities	TANESCO	3,000 USD
	Increased pressure on social services and infrastructure (e.g. roads)	Complaints from communities	Affected communities	As per the grievance redress mechanism	Upon receipt of complaint	TANESCO	As per the grievance redress mechanism
Community Health and safety	Increased crime and insecurity	Crimes and complaints	Affected communities	Crimes and complaints	Based on occurrence	TANESCO	1,000 USD
	Increase risks, hazards and accidents	Accidents, incidents and complaints	Affected communities	Incidents, accidents and community complaints	Based on occurrence	TANESCO	2,000 USD
	Increased risk of HIV/AIDS and other STDS	Prevalence of STDS	Affected communities	Health check described in Health & Safety Plan to be prepared by EPC	Yearly	TANESCO	5,000 USD
Occupational Health and Safety	Increase risks, hazards and accidents	Near-misses, incidents, occupational diseases, dangerous occurrences	Project activity areas and construction workers camp	As defined in construction phase Health & Safety Plan to be prepared by EPC contractor	As defined in H&S Plan	TANESCO	5,000 USD
Operation Phase							
General	Inspection of mitigation compliance	General compliance with mitigation measures presented in the ESMP and operational manual	Project activity areas	Visual inspection of all active work areas	Daily	TANESCO	10,000US D/year
Water	Impaired surface water quality	pH, temperature, turbidity, BOD, COD, TSS, oil & grease, total coliform	At wastewater discharge point	Standard analytical method	Quarterly	TANESCO	20,000US D/year
Air Emissions	Stack emissions	NOx as NO2, O2, moisture content	Main stack and by-pass stack	CEMS	Continuous	TANESCO	70,000 USD
	Emission concentrations	CEM validation for NOx	Main stack and by-pass stack	Standard analytical methods	Annually	TANESCO	15,000US D/year
GHG Emissions	Climate change	GHG generation	Plant control room	Natural gas consumption	Annually	TANESCO	3,000USD
Waste	Solid waste management	Appropriate collection, transport and management	Waste collection sites in Project activity areas	Visual inspection of all waste collection sites and confirmation of proper disposal	Weekly	TANESCO	5,000 USD
Terrestrial Ecology	Degradation of mangrove	Mangrove vegetation	Mangrove areas near the Kisiwa site	Visual inspection	Quarterly	TANESCO	5,000 USD
Marine Ecology	Thermal Water Discharge	Temperature of thermal water discharge	Discharge point At the mouth of Sudi Creek (Kisiwa Bay)	Standard analytical method	Continuous (The other 3 points: Quarterly)	TANESCO	10,000 USD

Project Stage/ Affected Component	Potential Impact	Parameters to be monitored	Location	Measurements	Frequency	Overall Responsibility	Cost (USD)
			The other 3 points in the Creek				
		Coral bleaching	Coral habitat area near the mout of Sudi Creek (Kisiwa Bay)	Visual inspection	Quarterly	TANESCO	5,000 USD
		Fish Catch	Sudi Creek	Interview with Fishermen, BMU and Mtwara District	Quarterly	TANESCO	5,000 USD
	Operation of the water intake facility	Impingement and entrainment of marine species	Intake facility	Visual inspection	Quarterly	TANESCO	3,000 USD
Local Economy	Increased local market opportunities	local market opportunities	Affected communities and neighbouring communities	Interviews with local people and relevant authorities	During stakeholder engagement activities	TANESCO	2,000 USD/year
	Increased local employment	local employment	Affected communities and neighbouring communities	Interviews with local people and relevant authorities	During stakeholder engagement activities	TANESCO	2,000 USD/year
	Increased pressure on social services (e.g. roads)	Complains from village members	Affected communities	Complaints from village members	As per the grievance redress mechanism	TANESCO	As per the grievance redress mechanism
	Changes in amount of fish caught	Amount of fish caught	Affected communities	Interviews with local people and relevant authorities	Annually	TANESCO	2,000 USD/year
Community Health and safety	Increase risks, hazards and accidents	Accidents, incidents and complaints	Affected communities	Incidents, accidents and community complaints	Based on occurrence	TANESCO	2,000 USD/year
Occupational Health and Safety	Increase risks, hazards and accidents	Near-misses, incidents, occupational diseases, dangerous occurrences	Project activity areas and construction workers camp	As defined in construction phase Health & Safety Plan to be prepared by EPC contractor	As defined in H&S Plan	TANESCO	2,000 USD/year

Table 12-64 Environmental and Social Monitoring Plan for the Proposed Mtwara-Somanga Transmission Line and Substations

Project Stage/ Affected Component	Potential Impact	Parameters to be monitored	Location	Measurements	Frequency	Overall Responsibility	Cost (USD)
Site Preparation and Construction Phase							
General	Inspection of mitigation compliance	General compliance with mitigation measures presented in the ESMP and as specified in EPC Contractor document/manual	Project activity areas and construction workers camp	Visual inspection of all active work areas	Daily	TANESCO	10,000USD
Water	Impaired groundwater quality	pH, temperature, EC, TDS, turbidity, total hardness, Cl, SO4+, NO3-, BOD, COD, Total Coliforms and heavy metals (As and Pb)	Neighbouring wells and boreholes	Standard analytical methods	Upon request from villagers	TANESCO	10,000 USD
Ambient Air	Air pollutant and dust Generation	Dust/exhaust CO, SO2, NOx	<ul style="list-style-type: none"> • Village(s) close to access roads • Receptors located within 150m from the construction site, if there is any. 	Dust: Visual Others: inspection Standard analytical methods	<ul style="list-style-type: none"> • Dust: Several times during construction • Others: Upon request • If there is any receptors within 150m from the construction site, daily. 	TANESCO	5,000 USD
Noise	Noise generation	Noise levels	<ul style="list-style-type: none"> • Within the construction site • Site described in the request • Receptors located within 150m from the construction site, if there is any. 	Noise level measurement	<ul style="list-style-type: none"> • Within the site: several times during construction • Other locations: Upon Request • If there is any receptors within 150m from the construction site, daily. 	TANESCO	10,000 USD
Waste	Solid waste management	Adequacy of solid waste management measures (e.g. appropriate storage, collection and disposal)	Waste storage areas, workers camp	Visual inspection of all waste collection sites, and confirmation of proper disposal	Weekly	TANESCO	5,000 USD
Terrestrial Ecology	Loss of vulnerable species, local terrestrial biodiversity and wild life	Presence of spotted ground thrush	Project activity areas and the neighbouring areas	Bird survey	Once prior to commencement of construction	TANESCO	50,000 USD
Local Infrastructure	Increased pressure on social services/infrastructure (roads)	Complains from communities	Affected communities	As per the grievance redress mechanism	As per the grievance redress mechanism	TANESCO	10,000 USD
Community Health and safety	Increase risks, hazards and accidents	Accidents, incidents and complaints	Affected communities	Incidents, accidents and community complaints	Based on occurrence	TANESCO	10,000 USD
Occupational Health and Safety	Increase risks, hazards and accidents	Near-misses, incidents, occupational diseases, dangerous occurrences	Project activity areas and construction workers camp	As defined in construction phase Health & Safety Plan to be prepared by EPC contractor	As defined in H&S Plan	TANESCO	10,000 USD

Project Stage/ Affected Component	Potential Impact	Parameters to be monitored	Location	Measurements	Frequency	Overall Responsibility	Cost (USD)
Operation Phase							
General	Inspection of mitigation compliance	General compliance with mitigation measures presented in the ESMP and operational manual	Project activity areas	Visual inspection of all active work areas	Daily	TANESCO	5,000 USD/year
Waste	Solid waste management	Appropriate collection, transport and management	Waste collection sites in substations	Visual inspection of all waste collection sites and confirmation of proper disposal	Monthly	TANESCO	5,000 USD/year
Terrestrial ecology	Loss of vulnerable species, local terrestrial biodiversity and wild life (potential bird strike, or elephant collision)	Habitats and Disturbance to terrestrial species	ROW	Record of incident(s), details of impact/ collision	Upon incident	TANESCO	5,000 USD/year
Community Health and safety	Increase risks, hazards and accidents	Accidents, incidents and complaints	Affected communities	Incidents, accidents and community complaints	Based on occurrence	TANESCO	5,000 USD/year
Occupational Health and Safety	Increase risks, hazards and accidents	Near-misses, incidents, occupational diseases, dangerous occurrences	Project activity areas and construction workers camp	As defined in construction phase Health & Safety Plan to be prepared by EPC contractor	As defined in H&S Plan	TANESCO	5,000 USD/year

12.1.10 Stakeholder Engagement

(1) Identification of Stakeholders

Identification of stakeholders is an essential step in effective engagement. It is necessary to determine who the stakeholders are and understand their priorities and objectives in relation to the proposed project. It is also important to understand how each stakeholder may be affected so that engagement can be tailored to inform them and understand their views and concerns in an appropriate manner.

The stakeholders for this project have been, and will continue to be, identified by:

- Identifying the different categories of parties who may be affected by or interested in the project; these groups are presented in Table 12-65; and
- Identifying specific individuals or organizations within each of these categories taking into account:
 - the expected area of influence of the Project, that is the geographical area over which it may cause impacts (both positive and negative) over its lifetime, and therefore the localities within which people could be affected; and
 - the nature of the impacts that could arise and therefore the types of government bodies, nongovernmental organizations, academic and research institutions and other bodies who may have an interest in these issues.

Stakeholder identification is a particular priority at the beginning of the EIA process; however additional stakeholders will be identified as the EIA proceeded. The process of identifying the individuals and organizations within each group is a continuing one.

Overview of individual stakeholders is shown in Table 12-65; however, the list will be updated throughout the engagement process. Stakeholders are pre-determined based on the nature of the project as follows:

Table 12-65 Overview of Stakeholders

Category	Institution/Group	Role and Responsibility
National level	Vice President's Office (Division of Environment)	<ul style="list-style-type: none"> • Coordinate various environment management activities in Tanzania • Advise the Government on legislative and other measures for the management of the environment • Advise the Government on international environmental agreements. • Monitor and assess activities, being carried out by relevant agencies in order to ensure that the environment is not degraded • Prepare and issue a report on the state of the environment in Tanzania; • Coordinate the implementation of the National Environmental Policy
National level	National Environmental Management Council (NEMC)	<ul style="list-style-type: none"> • Carry on environmental audit and environmental monitoring • Carry out surveys which will assist in the proper management and conservation of the environment • Undertake and co-ordinate research, investigation and surveys in conservation and management • Review and recommend for approval of Environmental and Social Impact Report • Enforce and ensure compliance of the national environmental quality standards

Category	Institution/Group	Role and Responsibility
		<ul style="list-style-type: none"> • Initiate and evolve procedures and safeguards for the prevention of accidents which may cause environmental degradation and evolve remedial measures where accidents occur; • Undertake in co-operation with relevant key stakeholder's environmental education and public awareness; • Render advice and technical support, where possible to different stakeholders
National level	Ministry of Energy	<ul style="list-style-type: none"> • To set and monitor implementation of policies, strategies and laws for sustainability of energy to enhance growth and development of the economy
National level	Ministry of Lands, Housing and Human Settlements Development	<ul style="list-style-type: none"> • Land use planning • Issuing of Right of Occupancy • Valuation and compensation
National level	Occupational Safety and Health Authority (OSHA)	<ul style="list-style-type: none"> • Registration of the workplace • Issuance of OSHA Compliance certificate • Inspection on OSH related aspects • Enforcement of Occupational Health and Safety Act, 2003 (Act No. 5/2003)
National level	Tanzania Petroleum Development Corporation (TPDC)	<ul style="list-style-type: none"> • Provisional of Natural Gas for the power plant
National level	TANESCO	<ul style="list-style-type: none"> • Mandated with electricity generation, transmission, distribution, supply, system operation, import and export of electricity and electrical installation. • Ensuring the operating conditions for power plant
National level	Energy and Water Utilities Regulatory Authority (EWURA)	<ul style="list-style-type: none"> • Licensing, • Tariff review • Monitoring performance and standards with regards to quality, safety, health and environment. • Promoting effective competition and economic efficiency, protecting the interests of consumers and promoting the availability of regulated services to all consumers including low income, rural and disadvantaged consumers in the regulated sectors.
National level	Tanzania Meteorological Agency (TMA)	The Agency is responsible for the provision of Meteorological services; weather forecasts, climate services and warnings and advisories information for the country
Government agencies	Mtwara Urban Water Supply and Sewerage Authority (MTUWASA)	Responsible for infrastructure development – Water supply pipeline to the Kisiwa site
Government agencies	TARURA – Mtwara Regional office	Responsible for infrastructure development – Access road to the Kisiwa site
Regional level	Mtwara Regional Secretary Office	<ul style="list-style-type: none"> • Responsible for environmental coordination of all advice on environmental management in the region and liaises with the Director and the Director General on implementation and enforcement of the Environment Act. • A Regional Environment Management Expert appointed by the Minister responsible for Regional Administration heads the secretariat. • The Regional Environment Management Expert is responsible for advising the local authorities on matters relating to the implementation and enforcement of the Environment Act. The Expert links the region with the Director of Environment and Director General. • Advice on implementation of development projects and activities at Regional level

Category	Institution/Group	Role and Responsibility
District level	Mtwara District Executive Director Office and Head of department	<ul style="list-style-type: none"> • District Executive Director in cooperation with head of departments. • Baseline data on social and economic conditions • Plan and coordinate activities on community-based natural resource and environment management • Enforcement of laws & regulations • Coordinate environmental matters at the District level
District level	Mtwara District Commissioner office	<ul style="list-style-type: none"> • Oversee and advice on implementation of national policies at District level • Proper management of the environment in their areas of jurisdiction • Carrying out directives given to promote and enhance sustainable management of the environment and as provided under the Local Government; • Performing any functions as provided by the Local Government (District) Authorities Act, 1982. • Advice on implementation of development projects and activities at District level
District level	Mtwara District: Head of Departments -Planning/ Natural Resource/ Health/ Community Development Departments etc.	<ul style="list-style-type: none"> • Plan and coordinate activities on community-based natural resource and environment management • Enforcement of laws and regulations • Issue license for forest/mangrove utilization • Provides guidelines for forest/mangrove use and management within project area and area of influence Baseline data on social and economic conditions
District level	District Environmental Officer and Environmental Committee	<ul style="list-style-type: none"> • Coordinate environmental matters at the District level
Ward Level	Ward Development Committees – (Ward Councillor, Ward Executive Officer (WEO), Ward Environment Committee	<ul style="list-style-type: none"> • Oversee general development plans for the Ward. • Provide information on local situation and Extension services • Technical support & advice • Project Monitoring
Community level	Village Council (Chairman/ VEO, Environment Committee); Other leaders– Health officer, Teachers, Elders, Vulnerable Groups etc.), Communities groups (farmers, women, youth, etc.)	<ul style="list-style-type: none"> • Information on local social, economic, environmental situation • View on socio-economic and cultural value of the sites and on proposed project operations. • Rendering assistance and advice on the implementation of the project • Project Monitoring (watchdog for the environment, ensure wellbeing of residents and participate in project activities
Community level	Local NGO/CBO and academic institutions	<ul style="list-style-type: none"> • With direct interest in the proposed Project, and its social and environmental aspects and that are able to influence the Project directly or through public opinion. • Monitoring and management of the project area • Forest/environment conservation • Socioeconomic development in the area
Bilateral and Multilateral Organizations	Development Agencies Financial Institutions - Japan International Cooperation Agency (JICA)	It may have useful data or insight into local and national issues of relevance to the proposed Project.

(2) Methods of Stakeholder's Participation

Stakeholder participation involves processes whereby all those with a stake in the outcome of a project actively participate in decisions on planning and management. They share information and

knowledge, and may contribute to the project design or even alternatives, so as to enhance the success of the project and hence ultimately their own interests. Effective public/stakeholder involvement requires attention to improving the opportunities for such involvements as well as enhancing awareness among the public/stakeholders of those opportunities (Hughes, 1998). Thus, having identified the relevant stakeholders, the EIA team had to establish clear lines of communication and interaction with the stakeholders. The techniques used varied from one stakeholder group to another. However, simple methods such as consultations, focused group discussion and interviews were used.

The consulting team started to conduct scoping exercise with various stakeholders as well as securing and reading through several documents that deal with the thermal power plants and environmental characteristics of the project area. The consultation was undertaken in two phases. The first phase was during scoping from 20th March to 08th April 2018 where two affected villages were involved. The second phase of consultation was conducted during the full EIA study from 8th – 17th August, 2018. The consultation was undertaken by sending prior information through letters to the Regional Administrative offices of Mtwara region. The Regional administrative Secretary allowed the consultants to proceed with consultation in Mtwara district council. From Mtwara district, letters were prepared and sent to the wards and village leaders in Kisiwa and Namgogoli villages. These letters apart from providing the program details, they were requesting the above named government leaders to inform their respective Wards Executive officers about the program. Wards Executive officer in collaboration with Kisiwa and Namgogoli village leaders informed the villagers to be prepared and attend the consultation meetings with the consultants. In general, the consultation activities were undertaken based on the following categories of stakeholders;

1) Consultation with Regional and District Officials

The consultation was undertaken with Mtwara Regional Administrative Secretary which was followed by consultation at the Mtwara district level. Within the district discussion and interviews were conducted with Acting District Executive Directors' offices which was followed by the discussion with the head of departments including Land Officer, Community Development Officer, Sports and Culture, Economics and Planning, TARURA, District Engineer, Education Officer as well as Natural Resources and Environment offices¹⁶. The aim of these consultations was to explain to them about the EIA process, share the layout of the proposed thermal power plant and its associated infrastructure, discuss various impacts associated with the project, give them an opportunity to air their views and concerns regarding the proposed project as well as determine alternatives for the project and additional potential stakeholders within their areas of jurisdiction.



Figure 12-63 Consultation with Head of Departments at Mtwara District Council

¹⁶ These were government officials within the district which are responsible for natural resources and environment.

Stakeholder (See the details in Table 12-67)	Date
Mtwara Rural District	21-23 March 2018 / 7 August 2018
Lindi District	26-27 March 2018
Lindi Urban District	26-27 March 2018
Kilwa District	4-5 April 2018

2) Consultations with Other Relevant Stakeholders

In Mtwara district consultation was conducted by visiting and discussing with key stakeholders such as TANESCO – regional office (project proponent to share issues raised by stakeholders mainly associated with compensation issues), Tanzania Forest Service, Marine Parks, Mtwara Port Authority, existing power plant in Mtwara and two NGO's namely Volunteer for Youth in Health and Development and MSOAP.

Stakeholder (See the details in Table 12-67)	Date
Ministries	28 August 2018
NGOs	23 March 2018



Figure 12-64 Meeting with Village Leaders at Kisiwa Village in Mtwara District

3) Meetings with Ward and Village Leaders

Village meetings were conducted with ward, village leaders. The meeting aimed at collecting specific data at the village as well as identifying sensitive sites/areas such as cultural sites that are within the village or its neighborhood. A checklist was also administered during the meeting to help gather relevant data related to infrastructure available, likely to be impacted, availability of land in case relocation is due.

The meeting also aimed at sensitizing the village leaders regarding how they can handle compensation matters and also to ensure that they will continue to sensitize and inform other villagers who were unable to attend the village public meetings.

Stakeholder (See the details in Table 12-67)	Date
Village leaders in Mtwara Rural	21-28 March 2018
Village leaders in Lindi Rural	10-13 August 2018
Village leaders in Lindi Urban	11-12 August 2018
Village leaders in Kilwa	4-6 April 2018 / 13-17 August 2018

4) Village Public Meetings

To ensure that all Kisiwa and Namgogoli villagers are informed of about the project, the team conducted public meetings in two phases.

The 1st phase of public meetings was conducted four times in the three villages from 22nd March, 2018 to 07th April, 2018. The first meeting was undertaken with village government leaders, then followed by village meeting which was attended by a significant number of villagers both men and women. The third and the fourth public village meetings were undertaken at Namgogoli and Mgao villages. The meetings aimed at informing the PAPs and the villagers regarding the project and the impacts that are associated with the project. Villagers were able to express their concerns in relation to the positive and adverse impacts of the project which include loss of land, possibilities of increase spread of HIV/AIDS especially during the construction phase as well as other environmental and social impacts associated with the project. In these meeting villagers were also sensitized on their right to be compensated and what is to be compensated if they will either loose land, crops and houses. Villagers were also given an opportunity to ask questions, raise their concerns and provide information to the team on issues such as availability of land in the village for resettlement purposes.

Stakeholder (See the details in Table 12-67)	Date
Villages in Mtwara Rural	21-28 March 2018 / 8 August 2018
Villages in Lindi Rural	10-13 August 2018
Villages in Lindi Urban	11-12 August 2018
Villages in Kilwa	4-6 April 2018

5) Focus Group Discussion and Interview

In this report, a Focus Group Discussion means discussion among a certain category of people such as women, elderly people, and fishermen. The first FGD was undertaken with fishermen at the fishing land site. The group comprised of two women and four men. Elders were considered to be an important source of history of the village in terms of major environmental and social events, which have occurred in the area which might have implications to the proposed thermal power plant. The selected elders also represented a group of vulnerable people in the project area, which is critical to be considered in EIA study. Another focus group was conducted with members of Beach Management Unit in order to obtain information to fishing activities and the role of the unit in the environmental management along the coast. On 8th August, 2018, another FGD was undertaken with a group of fishermen.

The second phase of consultation also intends to demonstrate how the information and views of stakeholders were taken into account in the preparation of Terms of Reference and in project decision making; and to discuss mitigation and benefit enhancement measures. The minutes for focus group discussion conducted in August 2018 was prepared.

In addition to the focus groups, interviewers were conducted with an opportunity sample of four local residents in the village who were engaged in provision of health and education services. The interview with village health an education officials was undertaken in order to understand the health and education conditions and facilities in the village and what will be the implications of the proposed development to these facilities.

(3) Result of Stakeholder engagement

1) Total number of participants

Public consultation was viewed as an important activity of RPF as well as EIA study since helped JICA Study Team to get the stakeholders' views on the perceived environmental and social effects of the project on the project area and their ideas on how the adverse impacts can be mitigated. Participatory public consultation for this project was carried out with a wide range of stakeholders in the project area, relevant government institutions, Non-Governmental Organizations and other interested parties as explained above. Total number of participants were as per Table 12-66. The number of Focus Group Discussion(women) in Table 12-66 is 203 which corresponds to the sum of Focus Group Discussion of women in Table 12-67 indicated as "Sensitization and awareness in Focus Group Discussion"..

Table 12-66 Total Number of Participants

Main Topic/Meeting Name	Male	Female	Total
Sensitization and awareness meeting with Regional and District Officials	66	11	77
Meeting and consultation with village leaders	80	17	97
Public meeting and awareness with normal villagers	2,471	780	3,251
Focus Group Discussion(Women)	00	203	203
Focus Group Discussion(Fishermen)	08	00	08
Consultation with other Stakeholders	04	01	05
Consultation with Sectoral Ministries	05	01	06
Total	2,634	1,013	3,647

Source: JICA Study Team, 2018

2) Main comments and responses in the meetings

A number of topics discussed were related to the impact of the project such as environmental and social impacts. These findings was considered during the preparation and will be taken care during the implementation of the Project. The summary of consultations, issues raised by the stakeholders are shown in Table 12-67. The minutes of the Focused Group Discussion (FGD) is attached in the EIA.

Table 12-67 Views and Concerns of Stakeholders

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
Sensitization and awareness meeting with Regional and District Officials	Mtwara Rural	First phase 21st 23rd 03.2018 and Second phase 07th 08 2018	25	03	The project will be beneficial to the community as it will help solve electricity problem in Mtwara region as well as increase the level of electricity generation capacity to the National Grid.	Noted
					The development of the project will be a winning point for the political leaders because it will help solve electricity problem in the community.	Noted
					The construction of the power plant will result to water pollution and impact on aquatic resources and marine biodiversity including the mangroves, there is a need to take this into consideration especially during the construction and operation of the project.	Waste water treatment plant and all discharge will meet IFC and Tanzania standards. There will monitoring plots in Mangrove to monitor changes of species composition of marine organism
					The Project Affected Persons (PAPs) should be compensated and given relative amounts that will help them restore their livelihoods and if possible, provide alternative areas for the relocation of the PAPs.	The compensation will be determined based on Tanzanian laws and JICA Guideline to ensure that the PAPs are not adversely affected. Most of PAPs opted for cash compensation, therefore, they will be required to find their own place for relocation. In kind compensation will be done for public infrastructures (if any)
					The road from Mikindani to Kisiwa village is challenging as it has corners around, and the best way to transport the other heavy electrical equipment which will be having above 50 tones and can't dismantled is through water ways.	For smooth transportation of materials an assessment of the road will be undertaken to ensure that unnecessary corners are removed during construction
	Lindi Rural	26th - 27th 03.2018	15	03	In most cases, local communities are not informed of their rights as well as the whole procedure for valuation.	Awareness program will be prepared and undertaken before and valuation of properties. However, the EIA exercise is also a platform for public awareness
					Delayed compensation once properties including land and houses have been evaluated and acquired by a developer."	In case of any delay in compensation, PAPs will be paid with interest depending on the number of days. The project is going to start before physical acquisition of land
	Lindi Urban	26th - 27th 03.2018	13	02	Value given to affected properties. It was noted that prices given to crops both seasonal and perennial was very low compared to the actual value of investment cost of a particular crop.	It is the responsibility of the Ministry of Agriculture to determine the value of crops. The price are normally reviewed after three years.
	Kilwa	04th - 05th 04.2018	13	03	Review of crop prices for compensation should be conducted every year and should involve relevant officials because investment costs of crops differ from one area to another due to variation in physical environment. Compensation of land value should include investment cost example preparation of rice/paddy farms one has to invest more	The price of various crops is reviewed by the Ministry of Agriculture after every three years. Seasonal crops are not compensated. PAPs are given time to harvest their crops before the project begin.

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					<p>compared to preparation of a maize farm.</p> <p>Compensation should also consider fertility of land and pay a much higher price to fertile land. For instance price of a land adjacent to a water source v/v a barren land.</p>	The value of land is determined by the market of a particular area. Therefore, if the land fertile, the market will reflect that situation
Meetings with Village leaders	Mtwara Rural	21th - 28th 03.2018	05	00	<p>The project such as increase of employment opportunity especially for young people though they were concerned that employment may be given to outsiders whilst the local people are left with simple manual jobs; other benefits include emergence of auxiliary activities, increase supply of electricity.</p> <p>The developer should assist the local communities in other projects since they will not directly benefit from the project e.g. construction of classrooms for schools, assist students from the villages to attend secondary schools, drill borehole for villages, assist in control of HIV/AIDS, etc.</p>	The contractor will ensure that all activities which does not need specialized skilled are undertaken by villagers, however, this will depend on the arrangement of the village government and accountability of those who will be recruited
	Kisiwa and Namgogoli villages	Phase 1. 21.03.2018 Phase 2. 08.08.2018	08	04	<p>As part of Corporate Social Responsibility, the school and dispensary should be improved.</p> <p>During construction of the project, the community around should be given priority in employment opportunities. This will enhance acceptance and support to the project since they will feel that they are part and parcel of the project.</p> <p>The project has been accepted by the community and they agree the project initiated in their area because it is for the development of the nation.</p>	<p>Although it is the responsibility of TANESCO to provide social services to the villages, it is expected the project will provide services such as dispensary to the workers, this will be accessed by villagers as well.</p> <p>The contractor will ensure that all activities which does not need specialized skilled are undertaken by villagers, however, this will depend on the arrangement of the village government and accountability of those who will be recruited.</p>
			04	02	The villagers should benefit from the project through the provision of social services such as schools and dispensary as well as employment opportunities.	Although it is the responsibility of TANESCO to provide social services to the villages, it is expected the project will provide services such as dispensary to the workers, this will be accessed by villagers as well
	Lindi Rural	10th - 13th 08.2018	28	07	<p>The project will improve businesses in the area and also create job opportunities to the local Youth during construction phase.</p> <p>The project will enhance Security due to lighting in the neighborhood at night.</p> <p>Attraction of innovation and invention leading to new investments due to adequate power access which will promote the local and national economy.</p>	Noted
	Lindi Urban	11th - 12th 08.2018	09	04	The project is good for the development of the country since it will boost power supply and improve on industrial development, and should therefore be undertaken.	Noted
	Kilwa	First phase 04th - 06th 04. 2018	26	06	<p>There would be possibility of insecurity in the areas due to the influx of other people during construction phase.</p> <p>There would be loss of land and property since residents may</p>	The contractor will ensure that all activities which does not need specialized skilled are undertaken by villagers, however, this will depend on the arrangement of the village government and accountability of those who will be

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
		and Second phase 13th - 17th 08.2018			be required to relocate The proponent should consider employing casual workers from the local areas during construction phase of the project.	recruited.
Public meetings with Normal villagers	Kisiwa and Namgogoli villages	Phase 1. 22.03.2018 Phase 2. 08.08.2018	252	97	Some of the members in the community depend on the ocean for fishing activities to earn their living, they should be provided with alternative sources of income once the land has been acquired. The village has got one dispensary and not easily accessible; the dispensary has insufficient medicine for the patients, they walk 26 km to the dispensary. The proposed project may result to the increase in the number of people in the community during the construction and after the completion of the project, it is necessary to consider the social services including dispensary, school and road infrastructure. The community around the project area should be given employment opportunities such as casual labor.	The project will consider how to support the provision of health facilities, given the fact that there will be an increase in the number of people in the village due to the project.
			104	31	Valuation was conducted in 2016 and some have stopped developing their areas including farms and land. What is the current status of the payment because the PAPs have not been compensated so far? The proposed project has been accepted by the community because it will be of benefit to them. They complained of delayed compensation. There is an alternative site for fishing activities at Namgogoli but the challenge is that it doesn't have access road. The potential landing site is in Mgao village.	The chief valuer has already signed the document, the PAPs will be compensated with interest due to the delay
	Mtwara Rural Namgogoli, Mbuo, Changarawe, Ndumbwe, Mpapura	First phase 21st - 28th 03.2018 Second Phase 08th 08.2018	212	62	How much are we going to be compensated for the loss of crops, trees and land?	Recently, the amount to be paid to the PAPs has not been stipulated yet. The valuer will disclose the prices during valuation based on the consultation and survey in the village.
					Will there be a difference in the value of crops and land during compensation depending on regions?	Yes, there will a variation in land and crop prices according to regions.
					How is the compensation on the loss of land? Will I be paid based on square meter or acre?	Land is compensated based on square meter or acre.
					There should be fair and prompt compensation after valuation process.	There will be a verification process before the PAPs are compensated. The PAP will be given a copy of the valuation form number one so as to have assurance and clear doubt during compensation.
					There has been a challenge during valuation where some	In order to ensure justice and clear doubt on land

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					members' properties who are not part of the community are valued in our village. For example, a person from Mbua village, will stand on the farm at Mpapura claiming to be theirs.	ownership, during valuation there called witnesses including village chairperson and neighbors to verify on land ownership.
	Lindi Rural Mtegu, Madangwa, Pangatena, Njonjo, Hingawili, Zingatia, Mnolela, Ruhokwe, Namunda, Mahumbika	Second Phase 10th - 13th 08.2018	617	172	The proposed project has been accepted by the community and they have understood what has been told on compensation issues.	Noted
					What is the benefit of the project to us as a community? We are requesting to be supplied with electricity at a reasonable price and the village gets a percentage from the project.	The project will be beneficial to the local communities and the nation at larger. There will be temporal employment such as clearing the project site and safe guarding the project area. The village council will receive a percentage for ensuring the safety of the project area and compensated for the village properties. In terms of nation wise, the project is expected to improve the power supply in south-eastern part of Tanzania and ensure availability of electricity.
					Who is supposed to establish the Grievance Redress Committee (GRC) and who will be the members that form the committee?	This is a requirement from the Development Partners, a GRC needs to be established in order to address complaints that may arise in the process. The committee will be composed of people of different categories including elders and youth and will base on gender. Among the members who will be involved in the committee include; representative from the village council, few affected persons and some village members.
					There are burial sites for the village and most of the members of the community use the burial site, who is given the allowance for the graves?	There is no compensation for the graves but there is an allowance that will be given to the family members of the deceased for conducting different traditional and religious rights during the relocation of the graves.
					Most of the people in the village depend on cashew nuts crops as a source of livelihood. It is necessary that during compensation, the crops are valued depending on the price within a specific village and relates to the crops.	The complaints during the project implementation can be resolved through Grievance Redress Committee, it is necessary to establish a Grievance Redress Committee to provide a platform for PAPs to voice their concerns and opinions related to RAP implementation
					How should we solve the complaints during the project implementation especially if there are problems in the valuation process?	Those are among the challenges that may happen during the administrative procedures, we shall advice the responsible people to use a language that is understood by many so that most can understand and avoid conflicts.
					We are requesting that the documents that will be brought during valuation and compensation should be written in Swahili language, a language we are used to. This is because in previous projects, were brought documents written in English language and we were told to sign the documents.	These are issues that may not be planned and may happen even before the PAPs has been compensated. If it happens, the wife or the close relative living with the deceased will be given the compensation after following the legal procedures of inheritance.
					Compensation should be fair and prompt and transparent in	The compensation will be determined based on Tanzanian

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					order to ensure justice to the affected PAPs. The contractor should establish an access road to the site so as to avoid damage to the crops during construction. After the valuer has valued my properties and I die, who will be compensated?	laws and JICA Guideline to ensure that the PAPs are not adversely affected. The land for access roads to the proposed transmission line will be acquired and compensated. Part of the land for access roads will be temporary acquired during construction, the roads will be closed after construction. Other roads will be maintained for in order to be used during maintenance. Next to kin will be compensated. However, this will need confirmation of the deceased relatives.
	Lindi Urban, Ruaha, Ng'apang'apa, Chikonjikaskazini, Chikonji kusini	Second Phase 11th - 12th 08.2018	270	178	Will the transmission line be constructed in the same location with the gas pipeline?	No, technically it is advisable to leave some few meters between the gas pipelines and the transmission because it is hazardous to position them together at the same place.
					How long will it take for the project to start?	The project is expected to start in 2022.
					What are the benefits to the village as a result of the project?	The community will benefit from the project through various opportunities including; temporary employment such as clearing the area and security guards to the project area.
					We are requesting for electricity available as a result of the project because there is shortage of electricity in the region and especially in Ruaha village.	The project will enhance availability of electricity because it intends to improve the power line capabilities for smooth power transfer to the coastal regions and beyond.
					There could have been a chart that shows prices of crops, and even value of land per acre. The valuer should come along with it in order to know the exactly amount of our compensation on the very day of valuation.	The valuer will come with a chart of listed prices of crops and land during the valuation day.
					Who will be responsible to handle the cost associated with grievances redress mechanism issue?	There will be a fund set aside as part of the project cost to facilitate all matters associated, but in a controlled manner.
					The PAPs should be compensated without delay.	The law suggest that PAPs are compensated within six months after the valuation date. If there will be any delay, the PAPs will be compensated with an interest rate.
					Can I be allowed to continue with farming after compensation?	No, you will not be allowed to continue farming or other related activities soon after compensation because the land does not belong to you anymore.
					Will the transmission line be constructed in the same location with the Gas pipeline?	Transmission line will not pass along the pipe line gas due to both are hazardous material. TANESCO transmission line has way leave of fifty two meter (52m) while pipe line gas has way live of sixty meter (60 meter) separate
					How will the village government/local government benefit from the project?	Village government will be provided with services from TANESCO for security and cleanness of the project site

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
						area.
					What about the traditional and ritual sites, if the transmission line will cross that area?	The sites will transferred according to the traditional process of specific area and the client (TANESCO) will take care of the costs for the relocation of the traditional and ritual sites.
					Will the house compensation have the same value with that of my house?	Yes, compensation will be paid according to replacement cost so as to enable the owner to build the same house
					Will there be any compensation to the affected persons before commencement of the project or compensation will be done after the project?	The affected persons will be compensated before commencement of the project soon after the valuation process. The law requires that the PAPs are paid within 6 months after the valuation date.
					What if the project cut across a farm, will that person be allowed to own the other two sides of the farm?	Yes, because you have been compensated only that part being affected by the project meaning that you still have rights over the other remaining piece of land.
					When the implementation of this project will start.	The project is expected to start in 2022.
					How are we going to benefit from the project?	The project will ensure availability of electricity to the nation and enhance employment opportunities to communities adjacent to the way leave. The village will benefit through availability of employment opportunities during construction such as casual labour, small business opportunities such as food vendors and soft drinks. Also, availability of electricity since the line will be connected to the national grid to enhance national development
	Kilwa , Likwaya, Moka, Mtumbikile, Kilangala A, Kilangala B, Mnimbila, Kitomanga, Mkwajuni, Mbwemkuru, Kiranjeranje, Mtandi, Mirumba, Mandawa, HoteliTatu, Kiwawa, Mavuji, Nangurukuru, Matandu, Miteja, Mtandango, Tingi, Njianne, Somanga Kusini FGD:Elderly (Njianne)	First phase 04 - 06. 04. 2018 and Second phase 13 - 17. 08.2018	1,268	337	Will graves be relocated?	Yes, the graves on the project area will be relocated through the district health department.
					If farms and trees will be compensated, what about seasonal and permanent crops, will they be compensated?	Permanent crops will be compensated for while the seasonal crops will not, owners of the seasonal crops will be given time to harvest the seasonal crops including; maize, pigeon peas and cassava
					What is the distance from the project area to the main road?	It has been varying from one village to another in a sense that there are some villages which the transmission line passes too close to the center of the village/main road but other villages a bit far
					What evidence will be used for the proof that a certain piece of land belongs to the said person?	During valuation, the land owner will be around and witnesses including the village chairperson and neighbors to verify that the area belongs to the said person
					During the valuation process, is it possible to have a breakdown	The valuer will come with a valuation form number one

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					of the properties and the right amount that will be paid to the PAP?	and list the properties that will be affected by the project. The PAP is supposed to remain with a copy of the form to have evidence and proof during compensation. It is not possible for the valuer to have the right amount at the moment he comes to value the properties. This will be done later after identifying the PAPs and their properties.
					Will there be awareness creation on the impacts of the project to the community?	As an EIA team, we are playing this part now, we have to communicate to the community, inform them about the project and the impacts of the project. It is not safe to stay around the electrical wires in order to avoid accidents and risks that may occur due to the electrical wires.
					When will the project start, and get to know that my properties will be affected so that I can get the farms ready?	The project will undergo different stages till it is complete, before valuation, information will be sent to the community prior the valuation date. You will know if the properties have been affected during valuation and the project cannot start till the PAPs have been compensated.
					We suggest that, there could have been a chart that shows prices of crops, and even value of land per acre and the valuer should come along with it in order for us to know the exactly amount of our compensation on the very day of valuation	Villagers will be informed to change the ritual sites according to their tradition and to let the project to be constructed soon after the valuation process
					Basically our main trouble here is on compensation, but all and we are thankful for this education you have provided us with because we have never experience something like this before. Even the issue of grievance redressing mechanism is very new to use, we couldn't have known it if it wasn't for you	There will be a fund set aside as part of the project cost to facilitate all matters associated, but in a controlled manner.
					What if I have prepared all construction material at my site ready for house construction and now coming with this project, what should I do?	
					We don't want you to involve people from the District Council because they have never been fair for compensation; if it will be possible you just come with different valuers to do this work	It is the responsibility of district council valuer to undertake the valuation, what is important is for the valuer to follow the process of valuation. In case the district have no valuer, the valuer will be hired from nearby district/ municipal
					Are we going to be distributed with that electricity or it will just pass by our village?	No, because It is high voltage (400kv) and that's why is being transmitted to Somanga power station with aim of adding power to the National grid.
					What if the project cut across a farm, will that person be allowed to own the other two sides of the farm?	Yes, land outside the project boundary will belong the owner
					The sandwich situation on piece of land left between the gas pipeline and this new proposed transmission line even lower the value of that land. We request TANESCO to compensate	Payment for land which is required by the project is possible because it will be difficult to account for during

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					the whole land from where the gas pipeline way live end to the whole section of the transmission line	auditing and verification
					We are so thankful for the education you have provided us with, because during the gas pipeline project, compensation was not fair as it happened to an extent that other people were compensated twice while others didn't receive compensation at all.	Noted
					We also request you to tell the valuers to give us copy of the valuation form number one that has listed all our properties that are going to be compensated	This is a requirement of law, that the PAPs must be given the form for their record
Sensitization and awareness in Focus Group Discussion with women	KISIWA VILLAGE Women	08.08.2018	00	06	We are a group of 14 women involved in fishing activities around the ocean since 2012, we depend on the ponds for fishing. The group is also involved in another activities including livestock keeping and farming.	-
					The project has been accepted by most of us but we are requesting that we be compensated because some of us have stopped developing our farms after valuation took place in 2016.	-
	MNOLELA VILLAGE Women	11.08.2018	00	34	The project is expected to be constructed in our village, how are we going to benefit from the project?	No activities will be allowed at the site once construction has started, this is for the sake of security purpose. They will be compensated once the land has been acquired.
					Who will benefit from the project the most? Is it men, women, the youth or elders?	All will benefit from the project depending on the opportunities that will be available. There is expected to be temporary employment and for the women that will be residing close to the project area, can get opportunity to cook food for the constructors.
					My farm of cashew nuts crops will be affected by the project, I am afraid that the cost may not be sufficient enough to replace the crops.	The crops will be compensated based on the percentage of the growth rate whether young or old. The crops will be compensated based on the current market price and will be sufficient to replace the cost used for cashew nuts.
					We are requesting for transparency during the valuation process and areas demarcated within the specified meters.	During the valuation process, the valuer will have the valuation form number one and will list the affected properties, then the owner of the property will remain with a copy of the form for assurance and clear doubt in case of any inconvenience.
	MAHUMBIKA VILLAGE Women	12.08.2018	00	24	Before construction of proposed project the surveyor should put permanent bicorn so as affected people should know the alignment.	Final design of the project route will be done and the alignment will be clear
					Accept the proposed project, there is an issue of employment to women especially during the construction period.	Unskilled labors will be hired from the adjacent village however chances of women employment may be low negligible due to the nature of the infrastructure

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
						development.
					Land acquisition for the project will negatively affect women livelihood because most of women are engaged in cultivation and their livelihood depend on farming activities which enable them to get food and money for various uses. They requested TANESCO to pay compensation on time to enable them buy other land for cultivation.	Livelihood restoration have been prepared to ensure that the livelihood of the affected vulnerable people is restored
					Resettlement Issue: Women in many occasions are denied land or property rights and hence will be deprived from receiving compensation because some of women are elderly and widow who makes them difficult to gets their right.	Noted.
					During project implementation, there is a potential for spread of diseases such as HIV/AIDS and other STD's due to influx of people with different cultural background.	TANESCO and the contractor will prepare and undertake awareness programs in relation to HIV/AIDS and other STD's before and during project contraction.
	MKWAJUNI VILLAGE Women	14.08.2018	00	14	Accept the proposed project to undertake in the village. Women at Mkwajuni insist on fair and promptly compensation, so as widow and elderly's can able to find other area for cultivation During project implementation there is compensation and in most cases compensation is delaying which cause women to have difficult in to get settlement and area where they can cultivate. Spread of diseases such as HIV/AIDS, during project implementation there is influx population of people with different cultural which can cause spread of diseases such as HIV/AIDS and to ensure the minimize the impact the contractor should provision of proper sexually education to labor and surrounding community in order to reduce new transmission.	According to the law governed compensation , it say that after valuation the compensation should payed to affected people within six month, and when the compensation delay and exceed six month the responsible institution should pay compensation with interest rate. TANESCO and the contractor will prepare and undertake awareness programs in relation to HIV/AIDS and other STD's before and during project contraction.
	MTEGU VILLAGE Women	10.08.2018	00	34	Some of the women along the proposed power transmission line are engaged in food vendors activities. Therefore, they requested government to support them by providing soft loan to sustain their livelihood Land acquisition during project implementation may cause the women livelihood to change because most of women engage to cultivation so their livelihood depend on farm to cultivate different crops and selling so as to get money for their house consumption, because of that the women beg government through its instruction TANESCO do not delaying on the compensation so as they can able to buy other area for cultivation.	Noted According to the law governed compensation , it say that after valuation the compensation should payed to affected people within six month, and when the compensation delay and exceed six month the responsible institution should pay compensation with interest rate.

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					Resettlement Issue: Women in many occasions are denied land or property rights and hence will be deprived from receiving compensation because some of women are elderly and widow who makes them difficult to get their right.	Noted.
	MTANDI VILLAGE Women	14.08.2018	00	41	Spread of diseases such as HIV/AIDS, during project implementation there is influx population of people with different cultural which can cause spread of diseases such as HIV/AIDS and to ensure the minimize the impact the contractor should provision of proper sexually education to labor and surrounding community in order to reduce new transmission	TANESCO and the contractor will prepare and undertake awareness programs in relation to HIV/AIDS and other STD's before and during project contraction
					During project implementation there is compensation and in most cases compensation is delaying which cause women to have difficult in to get settlement and area where they can cultivate.	According to the law governed compensation, it say that after valuation the compensation should payed to affected people within six month, and when the compensation delay and exceed six month the responsible institution should pay compensation with interest rate
					During compensation phase the valuer do not put exactly amount of the affected people is supposed to have where the affected people can be go so as can get their right?	They is need of establishment of grievance committee so as solve the grievance, this committee it formed by member from local government, affected people and NGO's this will help to affected people to get their right.
					Security Concerns for Women: The proposed project can potentially increase the security risk for women specifically during the construction phase of the transmission line if it is near settlements, the workers blockage access road which make difficult of women to go fetch water and collect firewood.	The power transmission traverse in settlements and farmland and forest are close to settlements and the Dar es Salaam – Mtwara main Road. Therefore, there is no threat for security.
	CHIKONJI VILLAGE Women	12.08.2018	00	50	There are some people who have their properties around the project area, how will they benefit from the project?	Those who have their properties whether it is a crop, tree, residential land and structures will be compensated for the loss of properties.
					What happens to those who loose structures, who will get for them an alternative place to stay?	For the loss of structures, the owners will be given an allowance for an alternative accommodation of not less than 36 months. Compensation for luggage of not less than 12 tones and luggage allowance of not more than a distance of 20 km. They will also be entitled to transport and disturbance allowance. The owner of the choice will have to go and look for another place to stay after being given the allowance. The project will not start if people are not compensated.
					What about a community grave yard, who will be given the allowance?	The relatives of the deceased will be given an allowance to enable them perform traditional and religious rights.
					How long will the project take till it is complete?	The project is expected to undergo different procedures till it is complete, after the completion of the Environmental

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
						and Social Impact assessment, the valuer will come to value the properties and the surveyor demarcate the areas and the affected PAPs. Then the PAPs will have to be compensated and then the project will go through.
					How is the village expected to benefit from the project?	The community is expected to benefit from the project though employment opportunities such as clearing the site for the construction of the electrical pillars and safe guarding the project area.
					We are requesting that the ones who will be affected by the project are compensated without delay.	The law suggests that the PAPs are compensated within six months from the valuation date and if they are not compensated within that period, they are supposed to be paid with interest rate.
					We are asking to be given priority in employment opportunities during the project construction.	This has been taken into account and will be addresses in the report for further actions.
					Who forms the Grievance Redress Committee?	The Grievance Redress Committee constitutes a representative from the village council, affected person and some representatives from the community.
Sensitization and awareness in Focus Group Discussion with fishermen	Kisiwa and Namgogoli villages	08.08.2018	08	00	Expressed their concerns about the inability to access the fish landing site as one of the area they depend for their livelihoods. Is it possible to continue with fishing activities during project construction? The requested the developer to provide an alternative means of livelihood compensate for the loss of landing site such livestock keeping, provided with modern fishing gears to enable them for deep sea fishing. It is possible to have an alternative fish land site in Mgao village, however, the challenge distance to their village unlike the location at Kisiwa village which was close to their home	The response with regard to the possibility of continuing with fishing activities was that, yes it will possible to continue with fishing but, but the area cannot be used as fish landing site due to the presence of plant and water discharge facilities. Besides, the water discharge facilities will slightly change the sea water temperature, although the temperature will change depending on the season. Further studies will be undertaken to understand the impact of sea water change to the fish and its availability.
Consultation with Sectoral Ministries	Ministry of Energy	28.08. 2018	01	00	The proposed project is one of the national priorities in power sector with the purpose of improving availability of power in the southern part of the country. And meet the government target to get 4915 by 2020. The proposed project will enable utilization of resources, gas being the source of the proposed electricity. The project proposed project will ensure voltage stabilization in order to avoid voltage loss and reliability. The Ministry in collaboration with Ministry of Finance and Planning an TANESCO is responsible to make all Project Affected People are compensated before commencement of the project, however, timely availability of funds have remained a	Noted

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					<p>challenge to many power project in the country.</p> <p>In a situation where the compensation have delayed, the PAPs are paid with interest that are determined by government valuers as required the law.</p> <p>In order to ensure timely compensation, there is a need to convince project funders to include compensation package as part of the loan.</p> <p>In order to reduce the cost of compensation, it is a high time to reduce the size of land to be acquired by taking land in areas where towers will be constructed, there is no need to acquired land which will be under transmission line. The system is also practiced in other countries like Zambia</p>	
	Ministry of Natural Resource and Tourism. Wildlife Division and Forest and Beekeeping		03	01	<p>Kilwa district is one of the wildlife dispersal area in the southern part of the country, however, the project impact on wildlife will be minimal.</p> <p>Movement of elephants have been reported in Lindi rural, notably in Miguruwe village.</p> <p>There is wildlife corridor at Mbwemkuru village, however, due to increased human activities such as agriculture, the corridor is not active.</p> <p>Due to possibility of having wildlife in the project area, the involvement of wildlife officers during project construction will be crucial, not only for the security of wildlife, but also to the workers themselves.</p> <p>There is a need to involve the Tanzania Forest Service in the process to determine the magnitude of forest destruction and assessment of biomass, especially during project construction.</p> <p>Undertake inventory in order to understand the species that will be affected by the project.</p> <p>The Ministry will write a letter to TFS to emphasize the need for TFS involvement in in critical stages of project implementation such as mobilization and construction to ensure all issues related to forest management is stages ensure that the contractors and client respect</p>	Noted
	Ministry of Land and Human Settlement Development Policy and Planning Department				<p>It is important to raise awareness to the people who will be affected by the project to ensure they informed about the implication of the project and their rights, especially where there is a need for land acquisition.</p> <p>The issue of compensation is governed by Tanzanian laws. The land to be acquired for project implementation should be compensated.</p> <p>Chief Government Valuer is responsible for approval of all</p>	Noted

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					valuation reports in the country. In case of any delay in compensation, PAPs should be paid with interest as required by law	
Consultation with Other Stakeholders	VOLUNTEER FOR YOUTH IN HEALTH AND DEVELOPMENT (VOYOHED) NON GOVERNMENTAL ORGANISATION (NGO).	23.03.2018	01	0	<p>The organization has been registered to work with the whole community within boundaries of Tanzania as a nation and deals with provision of advocacy and health advice to women but also advice youth to engage on development activities even if by volunteering as to keep them away from engaging on unethical influential groups.</p> <p>Currently, they are concerned with 50 social issues with HIV/AIDS being the main case.</p> <p>The organization has been working with Majengo and Vigaeni wards and is being supported by different Development Partners to assist those families living in with poor health and unpleasant environment. 12 women dealing with tailoring have been provided with maternity health education and 56 people home basic care.</p>	
	MTWARA SOCIETY AGAINST POVERTY (MSOAPO) - NGO	23.03.2018	03	01	<p>The organization has 17 staffs, it deals with provision of assistance in different sectors including agriculture, health, good governance, pastoralism, environment and Natural resources.</p> <p>There is an ongoing project supported by World Wide Fund for nature (WWF) in Newala, the project is about better use of solar system, which include installation, maintenance and repair.</p> <p>The organization is also working with US Aid through deloitte Company on issues concerned with health especially HIV/AIDSs, Nutrition, TB, Family planning (Reproduction) and Gender violence.</p> <p>The project area is also their area of consideration because they are working with Mtwara rural by dealing with HIV/AIDSs victims through reminding them on proper use of their medications.</p> <p>There is another project in which the organization is working together with Oxfam, and it is divided into 3 subdivisions.</p> <p>Oil and Gas (as to make the community understand opportunities together with direct and indirect benefits of Oil and Gas).</p> <p>Gender (establishment of groups of women engaging with farming and pastoralism as well as creation of better relationship with the surrounding community).</p> <p>Good governance and involvement.</p> <p>There is another project about supporting agriculture in which</p>	

Main Topic/ Meeting Name	Place	Dates	Number of Participants		Main Comments from the Participants	Response of TANESCO to Comments
			MALE	FEMALE		
					they are working with Swiss Aid and more than 500 people are being benefited from the project. Animation approach has been the best strategy though the use of famous people on villages to educate their fellow villagers on different development matters as been trained by the organization, this will be easy to educate the villagers.	
Total			2,634	1,013		

(4) Identified issues and Concerns during Consultations

As a result of public engagement and consultation, a number of issues and concerns were identified and are addressed. In general, stakeholders have different opinions with regard to implementation of the proposed project that mainly focus on issues of compensation and environment as well as benefits of the project to the nation and local communities. Their view and concerns include the following:

1) Environmental concerns

a) Natural disasters

The discussion with district and municipal council officials revealed that, Mtwara town experienced natural disasters particularly floods during rainy season. For example during the wet season, the area experienced flush floods in flats and low lying areas/valleys such as parts of Kyangu, Chuno, Mdenga and Chipuputa. Prolonged wet season coupled with land degradation increases the volume of surface runoffs and increases erosion and washing sediment into the Indian Ocean and manmade ponds like Dabwada and Mdenga na Maji. They pointed out that Municipal Council had also experienced El Nino (global phenomena) in the past in late 1997, 1998 and in 2012 where in 2012 there was a devastated impact. However they pointed out that the gas power plant at Msimbati Bay which is located close to sea shore had experienced massive sea erosion in the year 2015. Therefore a thorough assessment should be done on the proposed site so as clear mitigation measures could be provided.

Previous disasters are considered in implementing the JICA Study.

b) Environmental pollution

Municipal and District Environmental officers were consulted and concerned about levels of pollution likely to be caused by project activities, atmospheric air pollution was mentioned to cause local climate change. Similarly management of waste emanating from power plant operation may contribute to water and soil pollution. Similarly, other forms of waste would be generated from the construction activities, operation and decommissioning of project activities thus contributing to environmental pollution.

As described in ESMP in Table 8-1, wastewater and waste will be properly managed. Mitigation measures for air emission is also considered.

c) Environmental/biodiversity issues

Consultation with stakeholders especially dealing with conservation were concerned about the level of damage that the project will cause to the environment and affect biodiversity of the area. For example, views from TFS-mangrove Unit in Mtwara and Fishery Unit in Mtwara they all pointed out the importance of marine organisms as one of the potential biodiversity. TFS regional manager clarify on the procedures to be followed before implementing the project. The manager pointed out that, Mangroves has been zoned into 4 zones namely. Protection zone, Regeneration zone, Rehabilitation or recovery zone and Development zone where in development zone implementation of development projects is allowed. They also insisted that if the proposed development project will clears the mangrove compensation should be paid to TFS as stipulated in the GN. 255, THE FOREST (AMENDMENTS) REGULATIONS, 2017 They further insisted on the participation of TFS officials during the detailed EIA process so that they can give out detailed procedures.

The project will follow the procedures as per the regulations. Impact on mangrove is minor since the amount of clearance of mangrove is very small limiting to the area for installation of outfall pipe.

d) Temperature change effect:

The ambient temperature change at the ocean at the moment is 30-31degrees centigrade; the construction of the power station at Kisiwa will result to the increase in temperature of the water body by 3 degrees especially during the discharge of the cooling water of the steam to the ocean. The increase in temperature will impact the resources found in the ocean such as aquatic resources and marine biodiversity including the mangroves.

According to the modelling results, the temperature rise due to the thermal discharge is limited by the river creek and will generally disperse slowly out of the creek under the influence of tidal current (as well as river discharge in wet season).

2) Socio-economic concerns

a) Land acquisition and compensation

The land department in Mtwara District council were consulted. The project has acquired a large piece of land used villagers for agricultural activities and settlements. The acquired land is for planned power plant complex. Together with the above the area will be used for gas facility, water facility, substation, staff houses and material storage. This would create challenges in terms of the size of land acquired, fair and prompt compensation, and land ownership issues, as well as procedures for acquiring the land. The villagers at Kisiwa and Namgogoli were concerned about fair and prompt compensation on the properties to be affected by the proposed project development. Land officers revealed that the valuation exercise has been done since November, 2017 and PAPs are keenly waiting their compensation.

Land acquisition process will be conducted in accordance with the Resettlement Policy Framework.

b) Migration and population growth

Unlike previous years where Mtwara was known as sending region, currently, the region has experienced influx of people from within and outside the country who are searching job opportunities, particularly, in relation to gas exploration, cement manufacturing industry and agricultural activities. Discussion with stakeholders at Kisiwa and Namgogoli villages revealed that there is an influx of people from Dar es Salaam city and other urban areas searching for land and business opportunities. The influx of people could pose a very serious problem in land availability and social services in the future.

This kind of issue is to be considered in implementing the regional development plan of Mtwara Master Plan, where the planned power plant area is included.

c) Economic potentials

TPA and TANESCO officials were consulted and mentioned the economic potential of the proposed project. The proposed project would increase efficiency of electricity supplied by the National grid and facilitate growth of industries, agribusiness, and other auxiliary activities in Mtwara, Lindi and the entire nation. For example officials from TANESCO Mtwara have a concern on the power crisis in Mtwara due to mushrooming of industries and mining sectors in Mtwara and Lindi. Similarly they pointed out that, development of the proposed project will enhance production of the Dangote Cement

factory and several proposed industries in Mtwara and Lindi.

The planned project is expected to address such potential power demand by the industry development.

d) Loss of livelihood:

There are women groups in the village involved in different activities including fishing, farming and livestock keeping. Some of the women depend on fishing as their means of living. There is a group called Jikomboe dealing with fishing activities at the project site for household consumption and commercial purpose. The group has a total of 10 members including six males and ten females with a total of 55 dependants, mainly children. Their fish farm will be affected by the project, they complained of not being involved during the valuation process, there is a need to consider this especially during the compensation process.

As described in ESMP in Table 8-1, livelihood restoration plan will be developed for those who will lose their livelihood due to land acquisition.

e) Improvement of social services:

The proposed project will lead to the increase in the number of people at Kisiwa village, the social services including school and dispensary may not be sufficient for the community. The members of the community ask for the improvement of social services available so as to suite the population that will be available.

As a mitigation measures for the potential impact by the influx of construction workers, onsite health care will be provided to workers as well as the establishment of amenities at the worker camp to that help minimize the interaction between the workforce (particularly temporary construction workers) and local villagers.

f) Employment opportunities:

During construction of the project, the community around should be considered in the provision of employment opportunities both skilled and unskilled labor. This will enhance acceptance and support of the community to the project since they will feel that they are part and parcel of the project.

As described in ESMP in Table 8-1, a local recruitment and procurement management plan will be developed in consultation with relevant stakeholders, including government authorities and local villagers.

12.2 LAND ACQUISITION AND RESETTLEMENT

This section describes the situation of land acquisition and resettlement for both (1) Mtwara Power Plant and (2) Mtwara-Somanga 400kV Transmission line and 400kV substations. In Tanzania, a Resettlement Action Plan (RAP) refers to a legal document with agreed compensation and confirmed project affected persons (PAPs). Prior to developing the RAP, a Resettlement Policy Framework (RPF) is developed during the initial stage of the project. In some cases a Due Diligence Report (DDR) is prepared to ensure that the RPF and the compensation package are compliant with requirements of foreign financial agencies.

For the Mtwara Power Plant, the valuation reports have been approved in December 2016¹⁷ and April 2018¹⁸ by the Chief of government valuer for planned Mtwara power complex. The acquired land is for planned power plant complex. Together with the above the area will be used for gas facility, water facility, substation, staff houses and material storage. To make full reviews of the land acquisition and resettlement activities including Government Valuer's report of the proposed power plant site in compliance with the JICA Guidelines, JICA Study Team prepared a due diligence report (DDR) for this component. Since the compensation has not been paid yet by the project proponents, the DDR proposes additional action to TANESCO to fill the gap between legislation in Tanzania and the JICA Guidelines for Environmental and Social Considerations (April, 2010) (JICA Guidelines).

As for Mtwara-Somanga 400kV Transmission line and 400kV substations, Resettlement Policy Framework (RPF) is prepared under this Preparatory Survey to be followed when there is involuntary land acquisition in order to reduce to a minimum any adverse impacts to the PAPs. It should be noted that the result of census survey on the RPF will be replaced to the result of official valuation process which will be conducted by the District Councils after the transmission line route is confirmed at the Basic Design stage. Then, the project proponent will be required to prepare an RAP which incorporates the result of valuation.

12.2.1 Need for Land Acquisition and Resettlement

(1) Project components requiring land acquisition and resettlement

1) Mtwara Power Plant

The major activities in the Kisiwa site that will affect people include:

- Construction of the power plant and its facilities in the Kisiwa site;
- Construction of the Mtwara substation in the Kisiwa site;
- Future Mtwara GTCC No.2 in the Kisiwa site;
- Construction of access road to the Kisiwa site from the existing road; and
- Construction of workers' camps and storage for project materials.

The access road to the Kisiwa site is planned in the area where the Tanzania Port Authority (TPA) has conducted valuation, therefore it is supposed that the land right for access road will be transferred from TPA to TANESCO. Therefore, TANESCO will acquire land from private land owner for the proposed Mtwara Power Plant, Mtwara substation and the future power

17 Valuation Report for Compensation Purposes, the Proposed Electricity Power Plant (400 megawatt) to be located at Kisiwa and Namgogoli Villages in Naumbu Ward Mtwara District Mtwara Region (October, 2016) Valuation Section Mtwara District Council

18 Valuation Report for Compensation Purposes of properties (Land & Other Developments) in Respect of Proposed Additional Area to be Used for Loading/Off-Loading Materials Related to Proposed Construction of 300 Megawatt at Kisiwa Village in Naumbu Ward Mtwara District (February, 2018) Valuation Section Mtwara District Council

plant. The area for future Mtwara GTCC No.2 can be utilized for construction camps and/or storage area of the proposed Project as shown on Figure 12-3, therefore temporary land acquisition in other area will not be expected.

During the course of the study, minimization of the land acquisition was considered in consultation with TANESCO, however, it was found to be difficult to acquire the land of Kisiwa site dividing into two parcels taking into account the TANESCO's plan. Therefore, it was decided to conduct a land acquisition of 160ha with the same compensation policy. Within this 160ha area for the power plant complex, JICA project use only around 10ha for power plant and substation, and surrounding 24ha (in total 34 ha) in Area 1 will be levelled also in the Project considering the future development. The remaining land, around 150ha, will be used for another project by TANESCO.

While TANESCO is acquiring the land of 160 ha for the power plant complex area in Kisiwa, the area which is occupied by the components financed by JICA (i.e. Mtwara power plant and Mtwara substation) is expected to be 10 ha within this 160 ha. Therefore, the effects of the land acquisition related to the area for JICA financed components is considered to be arised from the 10ha of land.

2) Mtwara-Somanga 400kV Transmission line and 400kV substations

The major activities of the proposed project that will affect people include:

- Construction of line structures, accessories and conductors;
- Construction of the 400 kV double circuit transmission line from Mtwara to Somanga;
- Construction of substations;
- Clearing of wayleave; and,
- Construction of access roads, workers' camps and storage for project materials.

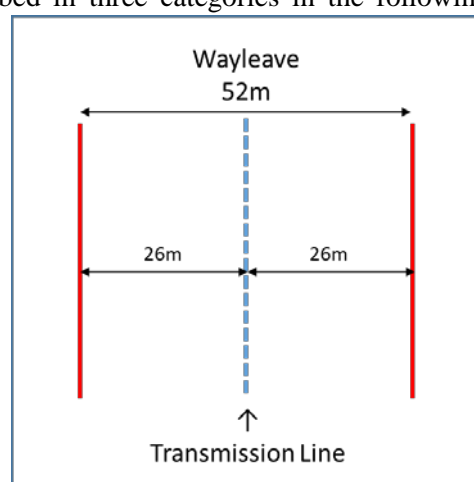
These activities will lead to loss of land and property, loss of crops and trees, loss of burial grounds, limited access to water supply, increased pressure on health facilities, loss of income/ means of livelihood, and emergence of potentially vulnerable people.

The land requirements for the project are described in three categories in the following sections:

- Land for construction of the transmission line;
- Land for the construction Mtwara and Lindi sub-station, and,
- Land required temporarily for construction purposes.

a) Transmission line

The proposed transmission line (about 270km) will require acquiring complete 52m wayleave whereby permanent land acquisition will take place. The wayleave corridor size, defined by TANESCO, considers tower geometry, conductor swing-out, span length, induction interference and tower falling range shown as Figure 12-65 below. About 700 towers are



Source: JICA Study Team

Figure 12-65 Corridor for 400 kV Line (dotted line) showing 52m Wayleaves

expected to be constructed throughout the line.

b) Substations

The proposed substation in Kisiwa in Mtwara District will be constructed within the area for the proposed Mtwara 300MW Gas Fired Combined Cycle Power Plant project of which land acquisition process has already started. The total land to be required for this substation is about 150m × 144m. Since the land for Mtwara substation will be acquired as a part of another project, the land acquisition and compensation process, as well as the total count of the PAPs at the Mtwara substation is not covered by the RPF and this Final Report.

The proposed Lindi substation will be constructed next to the existing Mahumbika substation. The total required land for this substation is 257m × 226m (H-GIS) (in case AIS is selected for Lindi Substation, necessary land will be 311m × 226m) and the land has already owned by TANESCO. Hence, the RPF and this Final Report do not need to cover the land acquisition and compensation process, as well as the total count of the PAPs for the Lindi substation.

c) Temporary land acquisition

Regarding temporary road or transportation road for construction, construction contractor conducts survey of route and type of temporary access roads to each tower location after contract signing under cooperation with local stakeholders and residents. In case TANESCO wishes to use the temporary road as a permanent road for their maintenance, the temporary road shall be upgraded subject to negotiation with the local residents. In such case, TANESCO needs to prepare a RAP or an addendum of RAP for a permanent road and submit it to JICA before acquiring the land.

As for camps/storages/workshop areas, based on TANESCO's past experience with other 400kV transmission line projects, it is anticipated that there will be three construction camps set up for each lot awarded to a contractor, one on either end of the line and one in the middle. Each construction camp will be sited under or near the wayleave for easy access to the construction workspace areas. The land used for campsite will be under wayleave or temporarily acquired whereby contractor agrees with respective village to lease certain size of land for establishing campsite. Regarding storages for construction materials, based on TANESCO's experience, the awarded contractors will use the wayleave of transmission lines. In case they will need additional land for storage space, they will negotiate and have a contract for lease with landowners, then return the land after construction with original condition. For Mtwara substation, 150 ha will be acquired including future expansion space of additional power plant, therefore there will be open space for construction storage. For Lindi substation, the area for Lindi substation is surrounded by land owned by TANESCO and it is not utilized, therefore this space can be utilized for construction purpose.

12.2.2 Legal Framework concerning Land Acquisition and Resettlement

(1) Outline of Tanzanian legal and institutional framework on land acquisition and resettlement

In addition to the legal framework described in Section 12.1.2, the following Tanzanian policies, laws and regulations are related to land acquisition and resettlement for both Mtwara Power Plant and Mtwara-Somanga 400kV Transmission line & 400kV substations. Although there is no official approval process for the Resettlement Action Plan, there is a need to closely coordinate with the relevant government agencies and agree with the contents of the RAP.

1) Policies

- National Land Policy, 1995 (revised in 1997)
- National Energy Policy (URT 2015)
- National Human Settlements Development Policy (2000)
- Agriculture and Livestock Policy, 1997
- National Gender Policy (1999)

2) Laws and regulations

- The Land Act (1999)
- The Village Land Act (1999)
- The Local Government (District Authorities) Act
- The Land Acquisition Act (1967)
- The Land Disputes Courts Act (2002)
- The Graves Removal Act (1969)
- The Land (Assessment of the Value of land for compensation) Regulation (2001)
- The Land Compensation Claims Regulations (2001)

3) Antiquities Act (1964) Institutional framework

As for Tanzanian institutional and administrative framework on land acquisition and resettlement, the institutional actor for population resettlement and compensation is the Ministry of Lands, Housing and Human Settlements Development. This Ministry is mainly responsible for land use planning, surveying and demarcating land/parcel/farms, and provision of land ownership and tenancy in both rural and urban areas. Within the Ministry, there is a Chief Government Valuer who is responsible among other things to ensure that prior to compensation of assets to any PAPs, valuation reports are prepared according to the Land Act of 1999. Therefore, after a Valuer has prepared a valuation report, the report is sent to the Chief Valuer for approval.

4) Process and valuation method

The Asset Inventories used to determine and negotiate entitlements, while the census information was required to monitor household re-establishment. For each individual or household affected, the Ward official in collaboration with the Valuer and project management team will complete a compensation dossier containing necessary personal information on the affected party and those that s/he claims as household members, total landholdings, inventory of assets affected, and information for monitoring their future situation. This information will be confirmed and witnessed by the village leader, and Compensation and Resettlement Committee. Dossiers will be kept current and will include documentation of lands surrendered. Each individual will be provided a copy of the dossier at the time of negotiations. This is necessary so that the resettlement process pertaining to each individual PAP can be monitored over time. All claims and assets will be documented in writing. The information obtained from the inventories and census will be entered into a computerized database to facilitate resettlement/relocation planning, implementation and monitoring.

Throughout Earnings Approach is to be used to assess market value for compensation in compliance with the Regulations made under S 179, the Land (assessment of the value of land for compensation) Regulations, 2001. The earnings approach, estimates the production capacity of an averaged tended crop that is normally found in the area. Adjustments are made to arrive at fair market value. Compensation will cover lost production until crop is again

producing at same level when impact occurred.

For buildings, Direct Comparison Method will be applied to arrive at the market values of the different housing. The resultant income will be compared with results of a Replacement Cost. The highest value will be taken as a base for compensation.

The basic principle governing compensation is that of none of the PAPs should be made worse but be better off. The element of compulsory acquisition of land is well treated in most legislation worldwide including Tanzania emphasizing the right to receive a fair compensation to those who occupy land that is subject to acquisition by the state for declared objectives.

In case there is an affected land or asset(s) belonging to a woman (and not to the head of the household), in households with both man and woman present, such land or asset(s) should be registered under the woman's name and she will be entitled to compensation separate from other household asset(s).

The valuation will be done by District Valuer's in order to reduce procurement process and time, to enhance flexibility in dealing with grievances and utilization of vast knowledge of the area from the local Valuers. A registered valuer is responsible for preparing the asset inventory and to calculate the compensation entitlements. Before valuation exercise, the valuer will sensitize PAPs that compensation is to replace the lost asset(s) and not to buy luxury goods. In addition, the valuer will notify the affected households (include both man and woman) on the compensation process list of affected assets and compensation amount for each affected asset(s). This will ensure that all household members, including women, are properly informed of asset replacement amount(s).

(2) JICA policies on land acquisition and resettlement

The key principle of JICA policies on involuntary resettlement is summarized below.

- Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
- When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.
- People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.
- Compensation must be based on the full replacement cost¹⁹ as much as possible.

¹⁹ Description of "replacement cost" is as follows.

Land	Agricultural Land	The pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, there are the local replacement cost mentioned in "Table 12-83 Recommended Entitlement Matrix", plus the cost of any registration and transfer taxes.
	Land in Urban Areas	The pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
Structure	Houses and Other Structures	The market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes.

- Compensation and other kinds of assistance must be provided prior to displacement.
- For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.
- In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.
- Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
- Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

Above principles are complemented by World Bank OP 4.12, since it is stated in JICA Guideline that “JICA confirms that projects do not deviate significantly from the World Bank’s Safeguard Policies”. Additional key principle based on World Bank OP 4.12 is as follows.

- Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.
- Eligibility of Benefits include, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.
- Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
- Provide support for the transition period (between displacement and livelihood restoration).
- Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.
- For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.
- In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed Financial Plan etc.

(3) Comparison between Tanzanian legal framework and the JICA Guidelines

The gap analysis between JICA guideline and Tanzanian regulation on land acquisition is described in 12.1.2(6)2b) of section 12.1.2.

(4) Project policy on land acquisition and resettlement

Project policy on land acquisition and resettlement are shown in 'Potential measures bridging the gap' in Section 12.2.7.

12.2.3 Scope of Land Acquisition and Resettlement

(1) Mtwara Power Plant

As described in Section 12.2.1, while TANESCO is acquiring the land of 160 ha for the power plant complex area in Kisiwa, the area which is occupied by the components financed by JICA (i.e. Mtwara power plant and Mtwara substation) is expected to be 10 ha within this 160 ha. Therefore, the effects of the land acquisition related to the area for JICA financed components is considered to be arising from the 10ha of land. Following section describes the scope of land acquisition conducted by TANESCO for the 160 ha of land for the power plant complex in Kisiwa that accommodates Mtwara power plant. Since it was found to be difficult to acquire the land of Kisiwa site dividing into two parcels taking into account the TANESCO's plan, it was decided to conduct a land acquisition of 160ha with the same compensation policy as described in this report.

1) Impact on people

Results from the valuation reports revealed that 140 landowners will be affected by the proposed Project as shown in Table 12-68.

Table 12-68 (1) Number of Landowners per Administrative Unit

Valuation Report	Village	Number of Land Owners
October 2017	Kisiwa	99
	Namgogoli	29
February 2018	Kisiwa	12
Total		140

Source: Valuation Reports in October 2017 and February 2018

Table 12-68(2) Summary of Number of Potential Affected People by Necessity of Relocation

Type of loss	No. of Affected Households			No. of Affected People*		
	Formal	Informal	Total	Formal	Informal	Total
To be relocated	11	0	11	62	0	62
No need of relocation	129	0	129	722	0	722
Total	140	0	140	783	0	783

Source: JICA Study Team

There was no informal settlers. Although some people might have been engaged in agriculture wage work such as harvesting cashew nuts, it is a seasonal wage work and finding alternative work place is not a big issue. Therefore, it is considered to be a negligible impact.

2) Impact on land

The total land to be acquired by TANESCO will be 159.8 ha in total in Kisiwa and Namgogoli villages.

Table 12-69 Affected Land by Type

Category of Land	Land size in hectare
Land for agriculture at	
Kisiwa village	123.5
Namgogoli village	35.8
Addition land take in 2018	
Land for agriculture	0.5
Land for houses/structures	0.04
Total	159.8

Source: Valuation Reports in October 2017 and February 2018

3) Impact on structures

There are several residential structures within the proposed power plant that will be affected by the project. The affected houses are in Kisiwa villages resulted from additional land acquisition near fish landing site. These structures are to be demolished to pave for the project site. The structures to be demolished according to the valuation reports include; Houses (11), Sheds (4), Barns for livestock (3), and Well (1) as shown in Table 12-70.

Table 12-70 Affected Structures

Project Affected People	Structures	Kitchen	Farm/Animal sheds	Structure for small business
Valuation of 2017				
PAP 1	02	0	01	0
PAP 2	01	01	0	0
Additional PAPs – 2018				
PAP 1	0	0	0	0
PAP 2	2	02	2	0
PAP 3	2 incomplete structures	0	2	0
PAP 3	0	0	0	0
PAP 4	0	0	0	01
PAP 5	0	0	0	0
PAP 6	0	0	0	0
PAP 7	02 incomplete structures	0	0	0
PAP 8	01 incomplete structure	0	0	0
PAP 9	0	0	0	1for frying fish
PAP 10	01 incomplete structure	0	0	0
PAP 11	0	0	0	0
Total	11	03	05	02

Source: Valuation Reports in October 2017 and February 2018

4) Impact on private grave yards

A total of 42 graves are going to be affected by the proposed Project as shown in Table 12-71. Under the Graves relocation Act, TANESCO will be required to pay compensation to the owner of the graves and also arrange for the relocation of all the graves in a culturally sensitive way before the construction activities commence. However, if local people request to keep the grave on site, TANESCO will provide access to it on some occasions.

Table 12-71 Loss of Private Graveyards

Administrative Unit	Number of graves
Kisiwa village	42
Namgogoli village	0
Total	42

Source: Valuation Reports in October 2017 and February 2018

5) Impact on crops and trees

Permanent crops include those that take more than a year to reach full maturity and can be harvested over a long period of time. The common permanent crops in along the proposed power plant include cashew nuts, coconut tree, banana trees, fruit trees as well as shades related trees. The land under the proposed projects is currently used by local people to grow various permanent crops used as food and cash crops. PAPs with standing crops and trees on their farms and plots within the project areas are entitled to compensation. Each tree or acre is counted and compensated according to its market value and age of maturity.

Seasonal crops are mainly those that take less than six months to reach total maturity that allows them to be fully harvested and then the land will be cleared. These crops mainly include maize, beans, rice, cassava, sweet potatoes and cotton. Disruption of farming activities and the disturbance of crops will occur during construction activities of the power plant where machinery access has to be gained and no permanent roads exist. See Table 12-72 for more detail.

Table 12-72 Affected Crops

Crops and Trees	June 2016		February 2016	Total
	Namgogoli	Kisiwa	Kisiwa	
Cashew	523	3467	0	3990
Timber Trees	531	1569	71	2171
Pineapple	268	216	0	484
Soursop	1	227	0	228
Mango Trees	13	157	0	170
Tamarind tree	20	136	4	160
Ebony tree	0	132	16	148
Banana	6	88	0	94
Sisal plant	13	74	0	87
Baobab	2	35	15	52
Pawpaw tree	0	52	0	52
Coconut	2	37	0	39
Mitopetope	0	0	19	19
Large Mango	0	17	0	17
Mmongo	0	15	0	15

Crops and Trees	June 2016		February 2016	Total
	Namgogoli	Kisiwa	Kisiwa	
Mitiasli	0	0	14	14
Orange tree	0	10	0	10
Pine tree	0	5	0	5
Lime	0	4	0	4
Margosa/Neem tree	1	0	1	2
Makaburi	2	0	0	2
Pepper	0	0	2	2
Hemp	0	1	0	1
Kapok tree	0	1	0	1
Mitimao	0	1	0	1

Source: Valuation Reports in October 2017 and February 2018

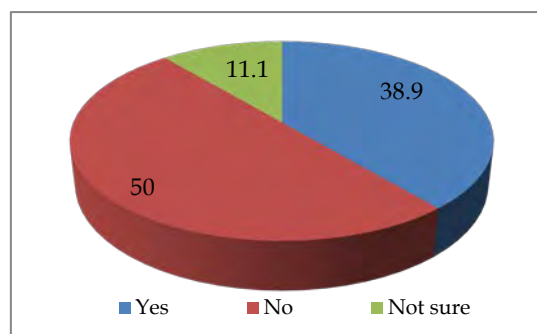
6) Impact on fisheries

Additional land acquisition has resulted to the loss of fish landing site which is being used by two villages of Kisiwa and Namgogoli. The fish landing site is used by about 62 fishermen who livelihoods depends on fishing activities.

The issue of availability of alternative fish landing site was discussed with the respondents. This was important because about 62 households use the site for landing. It is also a place where they meet with fish customers from Mtwara town. During the construction and operation of the Project, people will not be allowed to use the area.

As it is shown in Figure 12-66, about 50.1% of the respondents reported the availability of an alternative fish landing site at Mgao village. Their views and concerns with regard to the site have been shown in Appendix 2 of DDR. Other respondents proposed different means of livelihoods such as livestock keeping especially goats and chicken.

To respond to their concern, TANESCO arranged the meeting between Kisiwa village leader and Mgao village leader and confirmed that Kisiwa villagers will be able to use Mgao landing site and to have access to the fish market.



Source: JICA Study Team, 2018

Figure 12-66 Availability of Alternative Fish Landing Site

7) Number of severely affected household

Affected households who lose more than 10% of their productive income generating assets are considered severely affected. Among 36 interviewed households²⁰ of the proposed Project, 22 HHs will lose more than 10% of productive land.

²⁰ As for number of interviewed PAPs, please see 12.10.3.3 Household Survey 1) Sample population.

Table 12-73 Household Losing more than 10 Percent of Land Size

Land size lost in percent	Number of interviewed Household	Percent
25 - 40	3	13.6
41 - 80	3	13.7
81 - 100	16	72.7
Total	22	100.00

Source: JICA Study Team, 2018

8) Cut-off date

The eligibility for encroachers under the projects supported by JICA and World Bank will be determined by the cut-off date. The cut-off date in most time determined by the timing in which key project activities such as the census, survey of the project-affected area and data validation by competent authorities are completed. In the case of the proposed Project, there are two cut-off dates for this Project. The first one is for 159.3ha (see Table 12-69) and it was 29th December, 2016 when the initial valuation was approved by the Government Chief Valuer and the sensitization, valuation and census exercises had taken place. Even if there will be an influx of encroachers to the proposed Project site, they will not be eligible for the entitlement since this Project has conducted the valuation. The second one is for 0.54ha and it was 5th June 2018 when the valuation was approved by the Government Chief Valuer and the sensitization, valuation and census exercises had taken place. In this JICA Study, the socio-economic household survey was conducted from 8th to 17th in August, 2018 for all of these sites.

9) Preferences in mode of compensation

In trying to understand PAPs preferences on the mode of compensation PAPs were asked to indicate their preferences between cash compensation and in kind compensation and whether they will prefer to be relocated in the same village or would like to be relocated in the outside village or district. Compensation will replenish the lost assets if used for intended purpose and when is paid promptly. In kind compensation could be the best option for the vulnerable groups who are unable to utilize the compensation money to intended purposes (e.g. building a new house) due to disabilities, addiction, old age (elderly), and widow. These will need special assistance.

All sampled respondents expressed their preference to cash compensation. The major reason for the compensation was to enable them to buy another in an area where they prefer. According to the respondents, the option for in-kind compensation is not acceptable because they are not where they be located and the given land will meet their requirement. However, both cash and in kind compensation mode are considered in implementing compensation upon request.

Majority 97.2% of respondents are willing to relocate to pave the way for the construction of the power plant at Kisiwa and Namgogoli villages. 2.8% of the respondents were not willing to relocate because of difficult to get another land of the same quality.

Nearly 75.0% of the interviewed PAPs wanted to resettle in within the same village, if required to relocate from their existing plot or area to be acquired by the Project. Some 22.2% of the respondents were ready to relocate to another village within the district and 2.8% were ready to relocate outside the district. Relocation in the same area or village will assist PAPs to link

with the community they used to live with thus reducing the risk of households' disintegration with their communities.

Table 12-74 Preference of the Area to Resettle by the Interviewed PAPs

	Number of Interviewed PAPs	Percent
Within the village	27	75.0
Outside the village within the district	8	22.2
Outside the district	1	2.8
Total	36	100.0

Source: JICA Study Team, 2018

(2) Mtwara-Somanga 400kV Transmission line and 400kV substations

1) Impact on people

Results from the field observation, village meeting and household's survey including the various stakeholder consultations during the Environmental and Social Impact Assessment for this study reveal that 1,098 PAPs will be affected by the transmission line. Looking at the status of Affected Households (AHs), all households and family members have own land legally as shown on Table 12-75. At this stage where there is no demarcation for the power transmission, no tenants and encroachers were identified during the field work assessment. The impact is different in several districts that the transmission line traverses. Lindi Rural District has the highest number of PAPs followed by Kilwa District, Lindi Urban District and Mtrawa Rural District as shown on Table 12-76.

Table 12-75 Summary of Number of Potential Affected People by Necessity of Relocation

Type of loss	No. of Affected Households			No. of Affected People*		
	Formal	Informal	Total	Formal	Informal	Total
To be relocated	62	0	62	353	0	353
No need of relocation**	1,036	0	1,036	5,906	0	5,906
Total	1,098	0	1,098	6,259	0	6,259

Source: JICA Study Team

Table 12-76 Summary of Number of Potential Affected People by District

District	Number of estimated PAPs	Number of structures
Mtwara rural	86	08
Lindi rural	497	13
Lindi urban	118	07
Kilwa	397	34
Total	1,098	62

Source: JICA Study Team

2) Impact on land

The total wayleave acquired by TANESCO is 52 meters wide (or 26 meters on each side). Out of 26 meters way leave, 5 meters will be directly below the transmission line and will be cleared and used as access road along the way leave corridor. On the other hand the 21 meters on each side of the transmission line will be cleared for the safety of the line. Since the entire 52 meters is fully compensated, the use of this wayleave is restricted. No cultivation even with short crops is allowed apart from grazing. TANESCO will ensure regular clearance of tall vegetation in the right of way to ensure safety of the line and the communities along the corridor. Therefore, full land usage restrictions apply and landowners will be fully compensated for the land falling under the wayleave of 52 meters wide. This 52 meters wide wayleave is expected to be transferred to TANESCO after all rights upon this land have been compensated for and it is deemed not to have any residual value for the current owners. Table 12-77 shows that the Mtwara-Somanga 400kV Transmission Line will take a total of 1,387.6ha of land.

Table 12-77 Project Affected Land

District	Length in meters	Width in meters	Affected Land size in m ²	Affected Land size in hectare
Mtwara Rural	22,786.65	52	1,184,905.8	118.5
Lindi Rural	108,087.22	52	5,620,535.44	562.0
Lindi Urban		52		
Kilwa	135,979.22	52	7,070,919.44	707.1
Total			13,876,360.68	1,387.6

Source: JICA Study Team

3) Impact on structures

There are several residential structures along the proposed transmission line that will be affected by the Project. Following the results of the field survey performed and the subsidiary counting of houses along the proposed transmission line, it is estimated that about 62 houses will be affected in the wayleave and have to be removed. In addition to structures of individual households, a football ground used by the pupils at Mirumba village in Kilwa district will be affected (detail is explained in the section for “Impact on community properties” below).

Table 12-78 Affected Houses and Assets

District	No of Houses	Other Identified Assets
Mtwara Rural	08	Farms
Lindi Rural	13	Farms, Grave yard
Lindi Urban	07	Farms
Kilwa	34	Farms, Grave yard,
Total	62	

Source: JICA Study Team

4) Impact on private grave yards

A total of 350 graves are going to be affected by the transmission line mostly in private graveyard as per Table 12-79. TANESCO will pay the owners of the graves and also arrange

for the relocation of all the graves in a culturally sensitive way before the construction activities commence as stipulated in the Graves relocation Act.

Table 12-79 Some of the Graves located in the Wayleave of the Power Transmission Line

District	Village	Estimated number of graves
Kilwa	Miteja	35
	Tingi	04
	Madangwa	65
	Mandawa	246
Total		350

Source: JICA Study Team

5) Impact on community properties

A football ground at Mirumba village was identified during the field survey as a potentially affected community property. The football ground is used by the pupils at Mirumba village in Kilwa district. The discussion with school management revealed the land was allocated by village government to be used as a playing ground for the Mirumba primary school pupils. The assessment and discussion with school management confirmed that there is an alternative land nearby the school which can be acquired and be used as a playground for children, therefore, should acquire that land in order to mitigate this impact.

6) Impact on trees, fruit trees and plantation

Affected trees and crops based on interview with the land owners are shown in Table 12-80. These figures are preliminary and will be finalized during the valuation process after finalization of transmission line wayleave.

Table 12-80 Affected Crops/Trees within Wayleave

Name	Number
Cashew nuts	850
Coconuts	1,075
Timber trees	488
Shade trees	448
Fruit trees (Mango, Orange and others)	1,632
	4,493

Source: JICA Study Team, 2018

7) Preferences in mode of compensation

Most all (95.8%) of the respondent households preferred cash as the mode of payment rather than kind and 4.2% preferred in kind. The numbers of PAPs who responded to this question in each of the affected districts are shown in Table 12-81.

Table 12-81 Preferences on the Mode of Payments of the Interviewed PAPs

District	Cash compensation		In-kind compensation		Total	
	Number	Percent	Number	Percent	Number	Percent
Mtwara D.C	25	92.6	02	7.4	27	100.0
Lindi Rural	56	94.9	03	5.1	59	100.0
Lindi Urban	12	100.0	0	0	12	100.0
Kilwa	88	96.7	03	2.2	91	100.0
Total	181	95.8	08	4.2	189	100.0

Source: JICA Study Team, 2018

Majority 97.4% of PAPs are willing to relocate to pave the way for the construction of the Mtwara-Somanga 400kV Transmission Line while only 2.6% are not willing to relocate. Nearly 88.6% of the PAPs wanted to resettle in within the same village, if required to relocate from their existing plot or area to be acquired by the Project. Some 11.4% of the PAPs wished to relocate to another village as shown in Table 12-82. Relocation in the same area or village will assist PAPs to link with the community they used to live with thus reducing the risk of households' disintegration with their communities.

Table 12-82 Preference of the Area to resettle by the Interviewed PAPs

	Number	Percent
Within the village	167	88.
Outside the village within the district	21	11.1
Outside the district	01	0.5
Total	189	100.0

Source: JICA Study Team, 2018

8) Cut-off date

The cut-off date in most time determined by the timing in which key project activities such as the census survey of the project-affected area and data validation by competent authorities are completed.

In the case of the proposed power transmission line project, the Basic Design study will be conducted after this JICA study, the detail transmission line route will be determined. Based on the Basic Design, the sensitization, valuation and census exercises will be conducted by the valuers of District Councils. The cut- off date will be set as the date when the official valuation report have been approved by the Government Chief Valuer.

The date must be communicated effectively to the potential PAP's and the surrounding local villages/communities.

12.2.4 Concrete Measures for Compensation and Assistance

(1) Compensation for loss

For both (1) Mtwara Power Plant and (2) Mtwara-Somanga 400kV Transmission line and 400kV substations, the following compensation policies are suggested in DDR and RPF. As for Mtwara Power Plant, the DDR reveals some gaps between the Tanzanian legislations and JICA Guidelines in terms of compensation policy for loss of structures and transaction cost, etc., and then it suggests

means to fill the gaps which are result in the compensation policies stated as below.

1) Compensation for the loss of residential and productive land

Persons loosing residential and productive land will receive compensation for the lost land; full replacement cost for the residential house(s) to be relocated; disturbance allowance equal to 8% (of the total value of land, buildings and crops on the land) regardless of whether PAP has to relocate to a new area or whether they remain on the unaffected portion of their land; Accommodation allowance equal to an average of market monthly rent of the subject house multiplied by 36 months; transport allowance being actual cost of transporting 12 tons of luggage by rail or road within a distance of 20 km from point of displacement.

2) Compensation for the loss of non-residential houses and other structures

Persons loosing non-residential and other structures will receive compensation for the lost land or plot; full replacement cost for the building or structure to be relocated; disturbance allowance equal to 8% (of the total value of land, buildings and other structures) regardless of whether PAP has to relocate to a new area or whether they remain on the unaffected portion of their land. Non-residential houses will not receive accommodation and transport allowances.

3) Compensation for the Loss of Business Buildings or Structures

Persons loosing non-residential or business structures will receive compensation for the lost land or plot; full replacement cost for the building or structure to be relocated; disturbance allowance equal to 8% (of the total value of land, buildings and other structures) regardless of whether PAP has to relocate to a new area or whether they remain on the unaffected portion of their land; Loss of profit allowance equal to net monthly profit of the business carried out on the land or building (evidenced by audited accounts where necessary and applicable) multiplied by 36 months.

4) Compensation for the Loss of Standing Crops

PAPs loosing standing crops and trees in within way leave or substation land area will receive compensation for the lost perennial crops based on the type and growth (maturity) of those standing crops or trees/ fruit trees; compensation for the lost farmland; disturbance allowance equal to 8% of the total value of land and crops. Value of crops will be calculated based on a price list at the time of valuation. Annual crops such as maize, beans, paddy, millet, etc. will not be compensated rather the PAP will be given time to harvest the crop.

5) Compensation for the loss of public structure or common property

Villages or institutions loosing public structures such as school, dispensary, office building, church, mosque, etc. will be compensated in kind. However, if the institution or village demand cash compensation the village or institution will receive compensation for the lost land; full replacement cost for the building(s) to be relocated; disturbance allowance equal to 8% (of the total value of land, buildings and crops on the land); Accommodation allowance equal to an average of market monthly rent of the subject structure multiplied by 36 months.

In case of common properties such as water well, market structures the compensation will be strictly in kind.

6) Compensation for loss of grave yard and relocation of graves

PAP or Household having graves in the wayleave will need to relocate the graves. Household or PAP losing grave yard will receive cash compensation to be negotiated (currently TSh. 100,000 – 300,000) for each grave for ceremonial activities while the actual work of relocating the grave (coffin, medicine, groves, digging the old grave and reburial in new grave) will be done by health officials in each respective district council at the project proponent's cost. The village will be responsible to avail the new grave yard.

7) Persons affected by unforeseen construction damages and losses

Some households may suffer damage to their property by construction, and it may lead to additional compensation not foreseen during preliminary RAP preparation. This could include damage to buildings, walls, fences, hedges, gardens, trees and crops. These shall be brought to the notice of the grievance committee for redress and compensation will be done as applicable by the contractor.

8) Persons who suffer partial loss to buildings and assets where the main structure may not be impacted

Some households may suffer a partial loss to buildings where the main building remains unaffected. This could include loss of buildings other than main buildings or part of the main building is removed but the PAP can still use the main building with little modification. Persons with partial loss of structures will receive compensation for the lost land or plot; full replacement cost for the whole buildings or structure to be relocated whether it is fully or partially removed; disturbance allowance equal to 8% (of the total value of land, buildings and other structures) regardless of whether PAP has to relocate to a new area or whether they remain on the unaffected portion of their land; Accommodation allowance for 36 months of monthly value of the buildings if it used for residential; transport allowance of 12tons luggage up to 20km from the point of displacement. However, non-residential houses will not receive accommodation and transport allowances. Further details are shown in the entitlement matrix table below.

(2) Livelihood restoration plan**1) Mtwara Power Plant**

The following measures shown on Table 12-83 were planned for other projects in Tanzania. These may be possible to be implemented under the proposed Project as well, though it is subject to consultation with PAPs and relevant regional, district administrations. The detail livelihood restoration plan will be determined in consultation with PAPs after the signing the loan agreement. It is a part of the activities of the RAP.

Table 12-83 List of Possible Measures

NO	Name	Target	Contents (explanation on referred RAPs)	Necessary Action/ Budget
1.	Hiring PAPs	Anyone above working age	<ul style="list-style-type: none"> • Priority should be given to all able bodied members of the affected households and communities and, in particular, to resettled households when labour for the Project is recruited such as clearing of the wayleave; construction of access roads and construction of camps, reconstruction of community buildings and houses, services and goods to the workers; administration of the compensation program and follow-up activities, etc. 	Specific provisions to that effect must be included in the construction Terms of Reference.
2.	Purchase of local materials and services	Business owners in affected communities	<ul style="list-style-type: none"> • All goods and services (ex. sand, cement, food, etc.) should be bought (as much as possible) locally by the entrepreneur in charge of construction. 	Specific provisions to that effect must be included in the construction Terms of Reference.
3.	The Community Compensation Fund (CCF)	Community	<ul style="list-style-type: none"> • CCF could be used to improve public buildings (schools) services (dispensaries), and infrastructures (water supply, roads). Communities receive their share according to the length of the wayleave within their community and the number of households affected. • According to the full RAP, Kenya-Tanzania power interconnection project allocated 1% of project cost for CCF 	TANESCO needs to secure 1% of project cost as CCF, administration cost.
4.	Tree plantation	Community Forest	<ul style="list-style-type: none"> • An appropriate program of tree plantation to the affected communities. An experience agro-forester should be hired by the PIU to assist the communities and consult with the district Forestry Services to adequately plan the compensation program. 	TANESCO needs to secure budget for plantation, land, hiring agro-forester.
5.	Provision of Seedlings and seeds	Farmer	<ul style="list-style-type: none"> • Provision of Seedlings and seeds 	TANESCO needs to secure budget for seedlings and seeds, and administration cost, though depends on contents of program.
6.	Technical assistance to PAPs on livestock and crop production	Farmer	<ul style="list-style-type: none"> • TANESCO in collaboration with respective district councils will provide technical assistance to PAPs i.e. training on livestock and crop production for at least 1 year period to help PAPs rehabilitate their lives * In case of using existing scheme, its capacity of accepting PAPs, budget etc. should be checked whether connecting PAPs to existing scheme will be feasible and enable PAPs to restore their livelihood. 	Depends on capacity (human resource and budget) of district councils.
7.	Practical training courses on improved agricultural techniques	Farmer	<ul style="list-style-type: none"> • TANESCO in collaboration with respective district councils will arrange practical training courses on improved agricultural techniques, including crop varieties, fertilization, small scale irrigation, animal traction and related and use of related equipment and post-harvest grain conservation; * Same as above 	Depends on capacity (human resource and budget) of district councils.

NO	Name	Target	Contents (explanation on referred RAPs)	Necessary Action/ Budget
8.	Training and extension services to increase income generation opportunities	All PAPs	<ul style="list-style-type: none"> TANESCO in collaboration with respective district councils will organize training and extension services to PAPs groups to improve knowledge and awareness on issues aiming to increase income generation opportunities 	Depends on capacity (human resource and budget) of district councils.
9.	Support for women groups	Women	<ul style="list-style-type: none"> TANESCO in collaboration with respective district councils particularly community development offices will target women groups for a specific group of interest to engage in credit facilities 	Depends on capacity (human resource and budget) of district councils.
10.	Livestock development	Dairy Farm	<ul style="list-style-type: none"> If the region's climate and environmental conditions are favourable for keeping cattle, to produce meat or promote dairy cattle can be income resource. It is in this connection that a more serious investment is needed for quality improvement. Available village grazing land can be enhanced and used for this purpose. Credit facilities to enable households acquire dairy cattle for enhancing milk production hence incomes are required. Credit is also needed to acquire improved animal stocks and the training in the proper upkeep of those animals. 	Depends on what kind of program will be provided.
11.	Forestry	Forestry	<ul style="list-style-type: none"> Rapid increase in population has increased the pressure on the woodlands outside and inside forest reserves particularly for fuel wood as a source of energy for cooking, lighting and other activities as well as for tobacco processing. In addition to afforestation efforts agro forestry and improved land practices offer important opportunities for improving land productivity while maintaining environmental stability. 	Depends on what kind of program will be provided.
12.	Agroforestry/ Beekeeping	Forestry	<ul style="list-style-type: none"> Sustainable agro-forestry and the promotion of commercial beeswax honey production and afforestation programs can be a source of income, if ecological condition allows. Commercial and small-scale production of honey and beeswax production can be increased with improved technology. In addition further <u>establishment of beekeeping groups on a sound cooperative basis</u> will make easy the provision of extension services and financial assistance. 	Depends on what kind of program will be provided.
13.	Natural Resources	various	<ul style="list-style-type: none"> The following opportunities may be identified within the project area: i) seasonal fishing practices on paddy farms; ii) establishing fishponds; iii) establishment of canning and processing industries for natural fruit such as Amarula, Makasu, Mibuyu; iv) forest extracts (herbs); and v) tree nurseries for ornamental fruits, soil conservation and water preservation, etc. * This project needs to identify possibility of utilize natural resources around affected communities. 	Depends on what kind of program will be provided.
14.	Access to Credit	All PAPs	<ul style="list-style-type: none"> Savings and Credit Associations (SACCOs) especially for economic undertakings are catalyst in the region. Therefore <u>intensive awareness and sensitization campaign</u> are needed to give impetus to the formation of such groups all over the rural country side. Resources are required to fund such campaigns and to support such groups with credit facilities. The majority of population especially rural people are not credit worthy, however if these people are well organized in economic groups, can be eligible for credit. TANESCO in collaboration with respective district councils will promote women groups to 	Depends on what kind of program will be provided.

NO	Name	Target	Contents (explanation on referred RAPs)	Necessary Action/ Budget
			utilize to the existing Savings and Credit Associations (SACCOs) especially for economic undertakings for women groups particularly widows.	
15.	Alternative means of livelihood other than fishing	Fishermen who will lose access to the fish landing site and want to change their means of livelihood	<ul style="list-style-type: none"> Changing the occupation is risky and difficult to restore the livelihood, but if the fishermen want to change their livelihood, assistance should be proposed in order to enable the PAPs to have alternative means of livelihood other than fishing. Alternative means of livelihood can be considered either on this list or through the consultation with the fishermen. 	Depends on what kind of program will be provided.
16.	Assistance to access to modern fishery equipment as a livelihood restoration for PAPs who need to use the alternative fish landing site at Mgao	Fishermen who will lose access to the fish landing site and want to change their means of livelihood	<ul style="list-style-type: none"> Besides the item 15 above, fishing in Mgao village need advanced equipment to enable the fishermen to go in deep sea for fishing. The use modern equipment needs capital which the fishermen at Kisiwa village cannot afford. Therefore, there would be need for specific assistance to fishermen. 	Depends on what kind of program will be provided.

Source: JICA Study Team

2) Mtwara-Somanga 400kV Transmission line and 400kV substations

Since livelihood restoration programs should be carefully planned and selected through participatory process, it is not possible to prepare specific livelihood restoration programs at this time. Thus, the RPF proposes the strategy and procedure for the livelihood restoration programs, as well as the possible measures for the livelihood restoration programs as per Table 12-83 above.

(3) Resettlement site

1) Mtwara Power Plant

World Bank OP 4.12 para. 11 requires that preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. For example, farmers/aquaculture industries are typical type of livelihoods which are land-based. However, Land based resettlement is not stipulated in the law in Tanzania.

Regarding the proposed Project, the socio-economic survey of this DDR survey collected information about PAPs' preference on compensation whether they wish to be compensated in cash or in kind. All sampled respondents expressed their preference to cash compensation. The major reason for the compensation was to enable them to buy another in an area where they prefer. According to the respondents, the option for in-kind compensation is not acceptable because they are not where they be located and the given land will meet their requirement. However, both cash and in kind compensation mode are considered in implementing compensation upon request.

2) Mtwara-Somanga 400kV Transmission line and 400kV substations

PAPs will need to be resettled because of the proposed Project. Therefore, TANESCO has offered displaced persons choices among feasible resettlement options, including cash compensation to replace the lost buildings with all applicable allowances or in kind compensation and provide relocation assistance suited to the needs of each displaced person. In the social economic survey, majority of the households chose cash compensation. Because this is a linear project whereby the affected household have stretched along the 294km, PAPs are able to relocate in the same villages after receiving compensation.

(4) Entitlement matrix

In finalization of the detail plan of the project after this study, the Entitlement Matrix described in this report might be revised, if necessary.

1) Mtwara Power Plant

The compensation principle of Tanzanian laws and regulation establishes the eligibility and provisions for all types of losses (land, structures, businesses, loss of accommodation, disturbance, crops, transport costs resulting from displacement and trees). However, some gaps were identified as per Chapter 8 of DDR and recommendation to fill the gap on compensation and support for the PAPs were presented in Sections 9.2 and 9.3 of DDR. The recommended entitlement matrix for the proposed Project (Table 12-84) shows entitlement for household based on the following categorization.

- Households whose houses, associated structures and land are lost due to land acquisition (A).

- Households whose houses and associated structures are lost to land acquisition but land is not (B).
- Households whose lands are lost to land acquisition but houses and associated structures are not (C).
- Households who will be economically displaced due to adverse effects of the project on their livelihoods (D). Economic displacement refers to loss of income streams and means of livelihood resulting from land acquisition or obstructed access to resources such as land or forests.
- PAPs who earn a portion of their livelihood by renting their land and physical assets to other PAPs in the project area (E).
- PAPs who do not own any land or physical assets but derive their livelihood through (i) some form of employment (ii) social support networks and (iii) customary rights to common property, for example, water, in the project area (F).

In implementation of the RAP, it will be confirmed if there was any persons who was waiting for land registration or in a process of land purchase within the project site. When necessary and appropriate, such persons will be compensated in accordance with the Entitlement Matrix. If any assistance for restoration of livelihood of agriculture in a new land, it will be considered as part of the livelihood restoration plan in consultation with PAPs.

2) Mtwara-Somanga 400kV Transmission line and 400kV substations

The principle adopted from the Tanzania Laws establishes the eligibility and provisions for all types of losses (land, structures, businesses, loss of accommodation, disturbance, crops, transport costs resulting from displacement and trees). All affected persons will be compensated at full replacement costs and other allowances. Following the gap analysis between Tanzania laws on involuntary resettlement and that of the JICA Guideline and World Bank Safeguard Policies, this preliminary RAP will be aligned with the World Bank OP 4.12 which indicates best practices for rehabilitation of livelihoods of people affected by the implementation of the project. At the stage of RPF, same entitlement matrix shown above is suggested to the proposed Project.

Table 12-84 Recommended Entitlement Matrix

Category of Project Affected People (PAP)		Type of Loss	Compensation for Loss of Land	Compensation for Loss of Structures and Assets	Compensation for Loss of Crops	Allowances
A. Household or persons						
A1	Households or persons that have residential plots with houses and / or non-residential buildings within the Power Plant compound.	<ul style="list-style-type: none"> • Loss of residential land • Loss of housing and non-residential building assets 	<p>Land will be compensated at full replacement cost as follows:</p> <ul style="list-style-type: none"> • Compensation (cash or in-kind) of the <u>residential land plot at local replacement cost</u>. • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	<ul style="list-style-type: none"> • Cash compensation without depreciation according to: <ul style="list-style-type: none"> - subject area, - type of building and; - materials used and condition. 	N/A	<ul style="list-style-type: none"> • <u>Disturbance allowance</u> at bank interest rate of estimated land value at the time of valuation. • <u>Accommodation allowance</u> equivalent to 36months rent for the displaced house. • <u>Transport allowance</u> at cost to move 12 tons for 20 km (not applicable for backward relocation of houses).
A2	Household or person that owns non-residential buildings within the Power Plant compound.	<ul style="list-style-type: none"> • Loss of non-residential buildings 	<p>Land will be compensated at full replacement cost as follows:</p> <ul style="list-style-type: none"> • Compensation (cash or in-kind) of <u>the residential land plot at local replacement cost</u> • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	<ul style="list-style-type: none"> • Cash compensation without depreciation according to: <ul style="list-style-type: none"> - subject area, - type of building and; - materials used and condition. 		<ul style="list-style-type: none"> • <u>Disturbance allowance</u> at 8% of estimated land value.
A3	Households or persons that have building assets and own land and cultivate crops (annual and perennial / tree crops) within the corridor for Transmission line and Power Plant compound.	<ul style="list-style-type: none"> • Loss of residential land • Loss of agricultural land • Loss of housing and non-residential building assets • Loss of fruit and timber/ shade trees and other perennial crops 	<p>Land will be compensated at full replacement cost as follows:</p> <ul style="list-style-type: none"> • Compensation (cash or in-kind) of <u>the residential and agricultural land</u> inside the power plant compound according to area and local replacement cost • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	<ul style="list-style-type: none"> • Cash compensation without depreciation according to: <ul style="list-style-type: none"> - Subject area, - type of building and; - materials used and condition 	<ul style="list-style-type: none"> • Cash compensation for fruit and timber/shade trees and other commercially valuable standing crops (cashew nut, banana, etc.) at the time of valuation according to the growth. • Other crops PAPs given time to harvest 	<ul style="list-style-type: none"> • <u>Disturbance allowance</u> at bank interest rate of estimated land value at the time of valuation. • <u>Accommodation allowance</u> equivalent to 36months rent for the displaced house. • <u>Transport allowance</u> at cost to move 12 tons for 20 km (not applicable for backward relocation of houses).
A4	Households or persons that own land and cultivate crops (annual and perennial /tree crops) land within the Power Plant compound.	<ul style="list-style-type: none"> • Loss of agricultural land • Loss of fruit and timber/shade trees and other perennial crops 	<p>Land will be compensated at full replacement cost as follows:</p> <ul style="list-style-type: none"> • Compensation (cash or in-kind) of agricultural land inside the Project site according to area and local replacemeng cost. • The affected household/ person <u>will not be allowed</u> to continue cultivating annual (low) crops inside the Project site. • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	N/A	<ul style="list-style-type: none"> • Cash compensation for fruit, timber/ shade trees and other commercially valuable standing crops (cashew nut etc.) at the time of valuation according to growth. • Annual crops (maize, sorghum etc.) are left for the PAP to harvest and will not be compensated. 	<ul style="list-style-type: none"> • <u>Disturbance allowance</u> at bank interest rate of estimated land value at the time of valuation.
A5	Households or persons that lease land and cultivate crops (annual and perennial/ tree crops) within the Power Plant compound.	<ul style="list-style-type: none"> • Loss of fruit and timber/shade trees and other perennial crops (long-term leases) 	<p>Land will be compensated at full replacement cost as follows:</p> <ul style="list-style-type: none"> • The compensation for land will be paid to land owner. • The affected household/ person leasing the land will not be allowed to continue cultivating annual (low) crops inside the Project site. 	N/A	<ul style="list-style-type: none"> • Cash compensation for fruit and timber/shade trees and other commercially valuable standing crops (cashew nut etc.) at the time of valuation according to growth. • Annual crops (maize, sorghum etc. are normally not compensated but are left for the PAP to harvest. 	<ul style="list-style-type: none"> • <u>Disturbance allowance</u> at bank interest rate of estimated land value at the time of valuation.
A6	Household or Person or village owning a bare land	<ul style="list-style-type: none"> • Loss of bareundeveloped land 	<p>Land will be compensated at full replacement cost as follows:</p> <ul style="list-style-type: none"> • Compensation (cash or in-kind) for land at local replacement cost. • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	N/A	N/A	<ul style="list-style-type: none"> • <u>Disturbance allowances</u> at bank interest rate of estimated land value at the time of valuation.
A7	Households or persons outside the Project site who will be affected by temporary access roads and construction activities .	<ul style="list-style-type: none"> • Loss and damage to building assets. • Loss of standing crops. 	N/A	<ul style="list-style-type: none"> • Negotiated cash compensation according to cost of repair of damaged building assets (contractor to pay) 	<ul style="list-style-type: none"> • Negotiated cash compensation according to replacement cost of lost crops (negotiated and paid by contractor) 	<ul style="list-style-type: none"> • No allowances given

Category of Project Affected People (PAP)		Type of Loss	Compensation for Loss of Land	Compensation for Loss of Structures and Assets	Compensation for Loss of Crops	Allowances
A8	Households or persons that have graves on land that they own within the Power Plant compound.	• Loss of burial site (grave yard) inside the corridor for Power Plant compound.	N/A	N/A	N/A	<ul style="list-style-type: none"> • <u>Cash compensation</u> as required by the Graves Removal Act No. 9 of 1969 to cover for the ceremonies costs. • <u>Grave relocation costs</u> (coffin, reburial work, etc.) to be Stipulated and negotiated by relevant District Health Official shall be borne by the project. • <u>Village councils shall allocate replacement burial plots.</u>
A9	Household that loose part of the land less than 20% or the land or more.	• Loss of partial land	Land will be compensated at full replacement cost as follows: <ul style="list-style-type: none"> • Compensation (cash or in-kind) for the lost land at local replacement cost • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	N/A	N/A	<ul style="list-style-type: none"> • <u>Disturbance allowances</u> at bank interest rate of estimated land value at the time of valuation.
A10	Household that suffer the partial loss of building but can utilize part of the building.	• Loss of partial land • Loss of partial main residential building(s)	Land will be compensated at full replacement cost as follows: <ul style="list-style-type: none"> • Compensation (cash or in-kind) for the lost land at local replacement cost. • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	• Compensation for the loss of complete structure at replacement cost regardless whether the household can salvage the building material and do renovations to still remain and utilize the building.	• Compensation for the loss of crops if any at the market price	<ul style="list-style-type: none"> • <u>Disturbance allowances</u> at bank interest rate of estimated land value at the time of valuation. • <u>Accommodation allowance</u> equivalent to 36months rent for the displaced house. • <u>Transport allowance</u> at cost to move 12 tons for 20 km (not applicable for backward relocation of houses.
B. Institutions / authorities						
B1	Institutions or authorities that own buildings and land within the Power Plant compound.	• Loss of buildings • Loss of developed land	Land will be compensated at full replacement cost as follows: <ul style="list-style-type: none"> • Compensation (cash or in-kind) of the <u>lost land plot</u> at local replacement cost • Compensation of transaction cost (Either paying compensation for transaction cost to PAPs or allowing PAPs to be free of transaction costs) 	<ul style="list-style-type: none"> • Cash compensation according to: <ul style="list-style-type: none"> - Subject area, - type of building and; - materials used and condition. • In kind compensation for the building structures. 	N/A	<ul style="list-style-type: none"> • <u>Disturbance allowance</u> at bank interest rate of estimated land value at the time of valuation. • <u>Accommodation and transport allowance</u> may be applicable if buildings are also used for residential purposes (e.g. building owned by congregations and schools.) • Project assistance with organizing and supervising construction of replacement houses and buildings if requested.
C. Village/Mtaa/Sub-village						
C1	Village/Mtaa/Sub-village	• Loss of common property such as wells, school, etc.	N/A	• Compensation by replacement of common property resource with improvements.	N/A	N/A
D. Groups						
D1	Fishery groups using fish landing site in Kisiwa village and willing to change their means of livelihood	• Loss of accessible fish landing site	N/A	N/A	N/A	• Project assistance on livelihood restoration in case fishermen want to change their means of livelihood.
D2	Local group (Women group) who are using the fish pond in Kisiwa village	• Loss of fish pond (not possible to access)	N/A	• Compensation for investment on the fish ponds	N/A	
D3	Households having vulnerable APs (such as poor, elderly APs, female-headed households, Chronically ill and disabled)					• Project assistance on livelihood restoration based on the identified vulnerability condition of PAPs and their needs.

Note: When compensation for land is made by in-kind land, the equivalent production can be secured. And when compensation for land is made by cash, then the cost for initial cultivation can be included.

Source: JICA Study Team

12.2.5 Grievance Mechanism

For both (1) Mtwara Power Plant and (2) Mtwara-Somanga 400kV Transmission line and 400kV substations, grievance redress mechanisms are necessary avenues for allowing affected persons to voice concerns about the resettlement and compensation process as they arise and, if necessary, for corrective action to be taken promptly. Such mechanisms are important to achieving transparency in the acquisition and resettlement processes. Taking the complexity of resolving disputes and grievances into account, all grievances will be addressed expressively and amicably through mediations at the lower level government offices and existing committees. This will ensure, the affected person does not travel long distances or incur advocacy costs.

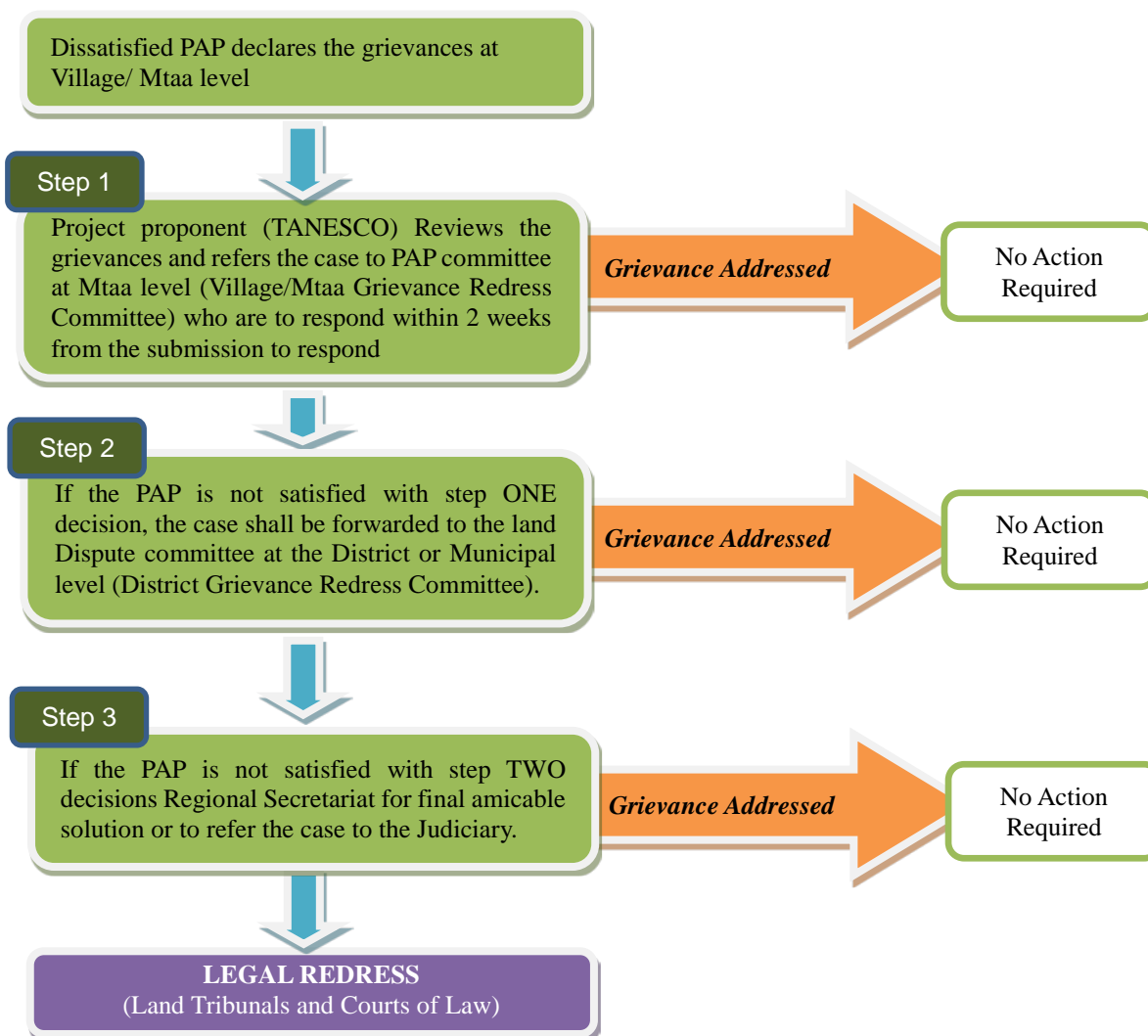
During the resettlement process, all disputes will be referred to TANESCO who may handle the grievance straight away or refer it to the PAP committee who will be asked to provide recommendations as to how it is to be addressed. If deemed necessary by the PAP committee the case will be re-investigated and depending on the nature of the issues referred to the district, regional and take some legal measures. This would ensure that recourse to the legal system as being the last resort. The PAP committee will be composed of people of different categories including elders and youth and will base on gender. Among the members who will be involved in the committee include representatives from the village council, few affected persons and some village members.

The mechanisms for grievance management and redress mechanisms are to be affordable and accessible and third parties independent of the implementers should be available at the appropriate point in the process. The grievance procedure will be simple, administered in the first instance at the local level to facilitate access, flexibility and open to various proofs taking into account the need for speedy, justice and fair resolution of their grievances. The process suggested for resolving the grievances is presented in Figure 12-67.

Grievance Redress Committees (or Land Dispute Committee) will be involved in redressing grievances arising from the PAPs in the project area. Village/Mtaa Grievance Redress Committee and District Grievance Redress Committee participate in resolution of grievances related to land acquisition, compensation and resettlement activities at the respective level.

TANESCO has opened various communication channels for any inquiry, complaint, concern and advice. For anybody willing to express their views or questions about the Project, they can communicate at all times through the following means:

- TANESCO Regional and District Office
- E-mail: info@tanESCO.co.tz
- Phone: +255-022-2451130/38, +255-022-2451148
- Postal Address: Umeme Park Building, Ubungo, Morogoro Road
- Hotline: <http://www.tanESCO.co.tz/index.php/customer-service/customer-complaints>



Source: JICA Study Team

Figure 12-67 Chart showing Grievance Redress Mechanism

12.2.6 Implementation Arrangements

For both (1) Mtwara Power Plant and (2) Mtwara-Somanga 400kV Transmission line and 400kV substations, the preparation and implementation of the resettlement strategies will require the participation of several institutions at different levels. Coordination of the participating institutions is a critical requirement to a successful resettlement program. It is always preferred to have this addressed early into the project cycle, so that all participating parties are made aware of each other's responsibilities, lines of reporting, communication channels, expectations and authority limits.

Key implementation activities with agencies primarily responsible and other agencies that are likely to be involved are presented in Table 12-85 below.

Table 12-85 Agencies with Primary Responsibility

No	Activity	Agency with primary responsibility	Other agencies involved, if any
1	Public Disclosure of DDR	TANESCO, Region administrations	JICA
2	Opening of Bank accounts for PAPs	TANESCO, Agency selected by TANESCO District Administrations	Local Banks
3	Training Programme	TANESCO	District Administrations
4	Preparation of entitlements/valuation document	Registered Valuer District Administrations	Chief Government Valuer, Dar-es-salaam, TANESCO
5	Village level meetings	District administration, village administration, TANESCO	
8	Payment of compensation	TANESCO	District Administrations Local leaders Banks
9	Handover of land for construction	TANESCO	District Administration
10	Provision of temporary works to local population	Civil works contractor, TANESCO	Village Administrations
11	Income Restoration activities	NGOs	TANESCO, District Administrations
12	Internal Monitoring	TANESCO	Regional Administrations, District Administrations
13	External Monitoring & Evaluation	Specialized agency	TANESCO, JICA
14	Dissemination of Project information	Communication Department of TANESCO	Regional and District Authorities
15	Redress of Grievances	Grievance committees at village, ward and district level, TANESCO	Regional and District Authorities

Source: JICA Study Team

12.2.7 Implementation Schedule

(1) Mtwara Power Plant

In terms of schedule for the RAP implementation, it is important that all land acquisition activities including payments for compensation are completed before line construction begins. This is to ensure that all possible barriers and hindrances to the project implementation are dealt with without interfering with the project implementation. However, some grievances may arise during the project implementation. Table 12-86 shows the proposed implementation schedule.

It should be noted that this schedule is based on utilizing the valuation report approved in December 2016 and April 2018 by the Chief of government valuer and not considered about conducting valuation process again. If the payments of compensation is not conducted within 6 months from the approval of the valuation, re-evaluation or payments with interest will be conducted. In case, TANESCO will consider about re-valuation, this schedule should be updated.

Table 12-86 Implementation Schedule (Mtwara Power Plant)

		2018				2019				2020				2021				2022																												
			10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12					
1	Phase: Preparatory activities (3 months)																																													
1.1	Household socio-economic survey																																													
1.2	Reviewing DDR by TANESCO and JICA																																													
1.3	Reflecting comments from TANESCO and JICA into DDR and submit it to JICA Advisory Committee																																													
1.4	Final DDR																																													
2	Phase: Compensation Approvals and Payment Phase (21 months)																																													
2.1	Approval on DDR in Tanzania																																													
2.2	Disclosure of the Final DDR on JICA website as well as in Tanzania																																													
2.3	Authorization of compensation schedules (seeking endorsement by relevant Authorities (DC, RC))																																													
2.4	TANESCO Internal Audit Verification																																													
2.5	Valuers to address Audit comments and submit the clean compensation																																													
2.6	Approval for payment by Management																																													
2.7	Preparation of Compensation Funds by TANESCO																																													
2.8	Opening of Bank accounts for PAPs																																													
2.9	Training Programmes: (capacity building of grievances committees, awareness on wise use of compensation money, entrepreneurship, improved productivity, etc.																																													
2.10	Payment of Compensation to all project affected persons and institutions																																													
2.11	Ready to hand over the land to the Contractor																																													
2.12	Grievance Resolutions and settlement of disputes																																													
3	Post Compensation and Livelihood Restoration Phase																																													
3.1	Hiring the implementing agency of Livelihood Restoration Programs																																													
3.2	Confirmation of Livelihood Restoration option by the implementing agency																																													
3.3	Stakeholders' (district) consultations																																													
3.4	Adjustment of Livelihood Restoration Programs after feedback from stakeholders																																													
3.5	Preparation of implementing Livelihood Restoration Programs																																													
3.6	Implementation of Livelihood Restoration Programs																																													
3.7	Assistance of vulnerable PAPs																																													
4	Supervision, Monitoring and Evaluation of RAP Implementation																																													
4.1	Internal Monitoring and supervision																																													
4.2	External monitoring and evaluation																																													
4.3	RAP Completion Audit																																													
Project Schedule																																														
	Contract process with Consultant																																													
	Contract process with Contractor																																													
	Construction																																													

Source: JICA Study Team

As of preparing the DDR, TANESCO has started the land acquisition process of the Kisiwa site for the proposed Project and future expansion of Mtwara GTCC No.2. The valuation has been conducted by the Mtwara District Council in October 2016 and the valuation report was submitted to TANESCO in February 2017. Then, the valuation for additional land has been conducted in February 2018 and the valuation report was submitted to TANESCO in June 2018. According to the PAPs interviewed in August 2018, the compensation for land and properties has not been paid yet.

Regarding the site for new access road from to the existing road to the Kisiwa site, part of land acquisition process was conducted separately from the Kisiwa site. It has been also evaluated its compensation cost as a part of land to be acquired by the TPA. The compensation for this area also has not been paid yet.

(2) Mtwara-Somanga 400kV Transmission line and 400kV substations

The envisaged RAP implementation activities include the following that are given a time frame in the implementation schedule:

- Confirmation of selected transmission line route option: The confirmation is important to check whether there is a need to change the route due to village expansions towards the proposed route during the basic design stage. This also encompasses the physical verification of the route.
- Stakeholders' consultations particularly the district councils on verification if there is any planned infrastructures under the proposed wayleave.
- Adjustment of the line routing after feedback from the field verification mission
- Preparations to undertake PAP census and asset valuation
- Demarcation of the transmission line route
- PAP identification and sensitization meetings with PAPs and setting up of village grievance committees
- Issuance of notice to potential PAPs over the land acquisition for the project
- Asset counting and valuation by the valuers of District Councils
- Household socio-economic survey by the Consultant
- Preparation of Draft Updated RAP Report by the Consultant
- Review of Updated RAP by JICA
- Preparation of Final Updated RAP by the Consultant

Table 12-87 shows the preliminary RAP implementation schedule.

Table 12-87 Preliminary RAP Implementation Schedule
(Mtwara-Somanga 400kV Transmission Line and 400kV Substations)

	2020												2021												2022												2023				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
1 Phase: Preparatory activities (8 months)																																									
1.1 Confirmation of temporary transmission line route by Basic Stakeholders' (district) Consultations																																									
1.2 Adjustment of the line routing after feedback from the field verification																																									
1.3 Demarcation of the line corridor (Way Leave)																																									
1.4 Preparations to undertake PAP census and asset valuation																																									
1.5 PAP identification and sensitization meetings with PAPs and setting up of village grievance committees																																									
1.6 Issuance of notice to potential PAPs over the land acquisition for the project																																									
1.7 Valuation (field survey and filling valuation form) by the valuers of District Councils																																									
1.8 Household socio-economic survey by the Consultant																																									
1.9 Preparing the Valuation Report by the valuers of District Councils																																									
1.10 Preparation of Draft Updated RAP Report by the Consultant																																									
1.11 Review of Draft Updated RAP by JICA																																									
1.12 Preparation of Final Updated RAP by the Consultant (with JICA comments addressed)																																									
2 Phase: Compensation Approvals and Payment Phase (14 months)																																									
2.1 Approvals of Valuation Report and the Final Updated RAP (Seeking the approval of Compensation schedules by Chief Government Valuer)																																									
2.2 Disclosure of the Final Updated RAP report including the entitlements to Stakeholders																																									
2.3 Authorization of compensation schedules (seeking endorsement by relevant Authorities (DC, RC))																																									
2.4 TANESCO Internal Audit Verification																																									
2.5 Valuers to address Audit comments and submit the clean compensation schedule																																									
2.6 Approval for payment by Management																																									
2.7 Preparation of Compensation Funds by TANESCO																																									
2.8 Opening of Bank accounts for PAPs																																									
2.9 Training Programmes: (capacity building of grievances committees, awareness on wise use of compensation money, entrepreneurship, improved productivity, etc.)																																									
2.10 Payment of Compensation to all project affected persons and institutions																																									
2.11 Hand over the land to the Contractor																																									
2.12 Grievance Resolutions and settlement of disputes																																									
3 Post Compensation and Livelihood Restoration Phase																																									
3.1 Hiring the implementing agency of Livelihood Restoration Programs																																									
3.2 Confirmation of Livelihood Restoration option by the implementing agency																																									
3.3 Stakeholders' (district) consultations																																									
3.4 Adjustment of Livelihood Restoration Programs after feedback from stakeholders																																									
3.5 Preparation of implementing Livelihood Restoration Programs																																									
3.6 Implementation of Livelihood Restoration Programs																																									
3.7 Assistance of vulnerable PAPs																																									
4 Supervision, Monitoring and Evaluation of RAP Implementation																																									
4.1 Internal Monitoring and supervision																																									
4.2 External monitoring and evaluation																																									
4.3 RAP Completion Audit																																									
Project Schedule																																									
Contract process for Consultant																																									
Contract process for Contractor																																									
Basic Design by Consultant																																									
Construction																																									
Foundation																																									
Erection																																									

Source: JICA Study Team

12.2.8 Cost and Budget

(1) Mtwara Power Plant

The project has to make the necessary budget provisions to ensure that the mitigation commitments, including compensation and the monitoring programs can be fully implemented. Full compensation will be paid for assets lost. The budget describes the estimated cost for the resettlement activities aspects: operations, compensation, resettlement, and monitoring. Indicative cost are presented in Table 12-88.

Although the valuation reports have been prepared for the Project, other implementation activities such as administration, monitoring, income restoration program, training etc, which should be in line with the requirement of JICA Guidelines and World Bank safeguard policy, will require additional budget.

It should be noted that this indicative cost estimation was prepared based on the best information available at the time of preparation of the DDR. As for compensation cost, the valuation reports (October 2017 and February 2018) were used as a reference for compensation on land, crops/trees and allowances. Compensation on structures were also referred the valuation reports, but figures without deduction of depreciation were used to pay compensation at the full replacement cost.

TANESCO will provide financing for those activities. The funds will be transferred to PIT which will pay compensation directly to the affected parties according to the government law.

Table 12-88 Indicative Costs (Mtwara Power Plant)

S/n	Components	Unit	Quantity	Unit Price	Costs- TShs
1	Structures (Full replacement cost)				
1.1	Buildings	PAPs	12		78,871,372.00
				Total 1	78,871,372.00
2	Land value for agriculture				
2.1	Kisiwa village	ha	124.0		2,144,673,640.00
2.2	Namgogoli village	ha	35.8		619,780,000.00
				Total 2	2,764,453,640.00
3	Trees and Crops				
3.1	Kisiwa village	No	6,386		497,516,727.05
3.2	Namgogoli village	No	1,382		83,819,342.35
				Total 3	557,781,755.00
4	Allowances				
4.1	Disturbance allowances				
	Kisiwa village				215,808,431.95
	Namgogoli village				56,287,947.39
4.2	Transport Allowances				
	Kisiwa village				570,000.00
4.3	Accommodation allowances				
	Kisiwa village				9,828,000.00
				Total 4	282,494,379.34
5	Relocation of graves				
5.1	Costs for relocation of graves payable to Mtwara District Council				

S/n	Components	Unit	Quantity	Unit Price	Costs- TShs
	Mtwara village	No.	50	500,000.00	25,000,000.00
	Namgogoli village	No.	2	500,000.00	1,000,000.00
5.2	Allowances to deceased relatives to cover the costs re-burial ceremonies	No.	5	4,500,000.00	22,500,000.00
	Mtwara village	No	50	300,000.00	15,000,000.00
	Namgogoli village	No	2	300,000.00	600,000.00
Total 5					64,100,000.00
Sub - Total (1+2+3+4+5)					3,747,701,146.34
6	Other Activities				
6.1	RAP Implementation and Administration	%	10	sub-total	374,770,114.63
6.2	Monitoring and Evaluation Internal	%	3	sub-total	112,431,034.39
6.3	Monitoring and Evaluation External	%	5	sub-total	187,385,057.32
6.4	Grievance Resolution Committees facilitation and GRM capacity building	%	5	sub-total	187,385,057.32
6.5	Training and Facilitation District Councils extension workers and community Development Officers	%	3	sub-total	112,431,034.39
6.6	Livelihood Restoration Program for PAPs, vulnerables, Fishing communities, Women marine culture group (JIKOMBOE) including mobilization of Agency for Livelihood Restoration Program	%	15	sub-total	562,155,171.95
6.7	Contingency RAP costs	%	10	sub-total	374,770,114.63
Sub - Total (Other Activities)					1,911,327,584.63
GRAND TOTAL					5,659,028,730.97

Source: Mtwara Power Plant Valuation Report (October 2016), Mtwara Power Plant Valuation Report (February 2018), and cost for other activities were estimated by the consultant.

(2) Mtwara-Somanga 400kV Transmission line and 400kV substations

Since the proposed power transmission project will be government owned and managed, land acquisition will be considered as being acquired in the public interest. That being the case all costs associated with the resettlement program will be borne by the government through the Ministry of Energy. TANESCO will, on behalf of the ministry, manage both the financial input as well as the additional managerial and technical expertise required to complete the transmission line or outsource services as required.

At this stage, it is not possible to have exact number of people who may be affected since the technical designs/details have not yet been finalized and identification of real PAPs have not done. The number of PAPs and structures provided in the RPF are based on the assessment which was done during the Environmental Impact Assessment. When these locations are known, and after the conclusion of the site specific, socioeconomic study, information on specific impacts, individual and household incomes and numbers of affected people and other demographic data would be available, thus facilitating the preparation of a detailed and accurate budget for resettlement and compensation.

At this stage, therefore, all that can be reasonably and meaningfully prepared is an indicative budget, highlighting key features that the budget must contain. The summary estimate of compensation costs for the proposed construction of the new transmission line is shown in Table 12-89. This budget is indicative and will be adjusted as needed during implementation and in accordance with the results of the surveys and socioeconomic studies that will be conducted during the preparation of RAP.

Table 12-89 Indicative Costs (Mtwara-Somanga 400kV Transmission Line and 400kV Substations)

S/n	Components	Unit	Quantity	Unit Price	Costs- TShs
1	Structures (Full replacement cost)				
1.1	Mtwara Rural	No	8	-	200,000,000.00
1.2	Lindi Rural	No	10	-	200,000,000.00
1.3	Lindi Urban	No	17	-	510,000,000.00
1.4	Kilwa	No	27	-	540,000,000.00
Total 1			62		1,450,000,000.00
2	Land value for agriculture				
2.1	Mtwara Rural	acreage	1,184,905.80		175,680,000
2.2	Lindi Rural and Urban	acreage	5,620,535.44		694,350,000
2.3	Kilwa	acreage	1,747.30		873,630,000
Total 2			6,807,188.54		1,743,660,000.00
3	Trees and Crops				
3.1	Cashew nuts	No	850	170,000.00	144,500,000.00
3.2	Coconuts	No	1,075	240,000.00	258,000,000.00
3.3	Timber trees	No	488	100,000.00	48,800,000.00
3.4	Shade trees	No	448	20,000.00	8,960,000.00
3.5	Fruit trees (Mango, Orange and others)	No	1,632	160,000.00	261,120,000.00
Total 3			4,493		721,380,000.00
4	Allowances				
4.1	Disturbance allowances (8% of Compensation on Structures/Land/Trees and Crops)				313,203,200.00
4.2	Transport Allowances	PAPs	62	70,000.00	4,340,000.00
4.3	Accommodation allowances (Rent/per month×36 Months)	PAPs	62	1,080,000.00	66,960,000.00
Total 4					384,503,200.00
5	Relocation of graves				
5.1	Costs for relocation of graves payable to Mtwara District Council	No.	350	500,000.00	175,000,000.00
5.2	Allowances to deceased relatives to cover the costs re-burial ceremonies	No.	350	300,000.00	105,000,000.00
Total 5					280,000,000.00
Sub - Total (1+2+3+4+5)					4,579,543,200.00
6	Other Activities				
	RAP Implementation and Administration	%	10	sub-total	457,954,320.00
	Monitoring and Evaluation Internal	%	3	sub-total	137,386,296.00
	Monitoring and Evaluation External	%	5	sub-total	228,977,160.00
	Grievance Resolution Committees facilitation and GRM capacity building	%	5	sub-total	228,977,160.00
	Training and Facilitation District Councils extension workers and community Development Officers	%	3	sub-total	137,386,296.00
	Livelihood Restoration Program for PAPs and vulnerables including mobilization of Agency for Livelihood Restoration Program	%	15	sub-total	686,931,480.00
	Contingency RAP costs	%	10	sub-total	457,954,320.00
Sub - Total (Other Activities)					2,335,567,032.00
GRAND TOTAL					6,915,110,232.00

- Note: i. The values of structure were estimated based on the discussion with district officials on costs of construction in their respective district.
- ii. The values of crops/trees were determined based on list of crops with their prices which was prepared by the Ministry of agriculture in 2012. The ministry have recently updated the price of crops which might be used in the valuation, therefore, costs of crops will also change
- iii. Since the cut-off date when the official valuation process begins, this budget estimation does not include compensation for encroachers.

Source: JICA Study Team

12.2.9 Monitoring Plan for Land Acquisition and Resettlement

(1) Monitoring Responsibility

The project (both Mtwara Power Plant and Mtwara-Somanga 400kV Transmission line and 400kV substations) will adopt three components for the monitoring framework that include:

- Internal monitoring by the Project Resettlement Office ;
- External monitoring by a contracted consulting firm or NGO; and
- RAP Completion Audit by a contracted consulting firm or NGO.

The scope of each of type of monitoring component and monitoring responsibilities are briefly described below.

Table 12-90 Scope of Each Monitoring Component

Component	Action	Responsibility	Frequency
Internal Monitoring	Site visits during resettlement implementation	TANESCO	Monthly
	Follow up with local leaders/ villagers/PAPs	TANESCO	Quarterly
	Reporting to JICA during RAP implementation (including reports of External Monitoring and RAP Completion Audit)	TANESCO	Quarterly
	Completion Report of land acquisition	TANESCO	On completion
External Monitoring	Implementation Audit Site visit	External Monitoring Agency (EMA)	Annually
	Implementation Annual Reports	EMA	Annually
Completion Audit	Completion Audit Report to JICA	EMA	On completion

Source: JICA Study Team

Table 12-91 Monitoring Responsibilities

ACTORS	RESPONSIBILITY
Project Implementation Unit (PIU)	Lead the internal monitoring, day to day and periodic activities, Submit reports to JICA including the External Monitoring Report and Completion Audit Report
Policy Planning and M&E Directorate of Ministry of Energy	Lead agency and coordinating institution for both internal and external monitoring of the implementation of this RAP. Periodic monitoring of the planed implementation and its impact.
TANESCO	Regular monitoring to ensure that the approved assessed value for compensation are paid
TANESCO Regional Offices	Periodic monitoring of the planed implementation and its impact
TANESCO District Offices	Periodic monitoring of the planed implementation and its impact
Consultant	Support PIU on internal monitoring and manage EMA for external monitoring as well as Completion Audit.
External Monitoring Agency (Consultant(s) or NGOs)	Periodic monitoring, evaluation and auditing of the implementation of land acquisition activities

Source: JICA Study Team

(2) Internal Monitoring

The objective of internal monitoring is to monitor the implementation of the entire land acquisition process for the Project mainly focusing on the progress of land acquisition procedures. The indicators to be monitored using the Monitoring Form (Appendix 4 of DDR and RPF) shall include:

- Progress of implementation schedule;
- The project impact and progress of compensation payment and resettlement;
- Timely rehabilitation of any affected infrastructure and assets;
- Details of consultative meetings and number of affected persons consulted during the planning or implementation stage;
- Details of Grievance Redress; and
- Progress of Income Restoration Program including number of affected people (men and women) employed in the project construction.

TANESCO will fill up the Monitoring Form (Appendix 4 of DDR and RPF) and submit it to JICA quarterly as an attachment of the Project Status Report.

(3) External Monitoring

In order to ensure the proper implementation of resettlement, an External Monitoring Agency (consulting firm or NGO) (EMA) will be recruited by the Project to conduct annual independent impact monitoring of the land acquisition, resettlement and rehabilitation activities of the Project. The items to be evaluated will include the comparison of the baseline data in the planning phases with the targets and post project situation. The indicators to be monitored shall include:

- Progress and implementation of actions recommended by this DDR;
- Reviewing and verifying the progress in land acquisition/resettlement implementation of the Project;
- Evaluating and assessing the adequacy of compensation given to the PAPs and the livelihood opportunities and incomes as well as the quality of life of PAPs of project-induced changes within 4 months after the compensation payment;
- Identification of the categories of impacts and evaluation of the quality and timeliness of delivering entitlements (compensation and rehabilitation measures) for each category and how the entitlements were used and their impacts and adequacy to meet the specified objectives of the Plans. The quality and timeliness of delivering entitlements, and the sufficiency of entitlements as per approved entitlement matrix;
- Providing a summary of whether involuntary resettlement was implemented (a) in accordance with the action recommended by the DDR, and (b) in accordance with JICA Guidelines for Environmental and Social Considerations;
- Analyzing the pre-and post-project socio-economic conditions of the affected people;
- Reviewing results of internal monitoring and verify claims through sampling check at the field level to assess whether land acquisition/resettlement objectives have been generally met.
- The total nature and level of all complaints received;
- Observing the functioning of the resettlement operation at all levels, to assess its effectiveness and compliance with the DDR.

(4) Completion Report of land acquisition

TANESCO will prepare a completion report after completing land acquisition to submit to JICA. The objective of completion report of land acquisition is to monitor the implementation of the

entire land acquisition result for the Project mainly focusing on quantitative data of land acquisition. The preliminary indicators to be included to the completion report are shown on Table 12-92.

Table 12-92 Preliminary Performance/Evaluation Indicators for Completion Report

Subject	Indicator	Variables
Land	Acquisition of land	<ul style="list-style-type: none"> Area of cultivation land acquired for the project site and number of households affected. Area of communal/government/private land acquired for project site
Buildings/ Structures	Acquisition of buildings	<ul style="list-style-type: none"> Number, type and size of private buildings acquired and number of households affected. Number, type and size of community buildings acquired Number, type and size of government buildings acquired
	Acquisition of other structures	<ul style="list-style-type: none"> Number, type and size of other private structures acquired and number of households affected. Number, type and size of other community structures acquired
Trees and Crops	Acquisition of trees	<ul style="list-style-type: none"> Number and type of private trees acquired and number of households affected.
	Destruction of crops	<ul style="list-style-type: none"> Crops destroyed by area, type, ownership and number of households affected.
Livelihood Restoration Program	Livelihood Restoration of affected households	<ul style="list-style-type: none"> Number of households received Livelihood Restoration Program by type of assistances
	Other Livelihood Restoration Activities	<ul style="list-style-type: none"> Details of Other Livelihood Restoration Activities and its effect.
Consultation	Consultation programme operation	<ul style="list-style-type: none"> Number of local committees established Number and dates of local committee meetings Type of issues raised at local committees meetings Involvement of local committees and NGOs in participating in the project's planning and development
	Information dissemination	<ul style="list-style-type: none"> Number, position, staffing of Information Centres Staffing, equipment, documentation of Information Centres Activities of Information Centres Number of people accessing Information Centres Information requests, issues raised at Information Centres
	Grievances resolved	<ul style="list-style-type: none"> Number of grievances registered, by type Number of grievances resolved Number of cases referred to court
Training	Operation of training programme	<ul style="list-style-type: none"> Number of local committee members trained Number of affected population trained in Project-related training courses
Management	Staffing	<ul style="list-style-type: none"> Number of implementing agencies by function Number of RSS ministry officials available by function Number of office and field equipment, by type
	Procedures in operation	<ul style="list-style-type: none"> Census and asset verification/ quantification procedures in place Effectiveness of compensation delivery system Number of land transfers effected Co-ordination between local community structures, NGOs and RSS officials

Source: JICA Study Team

(5) Completion Audit

The purpose of the completion audit is to establish whether TANESCO and Ministry of Energy have implemented all the activities needed to ensure compliance with resettlement commitments recommended by the DDR and applicable policies, and whether compensation and resettlement

has been deemed complete. The completion audit will be carried out by the same auditor as the external monitoring. Based on data collected during this review and other data collected during implementation, the auditor will form conclusions on the following main issues:

- The objectives of the JICA Guidelines been achieved or not;
- The actions recommended by the DDR were conducted or not;
- Timely delivery of entitlements were provided or not;
- The adequacy of compensation in mitigating experienced impacts were provided or not; and
- Livelihoods restoration of PAPs were archived or not.

The preliminary indicators to be included to the completion audit report are shown on Table 12-93.

Table 12-93 Preliminary Performance/Evaluation Indicators for Completion Audit

Subject	Indicator	Variables
Livelihood Restoration Program	Livelihood Restoration Activities	• Effect of Livelihood Restoration Program
Consultation	Consultative meeting/ Information dissemination	• Adequacy of consultative meetings and information dissemination
Grievance Redress	Grievances Redress Mechanism	• Adequacy of grievance redress mechanism
Vulnerable Groups	Changes on status of vulnerable groups	• Status of Vulnerable households and populations
	Changes to status of women	• Participation in Livelihood Restoration Program
Economic Activities	Household earning capacity	• Change on primary Occupation • Change on Source and Average monthly income • Realization of household income restoration programs (components implemented, net income achieved)
Accessibility and Availability of Social Services	Changes to access	• Distance/travel time to drinking water, energy, market, school, health services

Source: JICA Study Team

12.2.10 Stakeholder Consultations

(1) Result of stakeholder consultations

Result of stakeholder consultations are shown in ‘Stakeholder Engagement’ in Section 12.1.1.

(2) Need for continuous consultations and future community engagement

It is expected that more consultations with affected persons regarding relocation and other future impacts during construction be carried out throughout the implementation of the project.

The PAPs raised a lot of issues and some go beyond corridor acquisition especially when future impacts are as a result of contractors’ activities that were not captured in the RPF. In summary, the PAPs are desperately in need of reasonable compensation to find alternative sources of livelihoods. The PAPs want to be sensitized on the way their entitlements were arrived at and given time to consult or get a second opinion on such matters. RAP implementation also requires several stages of stakeholder consultations to ensure all PAPs concerns are addressed in a transparent manner. It is therefore recommended that TANESCO develops a stakeholder / communication engagement plan that will ensure that all PAPs are effectively reached. Similarly, the plan should also ensure that all PAPs reach TANESCO Regional offices whenever and where ever. The starting point to ensuring a transparent process is for TANESCO to identify a RAP focal person or a representative

at the Village/Mtaa offices in the project area preferably in each affected Villages/Mtaas and or as agreed upon by the PAPs. It is through such offices that the grievance redress committee can submit their complaints for further action by TANESCO. All future communications can then be discussed with the PAPs or PAPs representatives and a communication plan distributed to all PAPs through their leaders and or media (especially local radio stations).

CHAPTER 13

INFRASTRUCTURES ASSOCIATED WITH MTWARA GTCC POWER PLANT

CHAPTER 13 INFRASTRUCTURES ASSOCIATED WITH MTWARA GTCC POWER PLANT

13.1 BACKGROUNDS OF THE STUDY

At first, three (3) infrastructures (access road including the collector road upgrading, installation of a new gas pipeline and installation of a new water pipeline) for the Mtwara GTCC Power Plant funded by JICA were planned to be constructed by the fund from GoT. However, in the course of the preparatory survey after the submission of DFR to MOE and TANESCO in September 2018, TANESCO requested JICA to incorporate 3-Infrastructures into the Project scope.

In November 2018, JICA agreed to carry out additional study and dispatch a JICA Study Team to investigate the site conditions and discuss with relevant authorities.

TANESCO issued the site survey results and the pertinent ESIA/RAP reports for 3-Infrastructures (an access road including a collector road upgrading, installations of a gas pipeline and a water pipeline) in November 2018.

Based on the foregoing information by TANESCO, JICA Study Team carried out the site investigation together with TANESCO, TPDC, TARURA and MTUWASA in December 2018. However, in February 2019, TANESCO informed JICA that TPDC failed to get the agreement from Dangote, because a part of the planned gas pipeline from the Block Valve Station (BVS) No.1 up to the Kisiwa site passed through the future quarry site of Dangote. TANESCO also informed that TPDC intended to find a new gas pipeline route in a short period of time.

However, it took a long time to determine the new gas pipeline route. TPDC could finally determine the new gas pipeline route with only a small part of the gas pipeline going through Dangote and TANROADS land; and the land use agreement for the same was signed in September 2019.

Upon receiving the information about the land use agreement, JICA Study Team visited Tanzania and discussed with TANESCO and TPDC about the new gas pipeline route. TANESCO and JICA Study Team agreed on it and signed the minutes in September 2019.

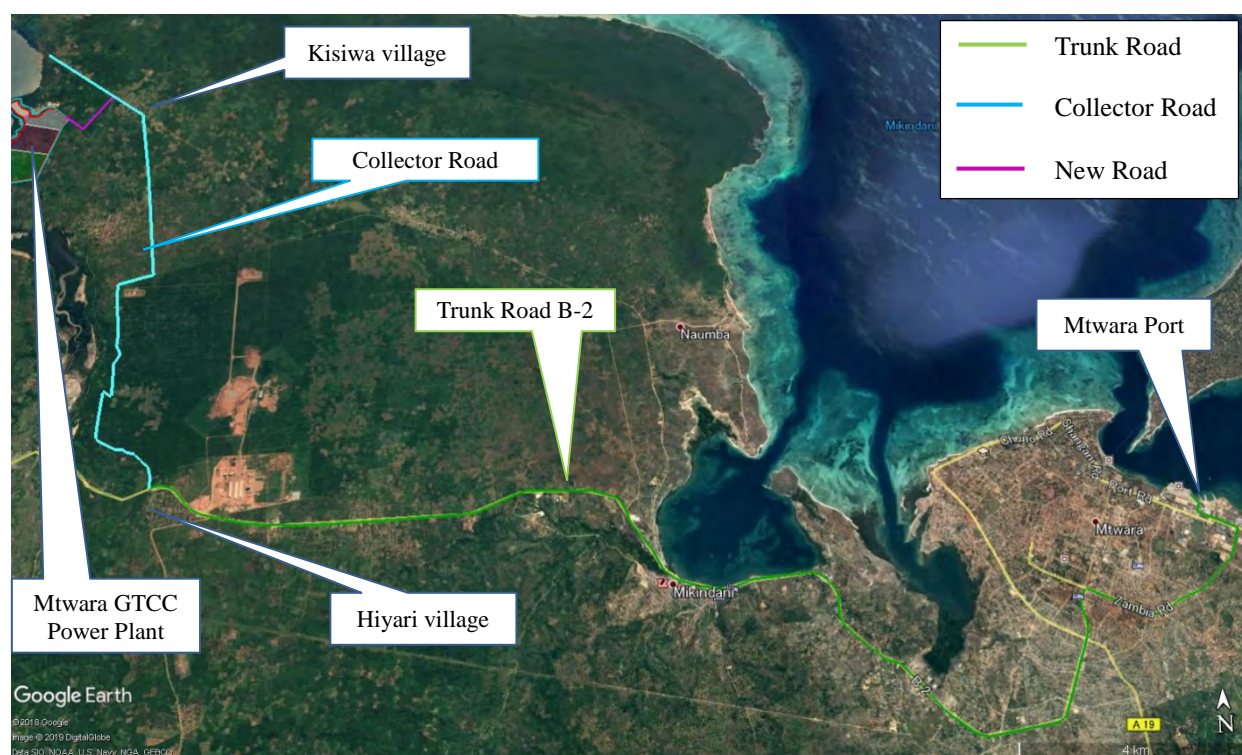
Based on the site investigation results and discussion results including the agreed new gas pipeline route, JICA Study Team designed 3-infrastructures and estimated the necessary work period and cost. The study results are integrated into FR as Chapter 13.

13.2 ACCESS ROAD INCLUDING THE COLLECTOR ROAD UPGRADING

13.2.1 Access Road Route from Mtwara Port

According to the Section 3.3 Heavy Cargo Transportation Route Survey, it is necessary to transport some of the equipment and material from the Mtwara port to the site of Mtwara GTCC Power Plant by land route. Most of the route is managed by TANROADS and TARURA. The limited road section, which is marked in red near the Mtwara GTCC Power Plant (Kisiwa site), should be constructed newly as shown in Figure 13-1. The Trunk Road that is administrated by TANROADS is paved with a roadway width of nine (9) meters approximately and it is named as B-2. The other section from the intersection near Hiyari village to Kisiwa village that is administrated by TARURA is unpaved with a road width 5 - 6 meters and it is categorized as collector road. There are a few narrow trails from Kisiwa village to the final destination (the Kisiwa site) and the length of the route is 1,500 meters approximately.

Most of the route on the Trunk Road B-2 can be used as access road without upgrading and/or repairing. Therefore, the Study focuses on the Collector Road from Hiyari intersection to Kisiwa village, and the new road which has to be constructed between Kisiwa village and the final destination.



Source: JICA Study Team

Figure 13-1 Access Road Route from Mtwara Port to Mtwara GTCC Power Plant

13.2.2 Current Condition of the Access Road

(1) Targeted Route

Figure 13-2 Access Road Route (Existing) shows the entire route of access road from Hiyari intersection, near Dangote Cement Factory up to the Kisiwa site. Plantations of cashew nut and shrub zone are present along the route. There is no existing road from the place near Kisiwa village to the Kisiwa site. Several points have to be improved and/or considered throughout the route.

The existing road goes through the communities of Hiyari, Namgogoli, Mbuo, Kisiwa and Mgao and is administrated by TARURA. The road is in a good condition during dry season, but during the rainy season it is difficult for vehicles to pass due to the mud caused by the nature of the soil, which makes it slippery. The road needs to be designed and widened, since there are tight curves and culvert structures along the route, in order to allow the passage of long and heavy trucks to the proposed Kisiwa site.



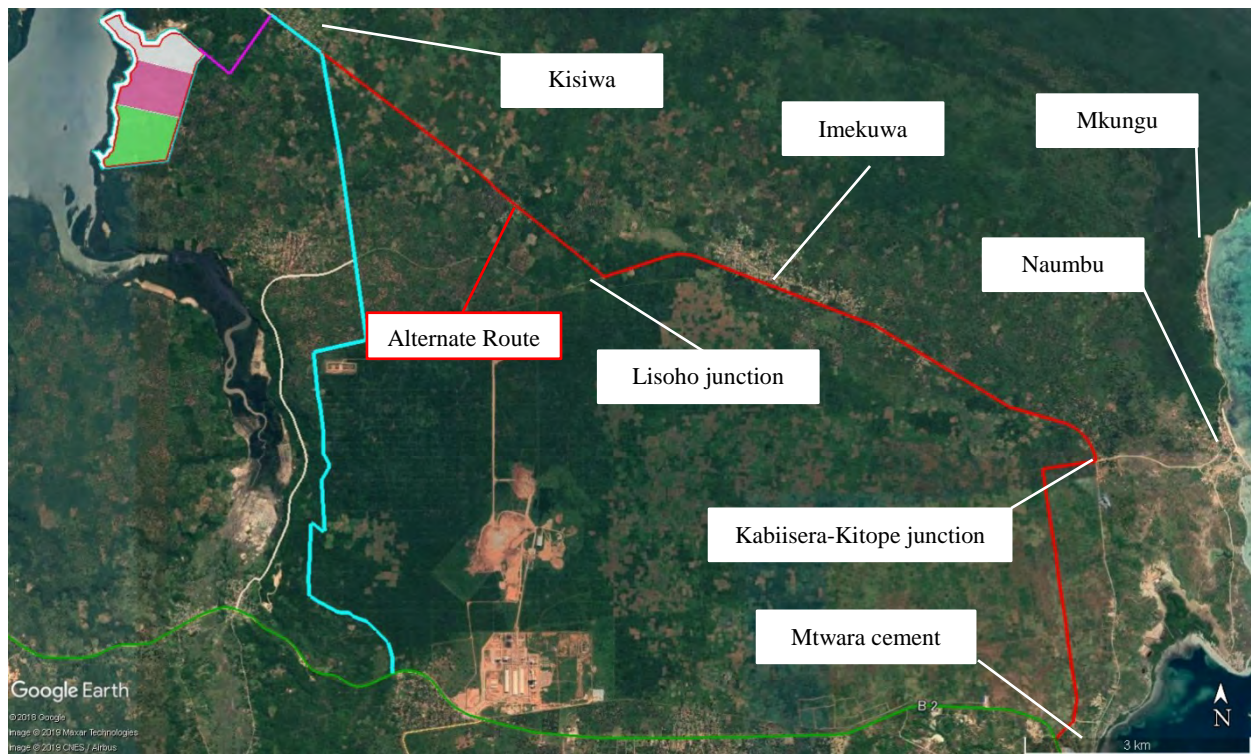
Source: JICA Study Team

Figure 13-2 Access Road Route (Existing)

(2) Alternate route

Alternate access road route is as follows; Road is diverged from the junction near Mtwara cement at the B-2 Trunk Road and goes to the Kisiwa site via Kamisera-Kitope junction, Imekuwa, Lisoho junction to Kisiwa village with about 19 km . This route is administrated by TARURA and a community road for not only above-mentioned villages but also Naumbu and Mkungu. If this road upgraded will serve many people as it crosses to many villages, hence many settlements will be affected and increases project costs due to compensation issues.

Therefore, access road route from Hiyari to Kisiwa has economic and environmental advantage comparison of the latter alternate.

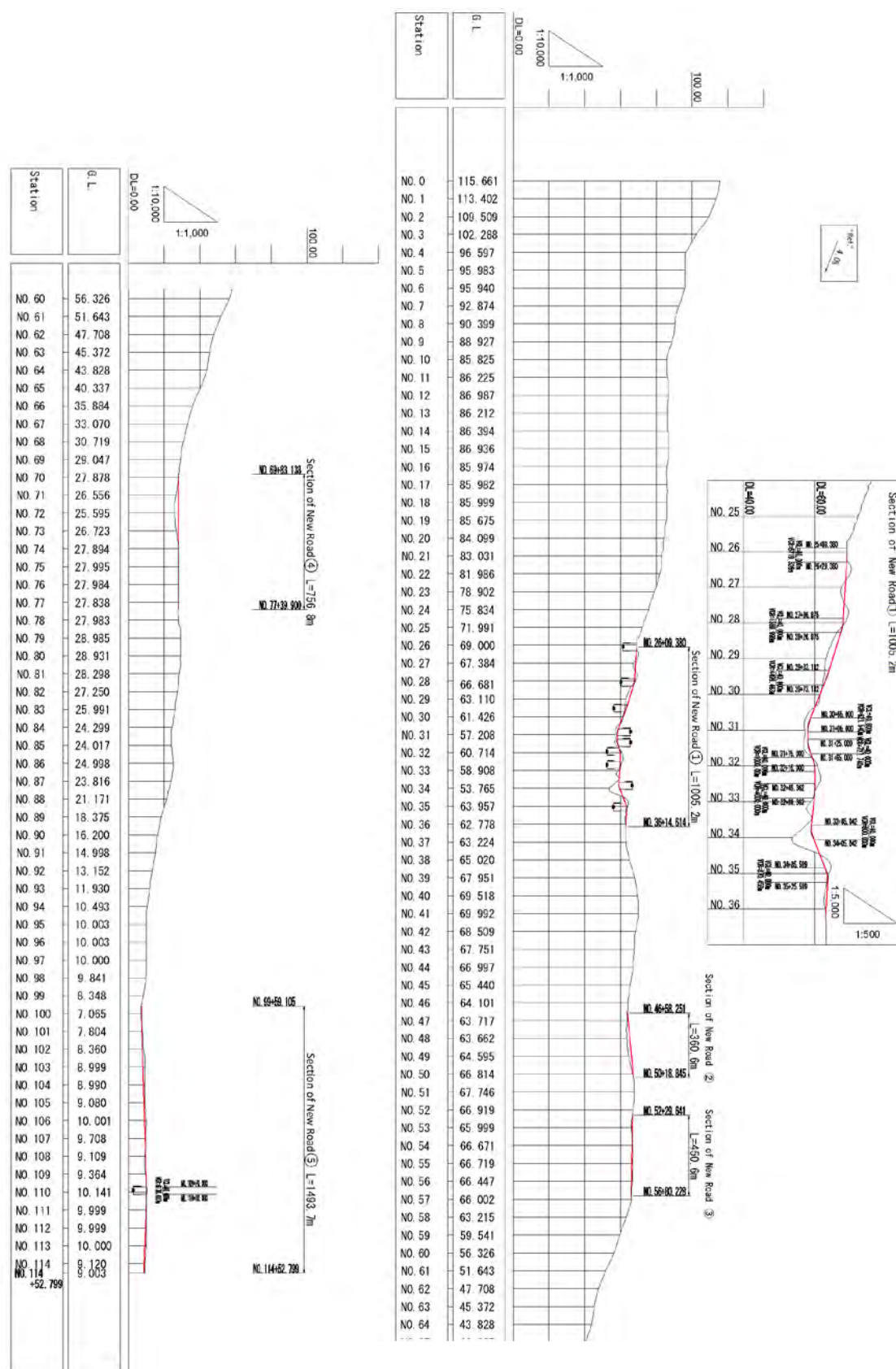


Source: JICA Study Team

*Figure 13-3 Alternate route of Access Road***(3) Road vertical alignment**

The vertical alignment of the existing road comprises a downward slope, starting at Hiyari Intersection up to the Kisiwa site, in general, as shown in Figure 13-4. It becomes flat with small undulations in sections: from 1.0km to 2.3km, from 3.5km to 5.8km, from 7.0km to 8.8km, and from 10.0km to the final destination of 11.4km.

The gradient reaches a maximum of 4.8% near the first section, from the Hiyari Intersection to a 0.4km point.



Source: JICA Study Team

Figure 13-4 Vertical Alignment of the Existing Road

(3) Cross section of the Existing Road

Typical cross section of the existing road is shown in Figure 13-5 and Figure 13-6. Current carriageway is 5-6 meters and the Right of Way (ROW) is secured for 15 meters (7.5 meters from the center line of the road) by TARURA. Road surface is unpaved and an unlined drainage side ditch is installed.

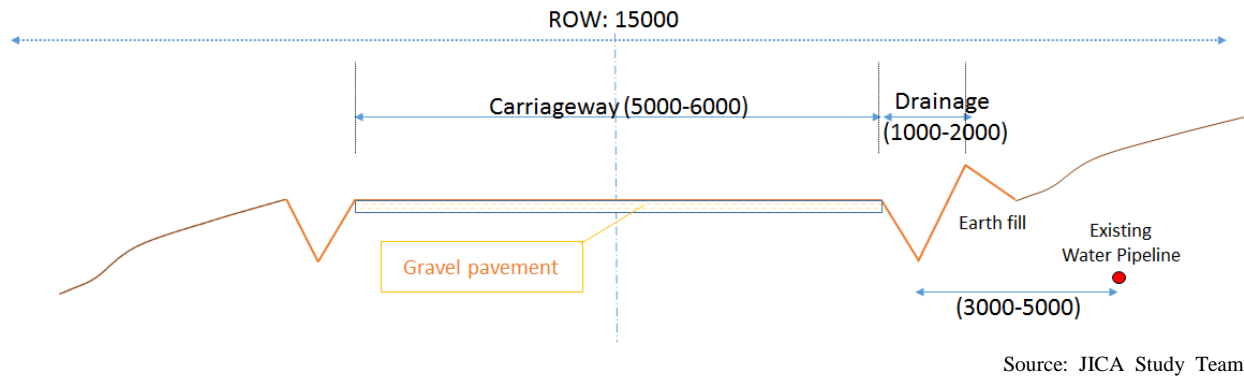


Figure 13-5 Cross-section of Existing Road

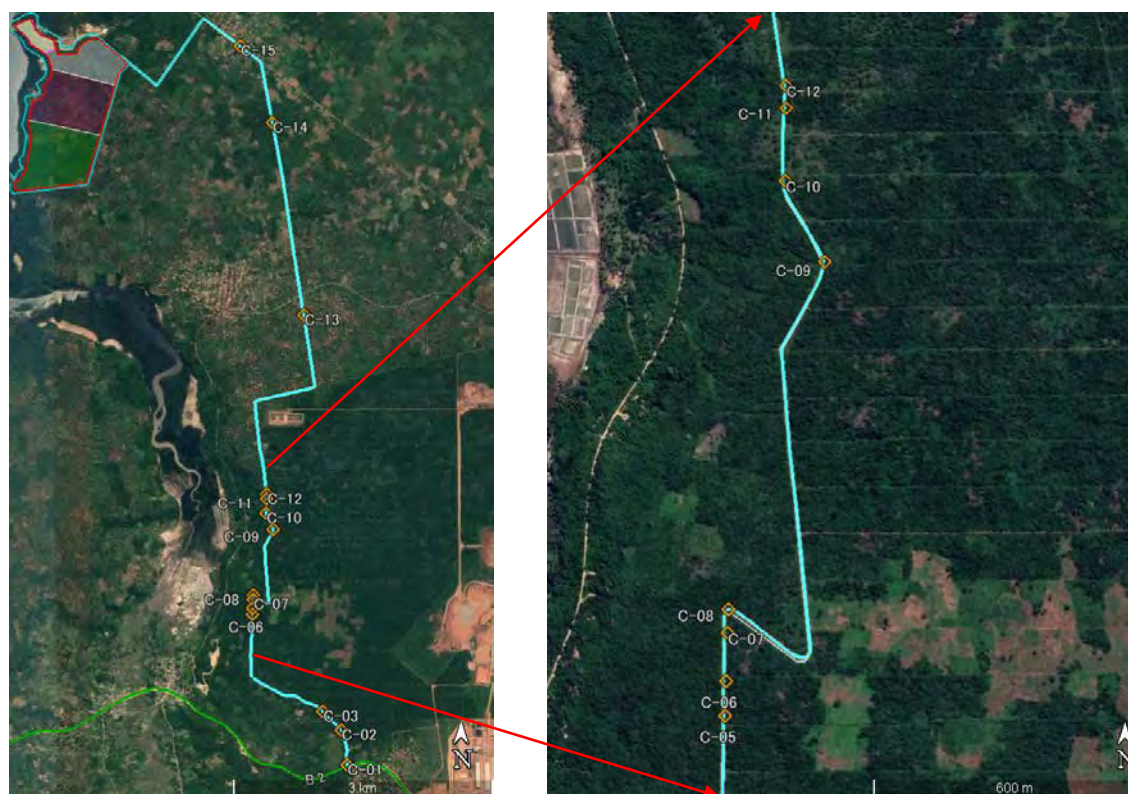


Source: JICA Study Team

Figure 13-6 Condition of Existing Road

(4) Road Structures

There are no bridges and tunnels along the targeted section of the road, however there are several small culverts to drain rain water. There are 16 culverts along the targeted section. Location of culverts is shown in Figure 13-7, the list is shown in Table 13-1 and pictures of the current status are shown in Figure 13-8, Figure 13-9, Figure 13-10 and Figure 13-11. Some of culverts are well maintained and kept in good condition, but others are damaged and have deposits caused by sedimentation. Inventory of road structure is shown in Table 13-1.



Source: JICA Study Team

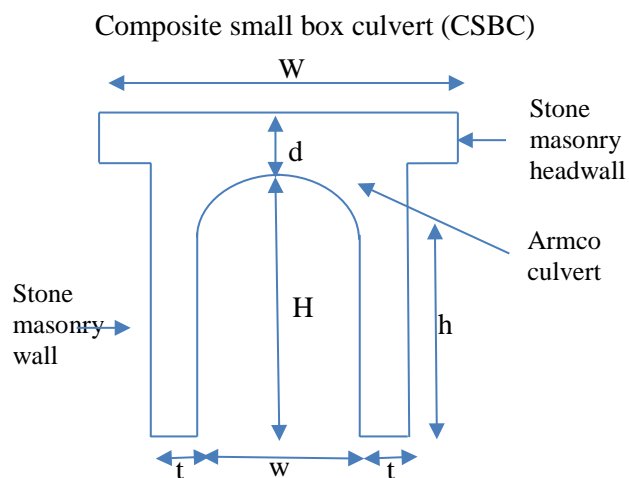
Figure 13-7 Location of Culverts

Table 13-1 Road Inventory Sheet

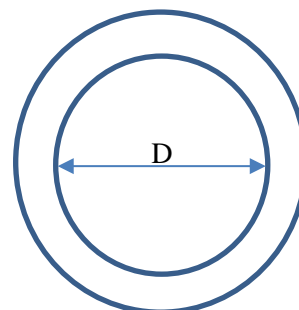
S.No.	Chainage (km)	TYPE	Unit (m)					Remarks
			D	L	w	H	W	
C-1	0.00	CSBC	-	8.1	0.7	1.1	1.34	Broken left hand side headwall
C-2	0.41	CSBC	-	6.8	0.65	1.1	1.27	Cracked right hand side wing wall
C-3	0.68	CSBC	-	5.4	0.7	0.7	1.17	Skewed and silted 100%, headwalls cracked on both sides
C-4	1.49	CSBC	-	5.05	-	-	1.30	Broken right hand side headwall
C-5	2.06	CP	0.88	8.55	-	-	1.40	Good condition, skewed
C-6	2.12	CP	0.9	6.0	-	-	1.40	Skewed, cast in situ
C-7	2.21	CP	0.9	6.4	-	-	1.0	Silted 50%, cast in situ
C-8	2.25	CSBC	0.9	7.3	-	-	-	Silted 100%, no headwalls Start of diversion to left hand side
C-9	2.87	CSBC/CP	0.9	5.7	0.57	0.6	1.0	CSBC(1.3m) connected to CP (4.4m)
C-10	3.07	CP	0.45	7.0	-	-	-	Buried headwalls, Good condition
C-11	3.24	CP	0.9	6.0	-	-	1.2	Good condition
C-12	3.29	CP	0.9	6.1	-	-	-	Broken headwalls
C-13	5.28	CP	0.9	6.0	-	-	1.1	Silted 70%
C-14	7.57	CP	0.9	6.0	-	-	1.77	Stone masonry headwalls
C-15	8.51	CP	0.9	6.1	-	-	1.45	Damaged right hand side headwall, no left hand side headwall, lined ditch on the right hand side

Source: JICA Study Team

Legends:



Cast in situ Concrete pipe culvert (CPC)



- D : Diameter of the pipe culvert
 L : Length of the culvert i.e. across the road width
 w : Internal width between the stone masonry walls
 H : Clear height of the culvert
 W : Length of the headwall



Figure 13-8 Condition of Culvert (C-3)



Figure 13-9 Condition of Culvert (C-7)



Figure 13-10 Condition of Culvert (C-9)



Figure 13-11 Condition of Culvert (C-11)

Source: JICA Study Team

(5) Traffic Condition

According to the result of TARURA Mtwara District Traffic Survey that was conducted in 2017, traffic volume at the targeted section of the collector road is 118 vehicles per day ADT (Average Daily Traffic) and the traffic volume increases during the harvesting season of cashew nuts, from September to January. Although site survey of the access road was conducted in December 2018, the harvest time was over and the amount of traffic was very limited. There is a small volume of pedestrian, motorcycle and bicycle traffic around the neighborhood of Namgogoli and Kisiwa village.



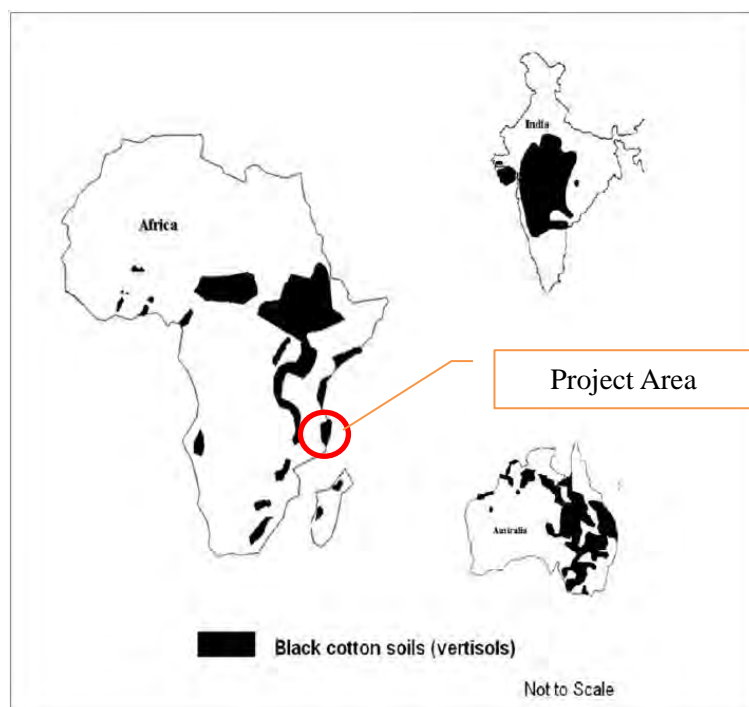
Source: JICA Study Team

Figure 13-12 Current Condition of Road Traffic (December, 2018)

(6) Soil Condition

Soils which can cause foundation problems and decrease the performance of the roads should be taken into account. These soils are collectively called problem soils and comprise among others; expansive; collapsible and compressible; and dispersive soils. The preliminary identification of such soils is crucial during the site investigation, therefore, appropriate additional investigations should be included during the detailed design stage.

Most of the access road routes follow the existing road alignment in the project, therefore the soil condition along the existing road seems to be suitable. However, Tanzania is known for the presence of expansive clays that is known by the name of black cotton soil as shown in Figure 13-13 that is characterized by high shrinkage and swelling properties. The black cotton soil is very hard when dry, but loses its strength in wet conditions. If such type of soil is found in the targeted area, such layers of soil need to be replaced, and it will have a major impact on the overall cost. Therefore, JICA Study Team focused to check the presence of black cotton soil along the route.



Source: Standard Scientific Research and Essay Vol.1 (14), December

Figure 13-13 *Distribution of Black Cotton Soil*



Source: JICA Study Team

Figure 13-14 *Layer of Black Cotton Soil (Simana site, Tanzania)*

As a result of survey by visual confirmation, it was determined that there is no black cotton soil along the existing road. However, there is a possibility of black cotton soil and other unsuitable soil to be present along the section of route, which has to be constructed newly.

(7) Issues for Road Upgrading

1) Hiyari Intersection

The Hiyari intersection that is connecting the Trunk Road (B-2) and the Collector Road to the Kisiwa site should be improved when the collector road is being upgraded. The condition of the intersection is such that, it is difficult for vehicles coming from Lindi to Mtwara to see the traffic from the collector road (left side). In order to improve the intersection, space should be secured. In addition, the Trunk Road is managed by the TANROADS, plan and design should be coordinated with TANROADS prior to the implementation stage.

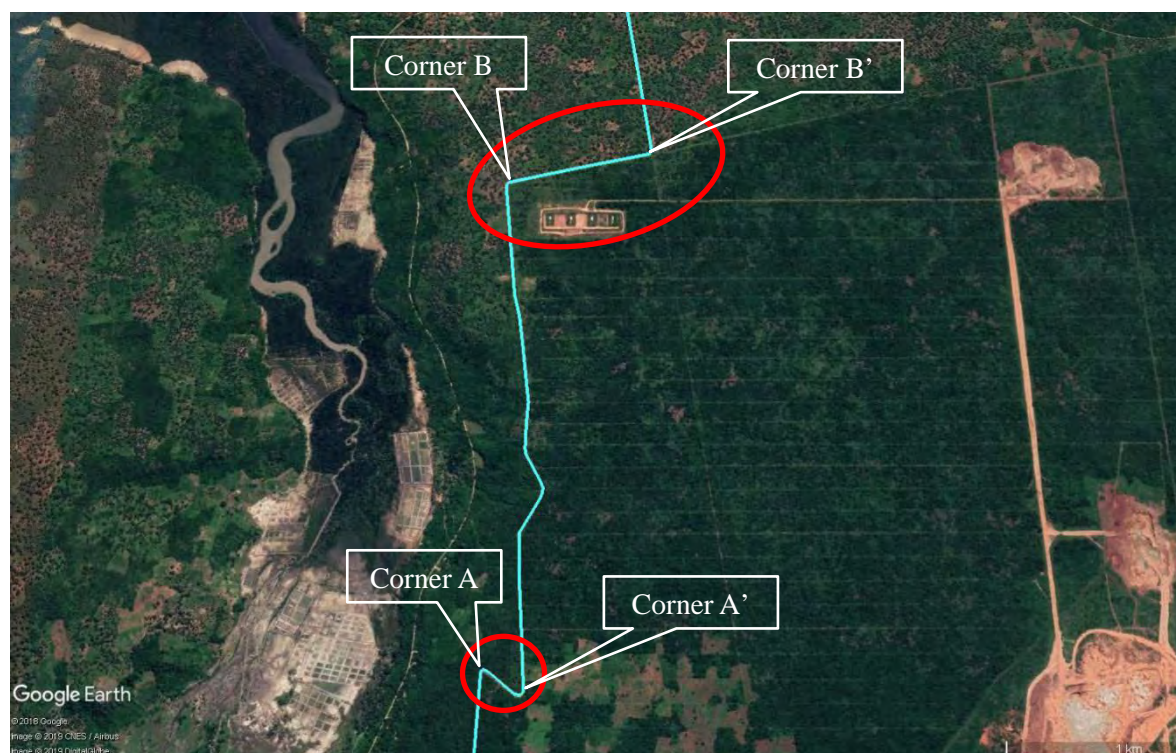


Source: JICA Study Team

Figure 13-15 *Current Condition of Hiyari Intersection*

2) Sharp corner

There are two (2) sharp corners along the targeted road as shown in Figure 13-16. In order to allow the smooth and safe passage of construction vehicles, the alignment of these two sections should be improved.



Corner A



Corner B

Source: JICA Study Team

Figure 13-16 Condition of Sharp Corners**3) Social and Nature Objects**

There are two (2) structures along the targeted road near Namgogoli village. They should be taken into consideration when the road is upgraded as shown in Figure 13-17. One is the Baobab tree on the schoolyard of Namgogoli Primary School that is just beside the collector road. The tree seems to be up to three (3) meters in diameter, and approximately 30 meters tall. The other is the building of Namgogoli Primary School. There are 94 pre-primary children and 595 primary children enrolled in the school as of 2018 (source: website of EduKaid). Both the structures are located within a few meters from the edge of road.



Baobab Tree



Building of Namgogoli Primary School

Source: JICA Study Team

Figure 13-17 Condition of Social and Natural Structures

4) Drainage System

As mentioned above, there are several culverts for rain water drainage along the road and some of culverts have been clogged and are not functional. In addition, the roadside ditches do not function when it rains heavily. JICA Study Team experienced heavy rain and it

continued for approximately 30 minutes during the site survey near Namgogoli village. Inundated water flowed on the surface of the road and there were puddles on the road. Pictures taken during/ after heavy rain are shown in Figure 13-18. Although it may have been caused by inadequate maintenance of drainage facilities, the plan and design of drainage system should be reviewed.



Source: JICA Study Team

Figure 13-18 Road Condition during/ after Heavy Rain

13.2.3 Road Standards in Tanzania

JICA Study Team collected the following standards and manuals pertaining to road sector during the site survey. To carry out planning and design, it is necessary to refer to these standards and manuals.

Table 13-2 List of Standard/ Manuals for Road Sector in Tanzania

#	Title	Year	Publisher	# of page
1	Pavement and Materials Design Manual	May 1999	Ministry of Works	185
2	Standard Specification for Road Works	Jun. 2000	Ministry of Works	317
3	Field Testing Manual 2003	Apr. 2003	TANROADS	155
4	Laboratory Testing Manual 2000	Jun. 2006	Ministry of Works	330
5	The Roads Management Regulations	Jan. 2009	Government Notice	40
6	Environmental Code of Practice for Road Works	Feb. 2009	Ministry of Infrastructure Development	236
7	Road Geometric Design Manual	May 2012	Ministry of Works	329
8	Low Volume Roads Manual	Nov. 2016	Ministry of Works, Transport and Communication	505

Source: JICA Study Team

Excerpts from Road Geometric Design Manual and Low Volume Roads Manual that are closely related and referable to the Study of the project are shown below.

(Excerpt) Road Geometric Design Manual (2012, Ministry of Works)

Composition of the Manual

- Foreword
- Acknowledgements
- Abbreviations and Definitions
- Terminologies
- Chapter 1 General
- Chapter 2 Road Classification
- Chapter 3 Road Planning and Survey Requirements
- Chapter 4 Design Controls and Criteria
- Chapter 5 Cross Section Elements
- Chapter 6 Alignment Design
- Chapter 7 At Grade Intersections
- Chapter 8 Grade Separated Intersections
- Chapter 9 Road Furniture and Other Facilities
- Chapter 10 Improvement of Existing Roads
- Chapter 11 Drawings Requirements
- Bibliography

2.5 Dimension of the Road Design Class

A number of standardized road design classes have been defined. They are shown in Table 2-3, where the dimensions of cross sections for each design class are displayed.

Table 2-3: Cross Section Dimensions of the Road Design Class

Design class	Surface	Road reserve width [m]	Roadway width [m]	Carriage way			Shoulder width [m]	Median width [m]
				Width [m]	Lane width [m]	No. of lanes		
DC 1	Paved	60	28-31	2 x 7.0	3.5	≥4	2 x 2.5 *	9 – 12
DC 2		60	11.5	7.5	3.75	2	2 x 2.0	–
DC 3		60	11.0	7.0	3.5	2	2 x 2.0	–
DC 4		60	9.5	6.5	3.25	2	2 x 1.5	–
DC 5		60	8.5	6.5	3.25	2	2 x 1.0	–
DC 6	Gravel or paved	40	8.0	6.0	3.0	2	2 x 1.0	
DC 7	Gravel	30	7.5	5.5	2.75	2	2 x 1.0	
DC 8	Earth or gravel	20	6.0	4.0	4.0	1	2 x 1.0	

* Inner shoulders of 2x0.9 metres are included in the median width

(Excerpt) Low Volume Roads Manual (2016, Ministry of Works, Transport and Communication)

1.5 STRUCTURE

The manual is divided into five separate parts which follow the distinct stages of LVR (Low Volume Roads) provision as illustrated in Table 1-1.

Table 1-1 Structure and content of manual

Part	Chapter
A. Introduction	1. General Introduction 2. Low Volume Roads in Perspective 3. Physical Environment
B. Planning	4. Rural Accessibility Planning
C. Investigations	5. Site Investigations 6. Geotechnical Investigations and Design 7. Construction Materials 8. Traffic
D. Design	9. Geometric Design 10. Road Safety 11. Hydrology and Drainage Structures 12. Drainage and Erosion Control 13. Structural Design: Paved Roads 14. Structural Design: Unpaved Roads 15. Surfacing 16. Life-Cycle Costing
E. Construction	17. Construction, Quality Assurance and Control 18. Borrow Pit Management 19. Technical Auditing

2.2.4 Road Classification

Based on the partly administrative and partly functional road classification system used in Tanzania, Table 2-1 shows those classes of roads which, for geometric design purpose, may be defined as low volume roads.

Table 2-1: Classification of low volume roads – geometric class

Road Design Class	AADT at Mid Design Life (vpd)	Design Traffic Loading < 1.0 MESA			
		Functional Class			
		B	C	D	E
DC 5	200 - 400	*	**	**	**
DC 6	50 - 200	N/A	**	**	**
DC 7	20 - 50	N/A	**	**	**
DC 8	< 20	N/A	**	**	**

Notes: * Most unlikely to be upgraded to a Class D4 road in the foreseeable future.

** Less than about 20% of HGVs; 3 or less axles; GVM ≤ 15 tonnes.

9.3.1 General (Selecting Geometric Design Standards)

Four different basic geometric standards (DC5-DC8) are defined for LVRs based on the daily number of 4-wheeled (and more) vehicles. The traffic level is the sum of traffic in both directions and is estimated at the middle of the design life period. The vehicle definitions and assessment of traffic is dealt with in Chapter 8 – Traffic.

With the provision to vary the geometric design in accordance with the design principles outlined above, the recommended basic geometric standards for the LVR classes are retained for new roads as described and specified in the Road Geometric Design Manual (MOW, 2011) and shown in Table 9-1.

Table 9-1: Recommended basic geometric standards

Road Class	Design Traffic Flow (AADT) (Mid-life)	Surface Type	Right of way (m)	Width (m)	
				Carriageway	Shoulder
DC5 ⁽²⁾	200 – 400	Paved Unpaved	60	6.50	Varying ⁽¹⁾
DC6	50 – 200	Paved Unpaved	40	6.00	Varying ⁽¹⁾
DC7	20 – 50	Paved ⁽³⁾ Unpaved	30	5.50	Varying ⁽¹⁾

13.2.4 Plan and Design

(1) Design Policy and Basic Concept

Taking into account the request of GoT and the findings of site survey, and discussions with TANESCO, TARURA and the related organizations, the basic concept of the road design will be to secure the safe and smooth flow of traffic. The basic policies to achieve the basic concept are mentioned below;

- 1) Access road will meet the Tanzanian design criteria for the collector road
- 2) The plan shall be examined so that it fits inside the new ROW. The existing road route will be traced as much as possible and the negative impacts on natural and social environment shall be minimized.
- 3) Project cost will be reduced upon securing the necessary functions and durability.
- 4) Passage of construction vehicles should be taken into account during the design and implementation stages.
- 5) Plans will be examined in consideration of traffic safety including installation of safety facilities.
- 6) Implementation schedule should be compiled in view of weather and social conditions, and diversions to minimize the impact on traffic will be planned.
- 7) Materials should be selected with a view to utilize local materials and products as much as possible and in consideration of cost, workability, quality and procurement reliability.
- 8) The road will be planned such that it can be kept in good condition over a long term with simple maintenance

(2) Basic Plan

The scope of the Project is the widening of the road from one lane to two lanes, upgrading or replacement of road drainage facilities and the footway from Hiyari intersection to Kisiwa site. Table 13-3 shows the outline plan that has been determined as a result of design review based on the basic concept.

Table 13-3 Outline Plan of the Project

Planned item		Description/ Specification
Targeted Section		Approximately 11.5km Hiyari to final destination (Kisiwa Site)
Design Speed		50 km/hr
Class of Road		DC-6
Number of Lanes		2 lanes
ROW		40 m
Width of Carriageway		6.5 m (3.25 m × 2)
Width of Shoulder		1.0 m
Width of Footway		1.0 m (section near Namgogoli and Kisiwa village)
Maximum vertical slope		4.0 %
Intersection		Hiyari Intersection (B-2 Trunk Road and Collector Road)
Fill Slope		H > 1m - 1:4 H < 1m - 1:2
Cut Slope		1: 1.0 ~ 2.0 (depends on geology)
Drainage facilities		Side ditch: install concrete lining along the entire route Road crossing culvert: Box culvert/ Pipe culvert
Ancillary road structures		Curbstone work, Road signs, Road marking, Speed hump, Slope protection (Turfes)
Design life of pavement		15 years
Road Paving Work	Carriageway	Wearing course
		Binder course
		Base course
		Sub-base course
	Shoulder	Gravel wearing course
	Footway	Gravel wearing course
Water pipeline		Some sections of the existing water pipeline shall be re-located. New water pipeline will be installed 2 meters from the ROW boundary at a depth of 1 meter from the surface of the section

(3) Design Condition**1) Design Standard**

Pavement and Materials Design Manual (1999), Standard Specification for Road Works (2000), Road Geometric Design Manual (2012) and Low Volume Roads Manual (2016) that are commonly utilized for road projects in Tanzania, will be applied to the design of the Project road. In addition, the “Road Design Standard in Japan –Commentary and Application” will be referred if necessary.

2) Road Classification and Geometric Structure

Abovementioned Road standards were examined upon applying the standards for collector road that are targeted in the project. According to the ADT of the targeted section of the road and considering the future development of the area and the increasing traffic volume, the road design class is adopted as DC 6. Design speed is set at 50km/h for the targeted section in coordination with TARURA.

3) Road Vertical Alignment

As described in previously, the vertical alignment of the existing road is a descending slope from the start point (Hiyari Intersection) up to the final destination (the Kisiwa site). Although, according to the Road Geometric Design Manual, the gradient for the road can be set as 7.0% based on the design speed of 50km/h at rolling terrain, the gradient of targeted road is set as 4.0% because heavy construction vehicles should pass safely and smoothly.

Since terrain around the section between 2.6km and 3.5km is rolling, the construction of large embankment can be expected.

4) Road Cross Section

a) Standard Cross-section

In accordance with upgrading of the road, ROW of the road will be reset from 15 to 40 meters for the section. Although width of carriageway can be set as 6.0m according to the Road Geometric Design Manual, it is set as 6.5m in order to allow the safe and smooth passage of heavy construction vehicles. Taking into account the requirements of two-lane road to secure drainage, safety etc., the following standard cross-section is planned. Figure 13-19 shows the planned standard Road Cross-section.

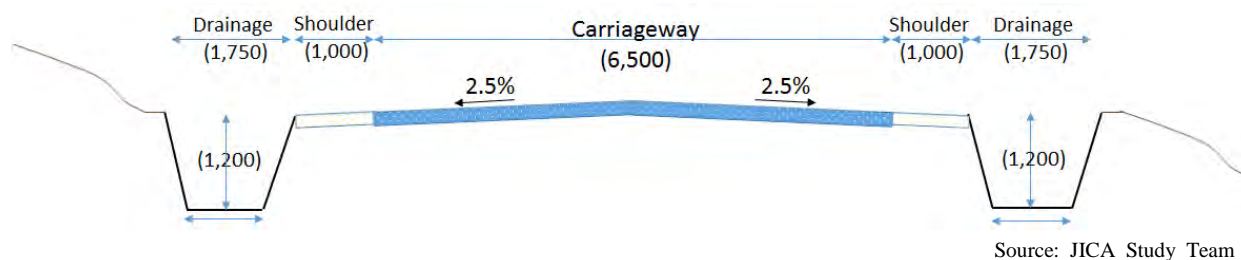


Figure 13-19 Planned Standard Road Cross-section

b) Footway

As previously mentioned, there are two (2) villages along the existing road, namely, Namgogoli village and Kisiwa village, and there are pedestrians in the neighborhood of those villages. In order to secure pedestrian safety, footway should be considered along the road section from 5,000 m to the final destination of 11,452 m. Figure 13-20 shows the planned standard Road Cross-section with footway section.

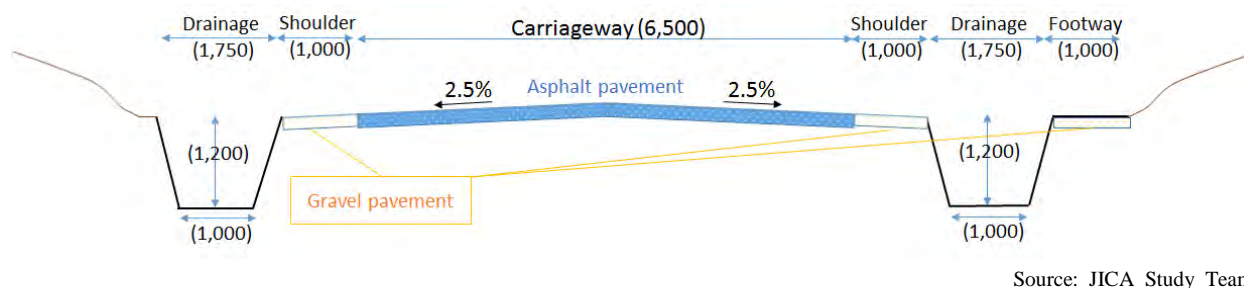


Figure 13-20 Planned Standard Road Cross-section with Footway

(4) Paving Plan

1) Outline

Pavement and Materials Design Manual 1999 (PMDM) and Low Volume Roads Manual 2016 (LVRs) are mainly referred to design the pavement mixture in this Study. The applicable materials were examined from the viewpoint of procurement condition and the cost factor for the targeted area.

2) Design Period

Targeted collector road will be used not only by the local community but also by those who will commute and work in Mtwara GTCC Power Plant after the COD of power plant. Thus, a longer design life is appropriate for this road, therefore the design period is determined as 15 years.

3) Design Traffic Volume

As described Sub-section 8.2.2, current traffic volume of the road is very limited.

According to the Mtwara Master Plan 2015-2035 that was published by the Ministry of Lands, Housing and Human Settlement Development in 2017, the Mtwara GTCC site is located within the Naumbu Cluster and this cluster is planned to become an epicenter of industrial employment. The cluster has a population of about 9,745 and is expected to grow up to 48,207 by 2035. Currently, the Dangote Cement Plant and Mtwara Cement Plants are operating in the cluster. The land for industrial use is designated for major industries. Other land use includes residential, trade, hotels, tourism and hospitality.

However, with the exception of Mtwara GTCC Power Plant, there are no major development projects in the area where the access road is planned. Although it is assumed that the traffic volume of commuters' vehicles to the power plant and the patrol and service vehicles will increase after the COD of Mtwara GTCC Power Plant, the access roads will have more traffic during construction stage than after the COD.

It is assumed that the traffic volume during construction stage will be 50 – 70 vehicles per day during the peak period. Therefore, for the paving design, the heavy traffic volume of the targeted road is considered as 80 vehicles per day.

4) Paving Design

According to the Pavement planning standards of Tanzania, the following options are provided for the materials of each paving course.

Table 13-4 Material Type for Each Pavement Layer (Tanzania Standard)

Item	Surface	Base course	Sub-base course
Option of material type	AC 5cm/ 1 layer AC10cm/ 2 layer Asphalt surface treatment	Crushed run stone (CRR) Natural crushed stone (CRS) Stabilized asphalt (DBM) Cement stabilized (C1, C2)	Natural material (Granular material) Cement stabilized (C1, CM)

AC: Asphalt Concrete

Source: JICA Study Team

Pavement and Materials Design Manual 1999 for Pavement design and the following condition are taken into consideration. Paving structure is determined by taking into account the ground condition, local characteristics (water accumulation during rainy season) and the passage of large-size vehicles. Based on the consideration of the above study, one-layer asphalt concrete surface course, asphalt stabilized upper base course and cement stabilized lower base courses are deemed to be appropriate as shown in Figure 13-21.

Design period: 15 years
Design Traffic Volume: 80 vehicles/day
Design traffic load class: TLC 3

5cm AC Surface
15cm Base course (Asphalt Stabilized DBM 40/30)
20cm Sub-base course (Cement Stabilized C1 Class)
20cm Subgrade CBR 15
20cm Subgrade CBR 7

Source: JICA Study Team

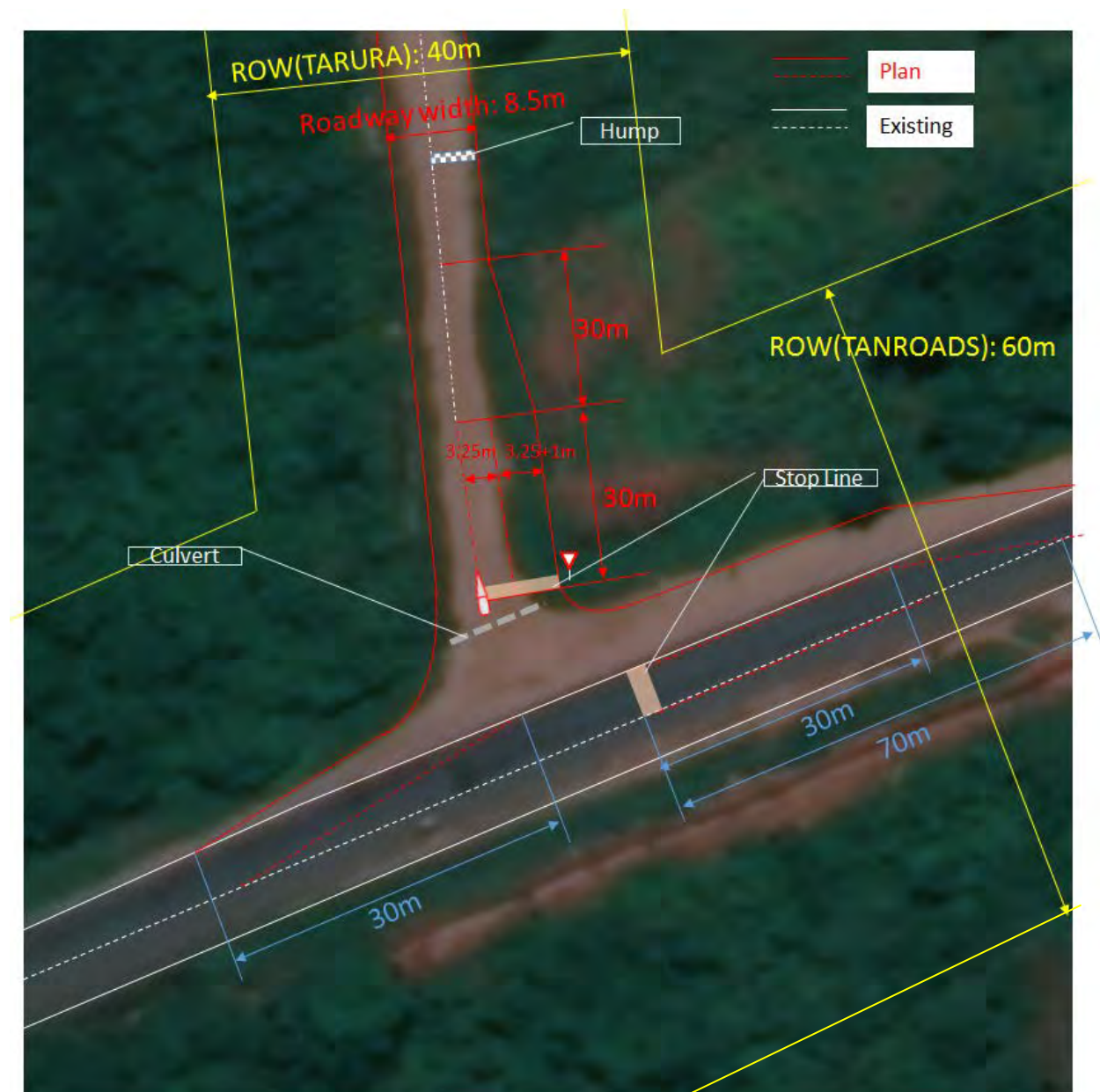
Figure 13-21 Draft Pavement Design

(5) Intersection Plan

As previously mentioned, there is only one major intersection in the project, namely, the Hiyari Intersection, where the B-2 Trunk Road intersects with the collector road. Figure 13-22 shows draft design of the Hiyari Intersection. At the intersection, the B-2 Trunk Road is the primary road and the collector road is the minor road.

Since some traffic is expected at both the B-2 Trunk Road and the targeted collector road during the construction and post-construction stage of Mtwara GTCC Power Plant, a right-turn lane should be installed to avoid traffic jams.

Based on the Road Geometric Design manual, draft design of the intersection is shown in Figure 13-22.



Source: JICA Study Team

Figure 13-22 Draft Design of Hiyari Intersection**(6) Drainage plan****1) Policy of Drainage Facility**

As described in the previous section about the current condition of the drainage facilities, some of the drainage facilities don't work and are damaged. When the drainage facilities are planned and designed, the following items should be considered;

- All existing drainage culvert and side ditches shall be replaced and constructed newly, as they don't have enough capacity and length.
- Strengthen and improve drainage facilities in line with the widening of targeted road

- To secure enough capacity to drain rainwater from catchment area, the drainage facilities shall be installed to avert road inundation

2) Probable Rainfall Intensity

According to the study of design rainfall intensity that is described in Chapter 7, the probable daily maximum rainfall at Mtwara is shown in Table 13-5. As per the climatic characteristics of this region, in the Tanzania coastal zone, the period of rainfall is not long and heavy rainfall tends to stop within one hour or 1.5 hour from the start of downpour.

Daily rainfall return period for two to seven years is assumed to be equivalent to the hourly rainfall, and the return period for 10 and 15 years is assumed to be centered around 1.5hr.

Therefore, the hourly rainfall of each year's return period is estimated as shown in Table 13-5.

Table 13-5 Probable Daily Maximum Rainfall at Mtwara

Period (Year)	Daily Rainfall (mm)	Applied Rainfall (mm/hr)
200	599.33	-
100	512.25	-
50	429.65	-
30	371.11	-
20	325.89	-
15	295.03	197
10	251.13	168
7	212.75	142
5	177.14	118
3	122.50	82
2	75.46	51

Source: JICA Study Team

According to Low Volume Road Manual, the indicative design rain period for different road structures is shown in Table 13-6.

Table 13-6 Indicative Storm (Rain) Design Return Period

Type of Drainage Structure	Geometric Design Standard
	DC6
Side Ditches	5
Culvert (diameter < 2m)	10
Culvert (diameter > 2m)	15

Source: Low Volume Road Manual (2016, MWTC)

3) Design of Drainage Facilities

Discharge capacity of side ditches and culvert is calculated using the following Manning formula. Discharge capacity is usually calculated on the assumption that the water depth is 80%, but for this project the depth shall be assumed as 70% taking into consideration the effects of accumulation and the local condition.

Formula of discharge capacity of flow

$$Q = 0.278 * C * I * A$$

Q: Capacity of flow (m³/sec)

C: Catchment Run-off Coefficient

I: Intensity of Rainfall (mm/hr)

A: Catchment Area (km²)

v: Average of flow velocity (m/sec)

Source: Low Volume Road Manual (2016, MWTC)

$$v = 1/n * R^{(2/3)} * I^{(1/2)}$$

n: roughness coefficient

R: Hydraulic mean depth (m)

I: Slope (%)

Based on the following conditions, the culverts and side ditches are designed.

Design rainfall intensity:

168 mm/hr (Culvert),

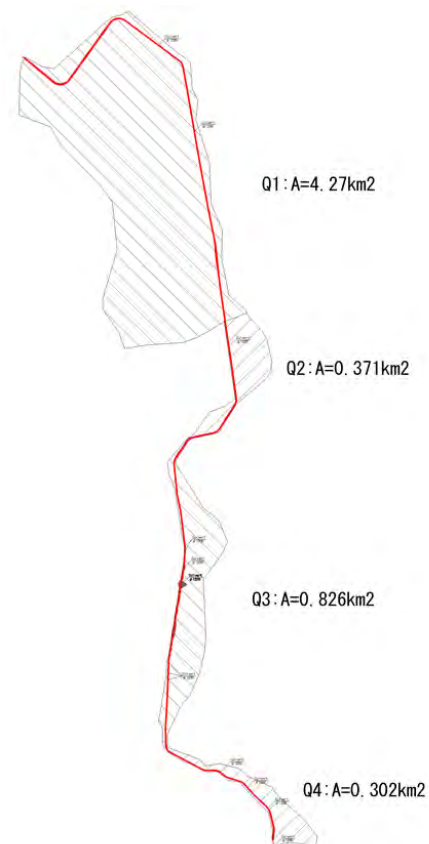
118mm/hr (Side Ditch)

Slope: 3 – 6 %

Maximum water flow (Culvert & Side ditch): 1.0 m³/sec as shown

Draft design of culverts and side ditches are shown in Figure 13-23 and Figure 13-24.

38 culverts should be installed in the targeted section of the road.



Source: JICA Study Team

Figure 13-23 Model of Catchment Area



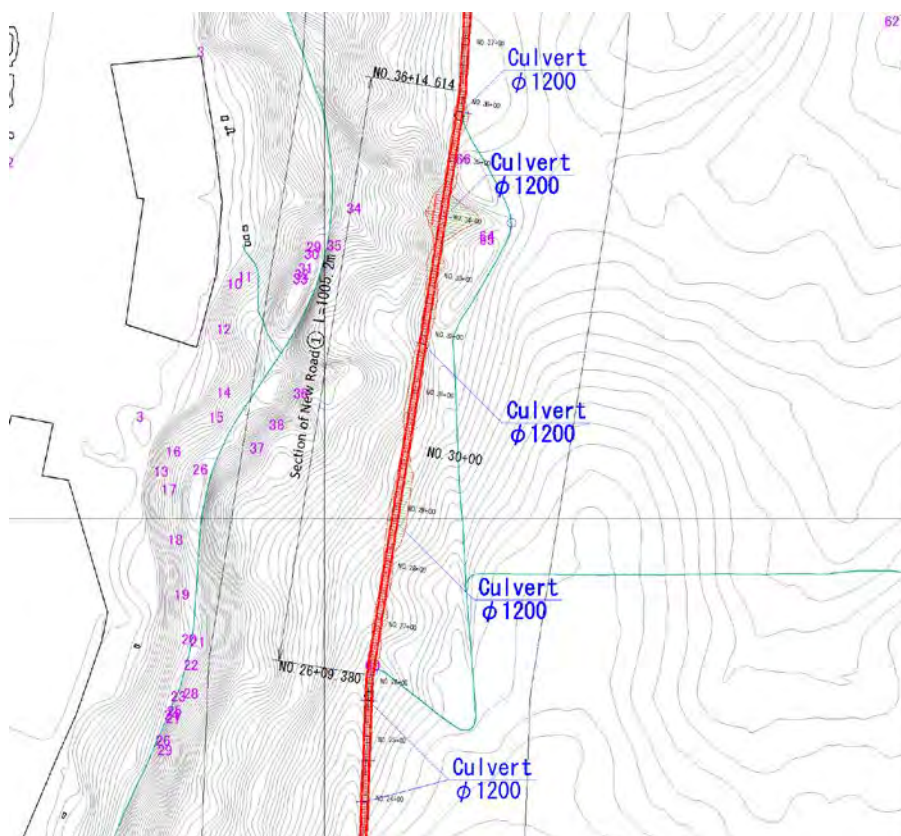
Figure 13-24 Result of Culvert Design



Figure 13-25 Result of Side Ditch Design

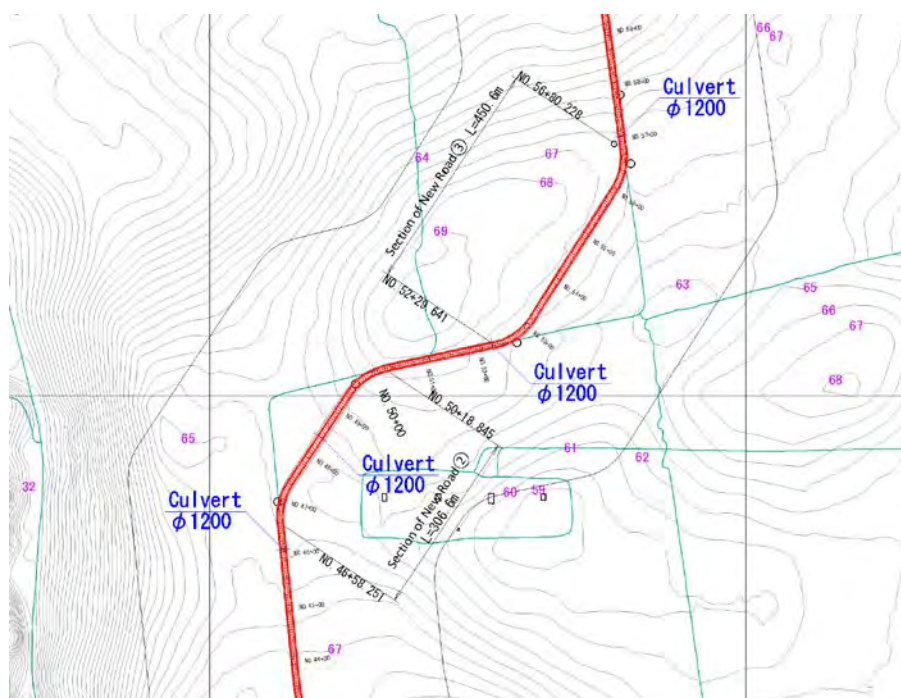
4) Design of Sharp Corner Improvement

Taking into of consideration the topography and the existing road alignment, two (2) sharp corners along the targeted collector road have to be improved. The designs for the same are shown in Figure 13-26 and Figure 13-27.



Source: JICA Study Team

Figure 13-26 Design of Sharp Conner A



Source: JICA Study Team

Figure 13-27 Design of Sharp Corner B

13.2.5 Outline Design Drawings

Outline of conceptual design drawings prepared for the basic plan are listed in Table 13-7, and the drawings are attached in the appendices.

Table 13-7 List of Conceptual Design Drawings

Item	Contents of drawings	Number of drawings
1	Whole Plan Drawing	1
2	Plan Drawing (sectional)	6
3	Longitudinal sectional drawing	2
4	Sectional Drawing	5
5	Structural Drawing (Culvert)	1
6	Intersection Drawing	1

Source: JICA Study Team

13.3 INSTALLATION OF THE GAS PIPELINE

13.3.1 Route and Specification of the Gas Pipeline

(1) Route of the Gas Pipeline

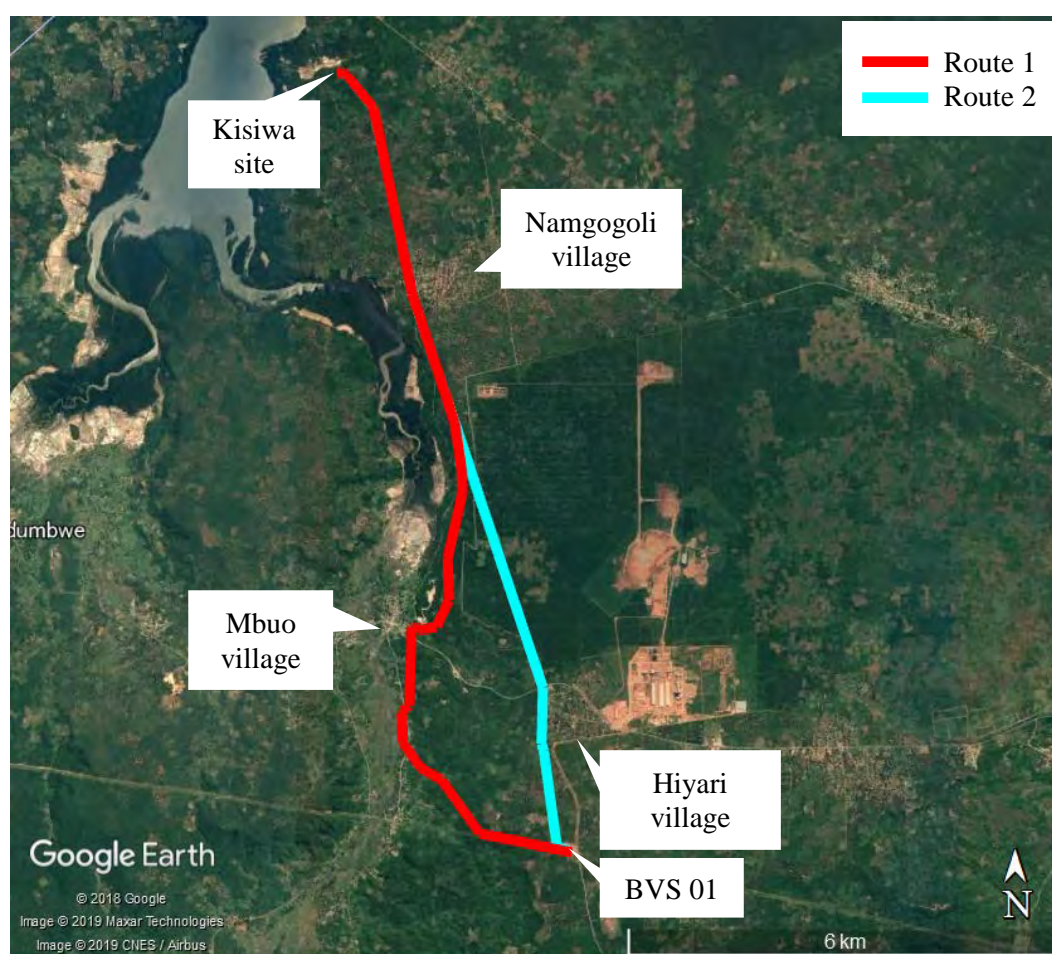
Gas will be supplied from BVS 01, located south of the Kisiwa site through a pipeline with a total length of more than 10 km. BVS 01 is located on the gas pipeline between the Mnazi Bay gas field and Dar es Salaam.

Straight line distance between BVS 01 and the Kisiwa site is about 10 km. There are 2 route plans for the gas pipeline, as follows.

Route 1: Proposed by TPDC and TANESCO (through Mbuo and Namgogoli villages, total length is approximately 13 km)

Route 2: Starts from BVS 01 then aligned to the Kisiwa site through Hiyari and Namgogoli villages (according to TANESCO, total length is approximately 13km)

Figure 13-28 shows 2 route plans.



Source: JICA Study Team

Figure 13-28 Route Plan of Gas Pipeline (2 Routes)

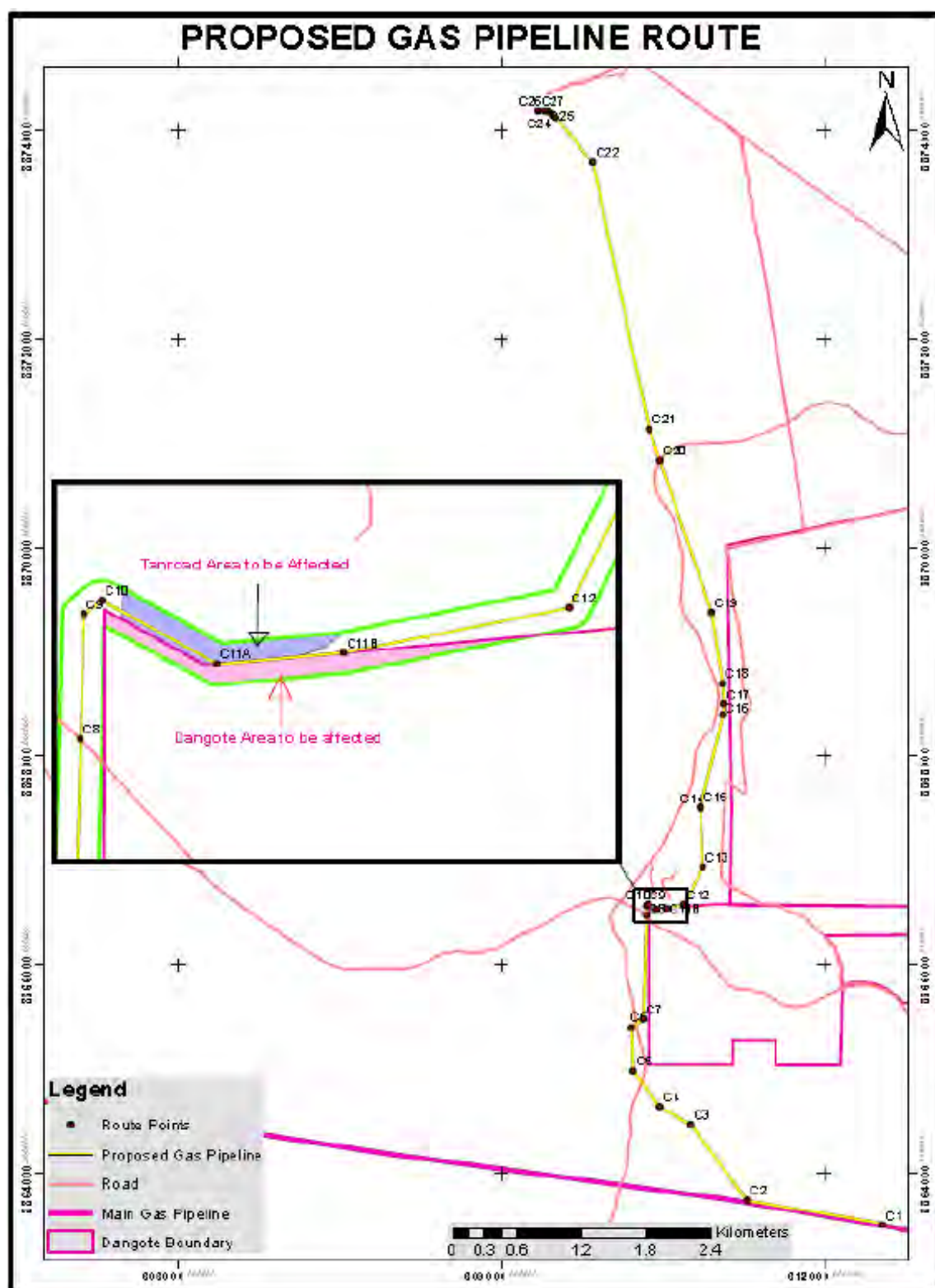
Table 13-8 shows the feature of each route. As shown in Table 13-8, route 1 is superior to route 2 from the viewpoint of social aspect, avoidance of Dangote land. In case Route 1 is selected, sections between C9 and C12 which is shown in Figure 13-29 is next to the quarry site. However, TPDC has agreed to acquire permits to utilize such portions of land from owners, in order to construct and operate the gas pipeline. Therefore, TPDC can monitor the area around the quarry site. From the above, JICA Study Team considers that there will be no issue. This study is examined based on the premise that route 1 is the optimal route.

Table 13-8 Feature of Both Routes

Item	Route 1	Route 2
Safety	No serious issues except TPDC is required to monitor activities of TANROADS at the quarry site and DANGOTE during operation of the gas pipeline.	No serious issues
Society	8 houses will be affected at Namgogoli village.	13 residential houses will be affected by the construction of the gas pipeline. Route 2 passes through Dangote land.
Economy	Length of the gas pipeline is 13 km	Length of the gas pipeline is almost same as Route 1
Environment	There is no difference for the environmental impact between Route 1 and 2 because both routes are almost same length.	
Evaluation	Good	Not applicable

Source: JICA Study Team

As shown in Figure 13-29, regarding the sections from C9 to C12 in the gas pipeline route 1, the gas pipeline with ROW affects the TANROADS land and Dangote land. Therefore, TANROADS, Dangote and TPDC discussed the handling of the land, and a memorandum on land use permission was signed on September 8th, 2019.



Source: Environmental Impact Statement for the proposed construction of natural gas pipeline from BVS-1 at Hiyari to the proposed 300MW gas power plant at Kisiwa village in Mtwara district, Mtwara region.

Figure 13-29 Gas Pipeline Sections affecting TANROADS and Dangote Land (Route 1)

Figure 13-30 shows the map of enlarged view of C9 to C12 in Route 1.

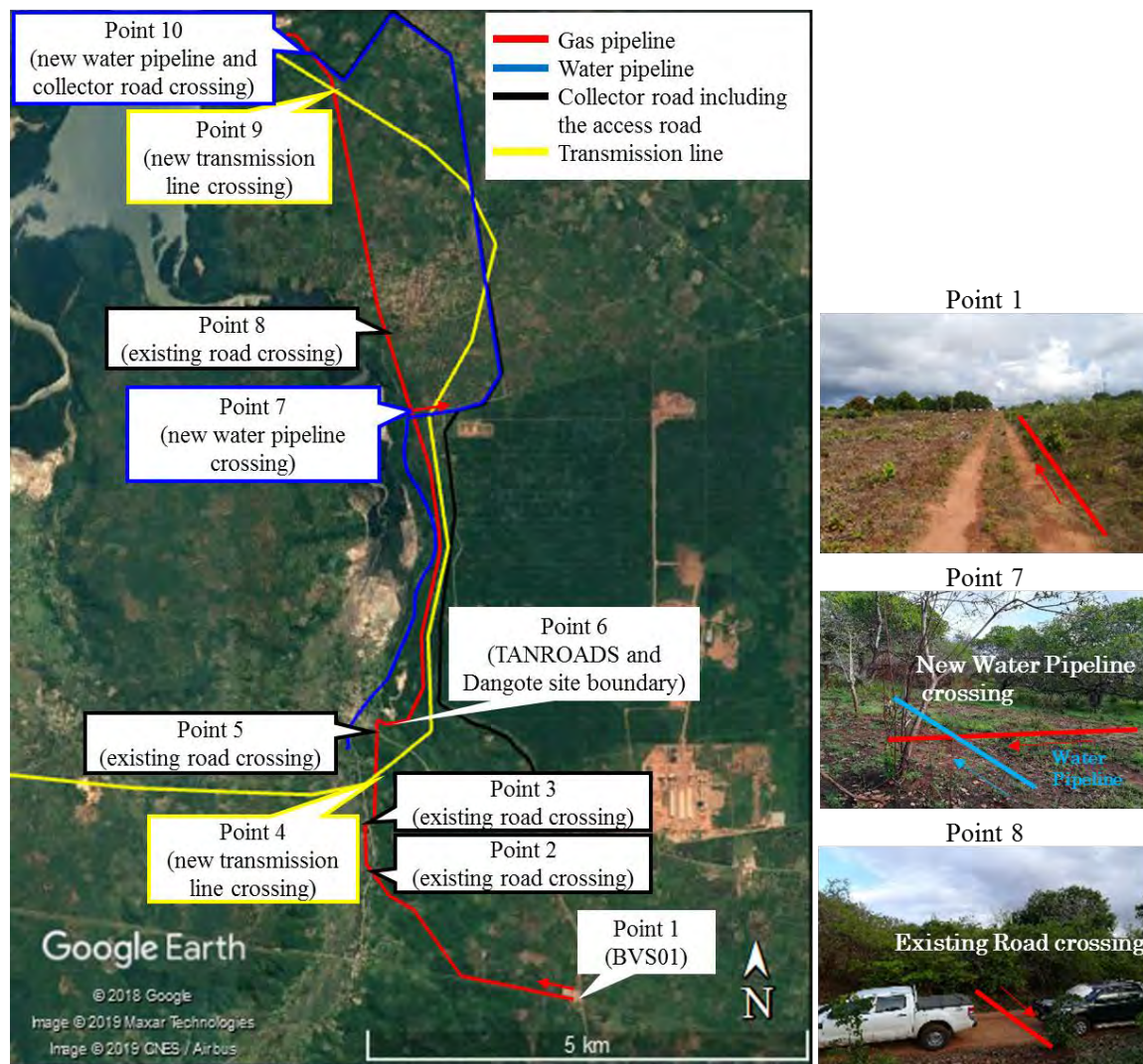


Source: JICA Study Team

Figure 13-30 Enlarged View of C9 to C12 in Route 1

Map of the gas pipeline Route 1 is shown in Figure 13-31. Gas pipeline Route 1 has 5 crossing points of road, 2 crossing points of water pipeline and 2 crossing points of transmission line.

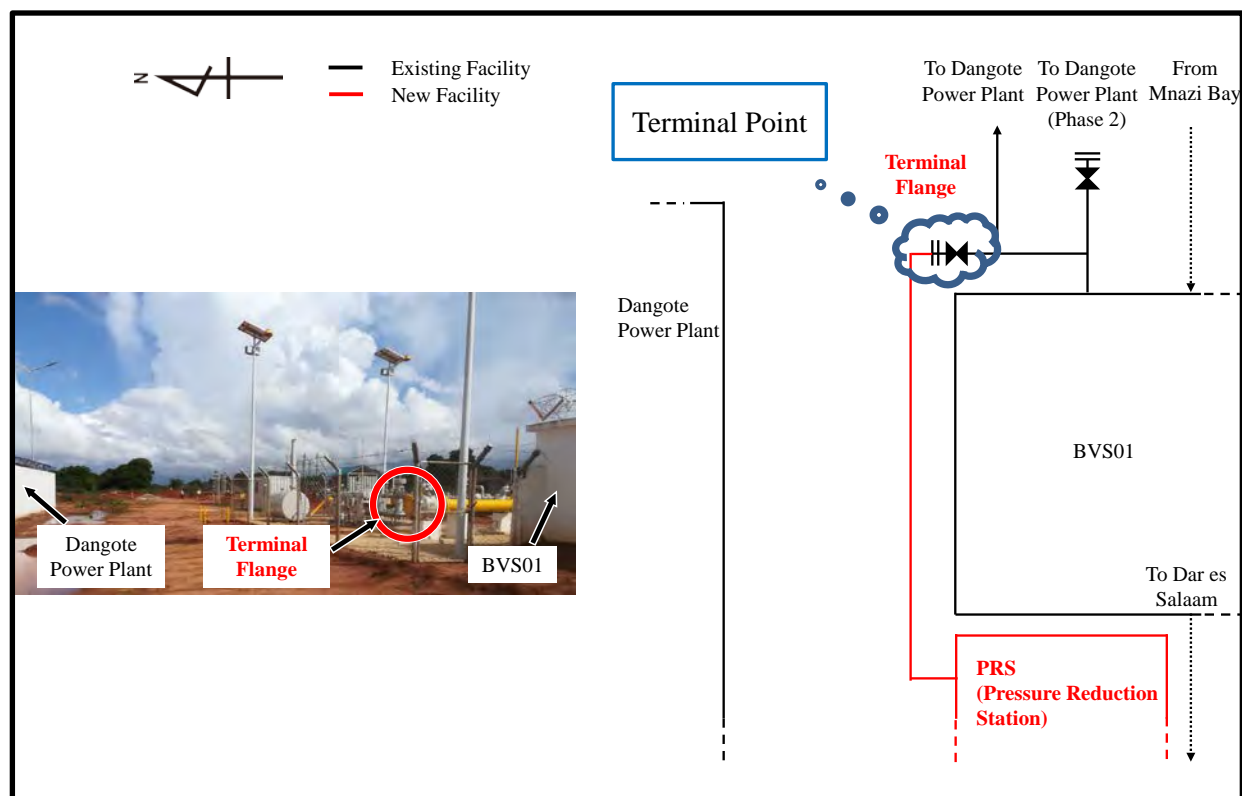
In this route, in order to reduce the construction cost with a lower grade piping, the two-stage pressure reduction method is recommended for the pressure reduction station. In this case, it is also recommended to install the first pressure reduction station near the BVS 01 and the second pressure reduction station near the terminal point of Kisiwa site.



Source: JICA Study Team

Figure 13-31 Map of the Gas Pipeline Route 1**(2) Terminal Point****1) Terminal Point at BVS 01**

Figure 13-32 shows a schematic of terminal point at BVS 01 of the Dangote Power Plant. If the existing flange of the branch line at the Dangote Power Plant is selected as the terminal point of this project, it will be beneficial from the viewpoint of economy, safety and easy construction, because it will not require the installation of a new flange.



Source: JICA Study Team

Figure 13-32 Schematic of Connection Point at BVS01 of Dangote Power Plant

Table 13-9 shows the specification of the terminal flange.

Table 13-9 Specification of Terminal Flange at BVS01

Item	Specification
Diameter	12 inch
Thickness	11.5 mm
Design Pressure	90 bar (g)

Source: JICA Study Team

2) Terminal Point at Kisiwa site

Figure 13-33 shows the coordination of terminal point at the Kisiwa site. JICA Study Team visited the Kisiwa site together with TANESCO and TPDC, and mutually confirmed the location of this terminal point on March 23, 2018 during the third site investigation

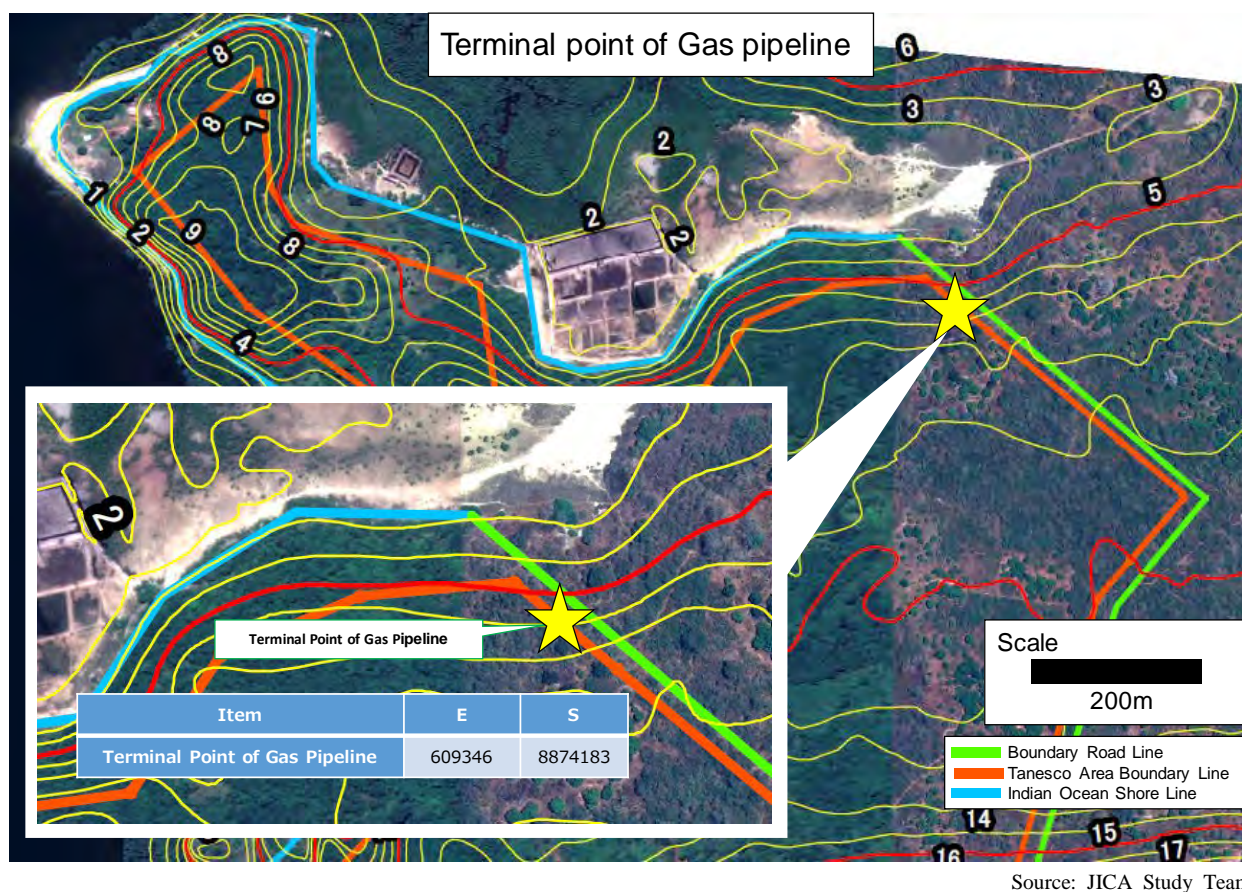


Figure 13-33 Coordinates of the Terminal Point at Kisiwa Site

(3) Outline of the Planned Installation site for Gas Pipeline

It was confirmed through visual survey during the field survey and satellite image survey that there are no obstacles on the gas pipeline route from BVS01 to the terminal point at the Kisiwa site (shown in Figure 13-33). In addition, JICA Study Team and the survey team dispatched by TPDC and TANESCO mutually confirmed adequateness of the entire route. Private houses, described as being planned to be relocated as mentioned in RAP, are not considered as obstacles. Regarding the soil quality of the gas pipeline route, it was confirmed by visual survey that there is no weakness or fragile soil that would hinder the piping installation. JICA Study Team recommends that a detailed survey be conducted on the soil by the EPC contractor before construction and the results be reflected to the construction plan.

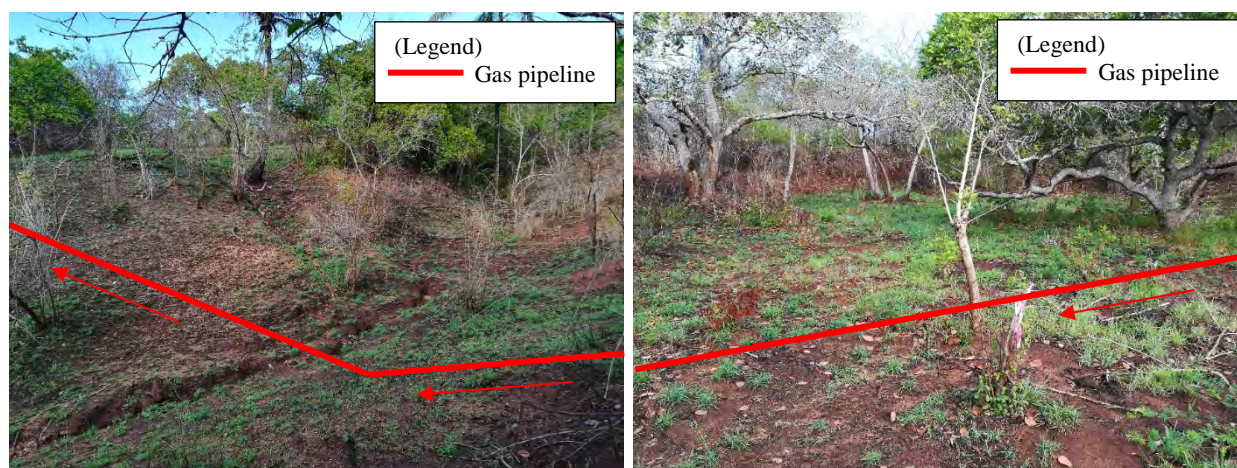
1) Road crossing and water pipeline crossing point

As shown in Figure 13-31, there are 5 crossing points of road (Points 2,3,5,8,10) and 2 crossing point of water pipeline (Points 7,10) on the gas pipeline route. In these road crossing points, JICA Study Team considers that it is possible to install pipes by using the construction method described below. This construction method will be also described later along with the construction method for general section. Regarding the road crossing point, the gas pipe will be installed in a sleeve and protected from the loads of the road. In the crossing point of water pipeline, an appropriate gap will be maintained between the water pipeline and the gas pipeline from the viewpoint of maintenance of both pipelines and to avoid the adverse effects of water leakage from water pipeline and so on.

2) Inclination area

Figure 13-34 shows the area around Point 7. As shown in Figure 13-34, there are terrain forming a landscape like a valley and slopes on the gas pipeline route. These terrains and slopes are inclined up and down and are perpendicular to the direction of travel of gas pipeline. However, as these terrain and slopes are gently inclined, it is possible to excavate like the other points and lay the pipes at 1.5 m below the surface of the ground. There is concern about the outflow of soil caused by heavy rain after construction. This is due to the existence of terrains like valleys and slopes, but it is thought that these outflows can be prevented by planting vegetation on the backfilled surface.

The terrain ascends along the direction of gas pipeline route around point 6, it seems there is inclination angle of about 22 degrees. This is the steepest inclination on the route. However, in the development of national gas pipelines, TPDC has experience in constructing at a higher level of inclination outside of this project. Therefore, this inclination would not hinder this project. Based on the results of soil survey that will be carried out by EPC contractor in the future, JICA Study Team recommends that additional measures be prepared and implemented if necessary.



Source: JICA Study Team

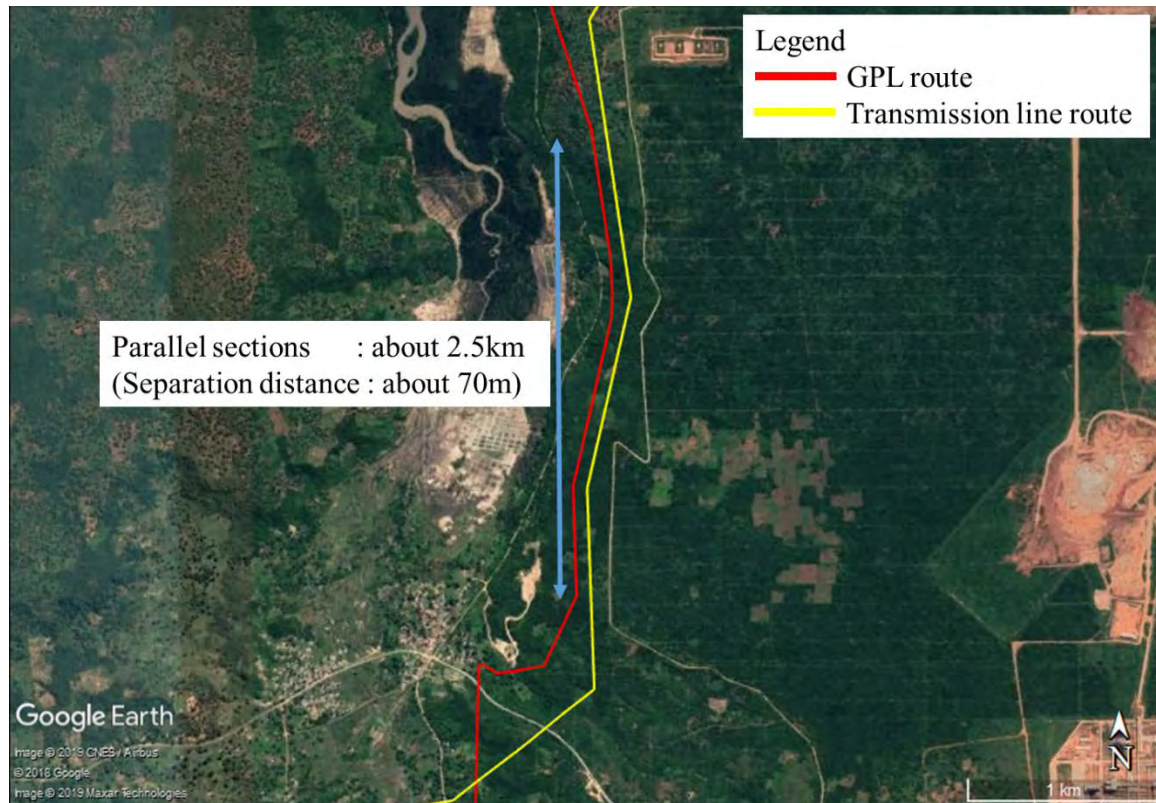
Figure 13-34 Picture of Typical Valley and Slope

3) Transmission line crossing and parallel area

In this project, 400kV transmission line will be constructed parallel to the gas pipeline in some sections. When the gas pipeline and the transmission line are installed in parallel, the gas pipeline will be affected by electromagnetic induction voltage in proportion to the length of the parallel section. This voltage causes corrosion of the gas pipeline. The necessary gap between the gas pipeline and the transmission line in the sections where they are laid in parallel is described in Section 5.3 Route Investigation. JICA Study Team and TPDC confirmed this separation distance to be 46m. In case they are laid in parallel, this separation distance shall be secured. Between Point 6 and 7, as shown in Figure 13-35, there will be some sections in which the gas pipeline and the transmission will be laid in parallel and the separation distance will be about 70 m in those sections. Total length of those sections will be 2.5 km.

On the other hand, there are two sections where the gas pipeline and the transmission line partially intersect (Points 4, 9). If the gas pipeline and the transmission line travel along at a

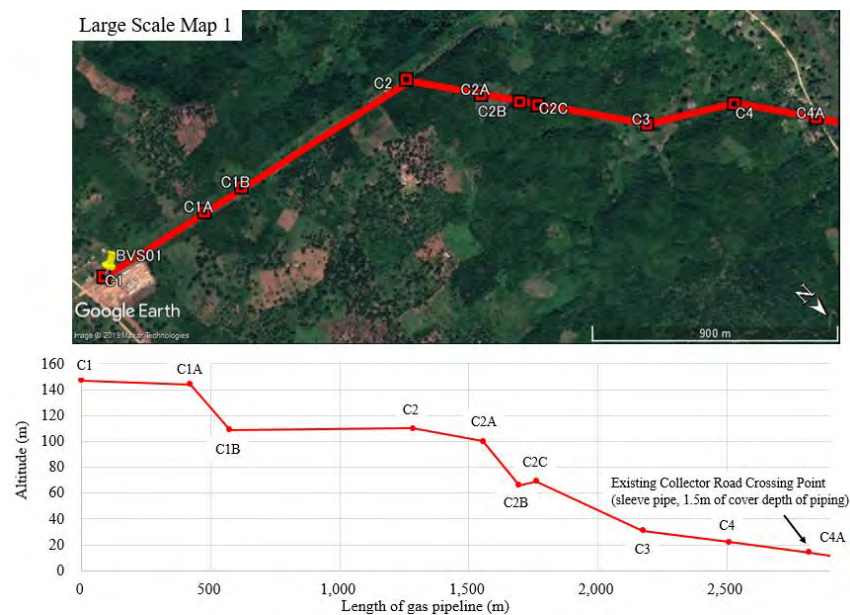
short distance, the electromagnetic induction voltage will increase. In case the gas pipeline and the transmission line are orthogonal to each other, the section which the gas pipeline and the transmission line are travelling along must be shortened. For this reason, they should intersect at an angle, as close to orthogonal as possible, by adjusting the position of the transmission towers during the detailed design stage of the transmission line.



Source: JICA Study Team

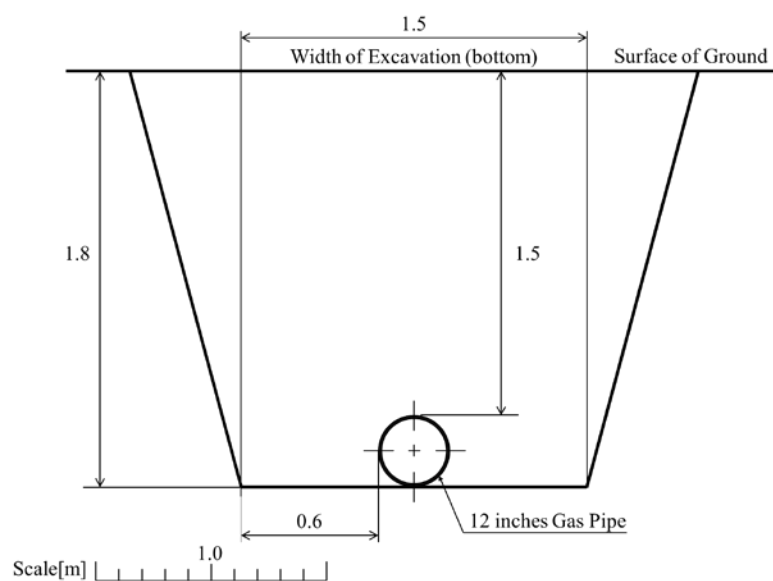
Figure 13-35 Sections in which the gas pipeline and transmission line will be laid in parallel

(4) Schematics of the Pipeline



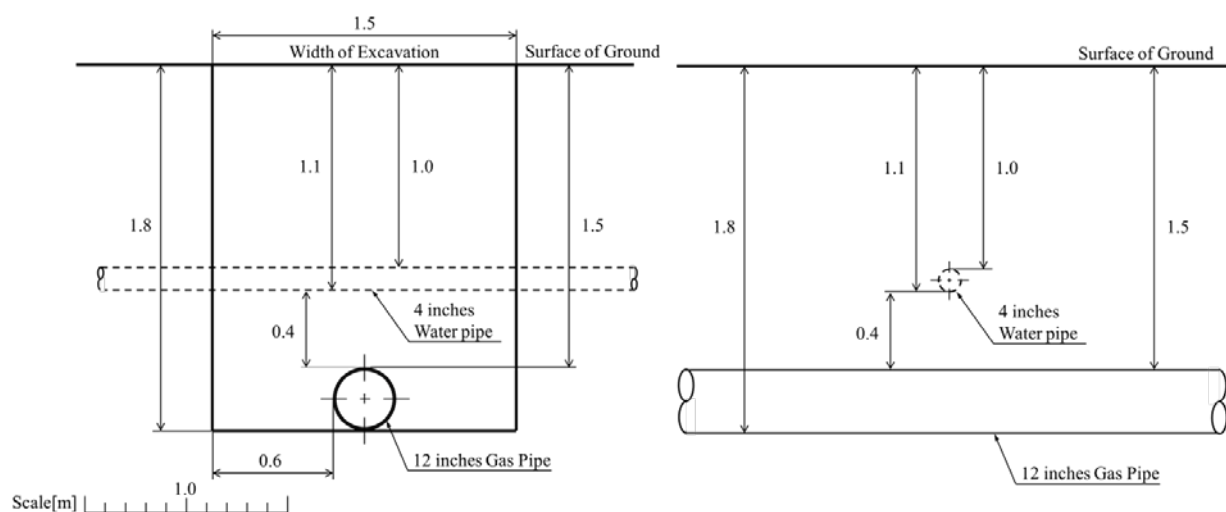
Source: JICA Study Team

Figure 13-36 Sample of Plain View and Longitudinal Sectional View



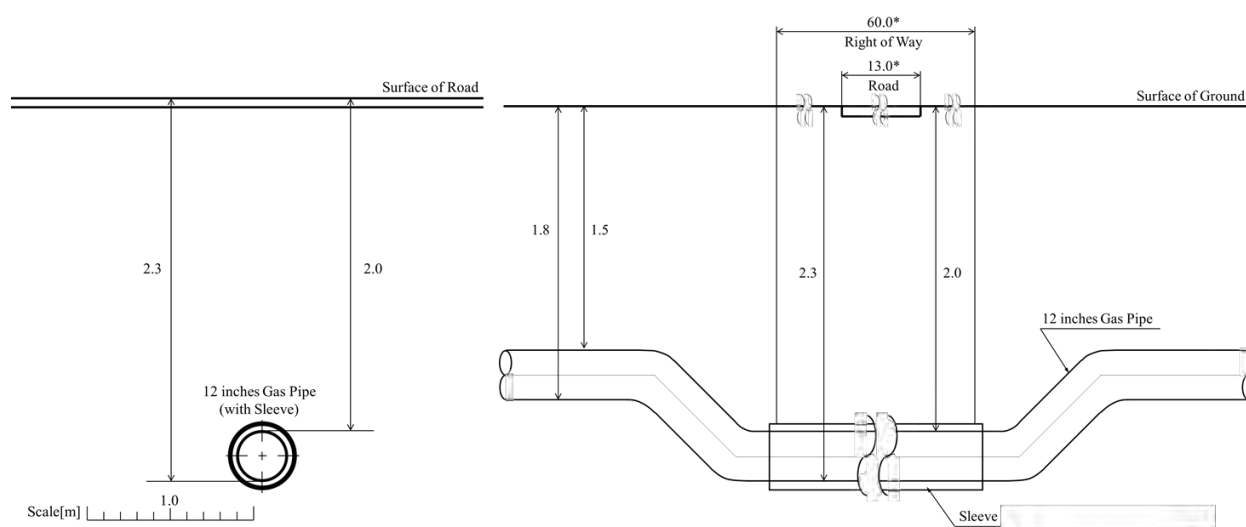
Source: JICA Study Team

Figure 13-37 Sample of Cross Sectional View at General Point



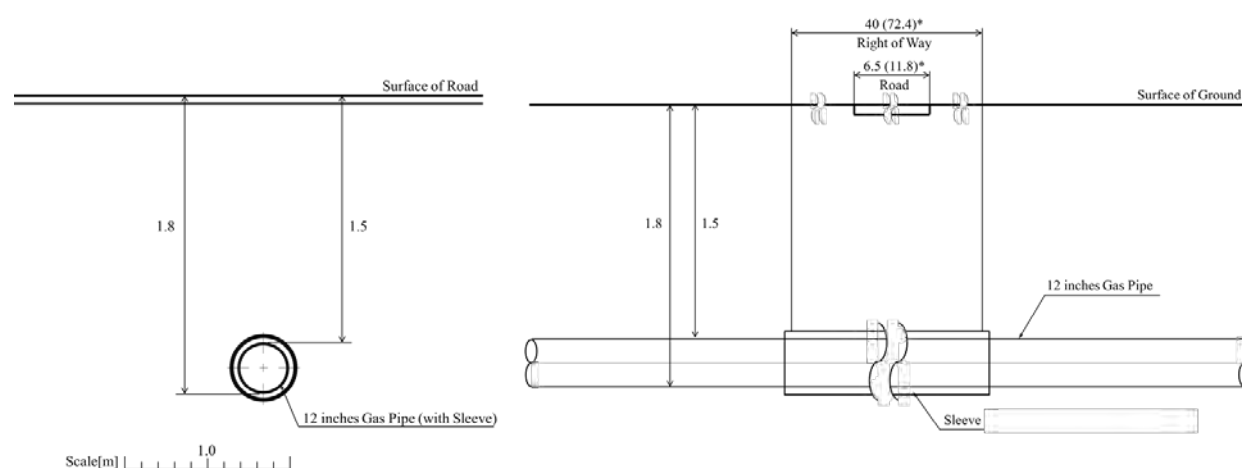
Source: JICA Study Team

Figure 13-38 Sample of Cross Sectional View and Longitudinal Sectional View at Water Pipeline Crossing Point



Source: JICA Study Team

Figure 13-39 Sample of Cross Sectional View and Longitudinal Sectional View at National Road Crossing Point



Source: JICA Study Team

Figure 13-40 Sample of Cross Sectional View and Longitudinal Sectional View at Collector Road Crossing Point

The newly constructed gas pipeline and the existing Tanzanian gas pipeline should be buried except for the connection point at BVS 01 as shown in Section 13.3.1 (2) and the terminal point at the Kisiwa site. Table 13-10 shows the cover depth of gas piping in Tanzania at each construction location. These covering depths have been recorded from the hearings during the field survey. These depths conform to ASME and IGEM. In this project, JICA Study Team recommends adopting Table 13-10, which conforms to the above described standards.

Table 13-10 Cover Depth Record of Gas Pipeline in Tanzania

Location	Cover depth of piping [m]	Applicable place
Under the Collector roads	1.5	Point 2,3,8,10
Under the National Roads	2.0	Point5
General	1.5	Others

Source: JICA Study Team

(5) Specification of the Pipe and Gas supply

1) Specification of the Pipe

In the field survey conducted by JICA Study Team, it was confirmed that the following are the requirements for pipeline of 7 bar or more.

- Use API-compliant pipe
- Compliance with ASME / IGEM
- Use an outer polyethylene coated steel pipe

In addition, it was confirmed in the field survey that there are no local standards that should be complied with, other than the above standards.

(Design Pressure)

Gas supply pressure is approximately 90 bar at BVS 01, which is more than sufficient to supply gas to the Kisiwa site.

Depending on the selection of the gas turbine type, the level of gas pressure at the terminal point will change. Table 13-11 shows the gas pressure requirements for the gas turbine candidates mentioned in Section 4.1.6 Fuel Gas Supply System. These pressures vary based on gas property and temperature.

Table 13-11 Gas Pressure Requirements for the Gas Turbine Candidates

	H-100	LM-6000PF+	SGT-800
Gas pressure	37bar (g)	50bar (a)	30bar (a)

Source: JICA Study Team

(Earthquake)

As mentioned in Section 7.4.1 Natural Disasters, and as confirmed at the Mtwara meteorological observation station, there are no records concerning earthquake.

(Thickness)

(a) Buried Pipe

a) Calculation based on ASME

As a result of field survey, it was confirmed that the pipeline should conform to ASME. Therefore, the pipe thickness is considered based on ASME B 31.8 - 2003. The calculation formula for pipe thickness as described in the standard is shown below.

$$t \geq \frac{P \times D}{2S \times F \times E \times T}$$

Table 13-12 shows each coefficient of the above formula and the value used in this Study.

Table 13-12 Each Coefficient of the Calculation Formula for Pipe Thickness in ASME and the Value Used in this Study

Legend	Contents	Used value	Unit
t	Wall thickness	To be calculated	in
P	Design pressure	1,305	psig
D	Nominal outside diameter of pipe	12	In
S	Specified minimum yield strength (API 5L X65)	65,000	psi
F	Design factor	0.72	-
E	Longitudinal joint factor (API 5L)	1.00	-
T	Temperature derating factor	1.000	-

Source: ASME B31.8-2003, JICA Study Team

As a result of the above calculation, a pipe thickness of 4.3 mm (0.17 in) or more is required.

b) Calculation based on Japanese Electricity Business Act

In addition to pipe thickness calculation based on ASME, calculation of pipe thickness based on Interpretation of Japanese Electricity Business Act is as described below. The calculation formula of pipe thickness described in the standard is shown below.

$$t = \frac{2.5P + \sqrt{6.25P^2 + 240(K_f W_f + K_t W_t)\sigma_a}}{16\sigma_a} \times D_o$$

W_f in the above formula is the vertical earth pressure caused by buried soil and is calculated by the following formula.

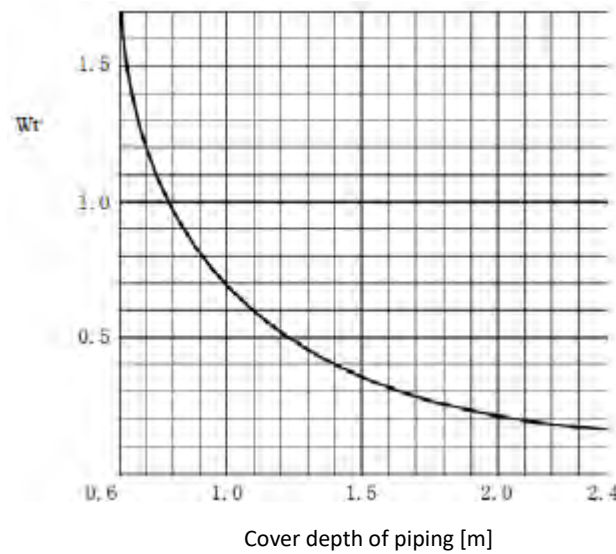
$$W_f = 4.59 \times 10^{-4} \left\{ 1 - \exp\left(-0.385 \frac{H}{B}\right) \right\} B$$

Table 13-13 shows each coefficient of the above two formulas and the value used in this study. Since there are two types of cover depth for the piping, due to the differences in installation location, the value is calculated for each condition. As a result of the above calculation, the pipe thickness is calculated to be 6.2 mm and 6.3 mm. Considering the condition that the largest value has to be assumed for the pipe thickness, it is determined that a tube thickness of 6.3 mm or more is required.

Table 13-13 Each Coefficient of the Pipe Thickness Calculation Formula in Japanese Electricity Business Act and the Value Used in this Study

Legend	Contents	Used value	Unit
t	Wall thickness	To be calculated	mm
P	Design pressure	9.0	MPa
K_f	Correction factor	0.223	-
K_t	Correction factor	0.011	-
σ_a	Tensile allowable stress (API 5L X65)	151	N/mm ²
W_f	Vertical earth pressure by buried soil	To be calculated (0.0220/0.0277)	-
H	Cover depth of piping	150/200	cm
B	Width of excavation	150	cm
W_t	Earth pressure by load of road surface $W_t = 0.098W_t'$	To be calculated (0.0343/0.0196)	-
W_t'	Value read from Figure 13-41 with the cover depth of piping	0.35/0.2	-
D_o	Nominal outside diameter of pipe	304.8	mm

Source: JICA Study Team



Source: Japanese Electricity Business Act etc.

Figure 13-41 Relationship between Cover Depth of Pipe and Correction Coefficient W_t **c) Calculation based on Japanese Gas Business Act**

The necessary pipe thickness is considered based on Interpretation of Japanese Gas Business Act. The calculation formula for pipe thickness, described in the standard, is shown below.

The pipe thickness should be greater than or equal to the larger one of the values calculated by the formula “(i)” and formula “(ii)”, or the value calculated by formula “(ii)” or formula “(iii)”.

Since the ratio of the outer diameter to the inner diameter is 1.5 or less, the below formula is used in the case where the ratio of the outer diameter and the inner diameter is 1.5 or less.

- formula “(i)”

$$t = \sqrt{\frac{2.5(K_f W_f + K_t W_t)}{\sigma}} D_o + C$$

- formula “(ii)” (this formula is applied in the case where the ratio of the outer diameter to the inner diameter is 1.5 or less)

$$t = \frac{PD}{2\sigma_a \eta + 0.8P} + C$$

- formula “(iii)”

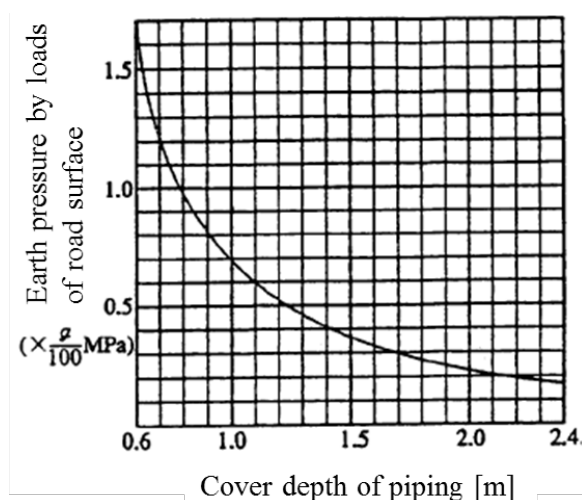
It is the same as the calculation required for pipe thickness based on Japanese Electricity Business Act.

Table 13-14 Each Coefficient of the Pipe Thickness Calculation Formula mentioned in Japanese Gas Business Act and the Value Used in this Study

Legend	Contents	Used value	Unit
t	Wall thickness	To be calculated	mm
P	Design pressure	9.0	MPa
K _f	Correction factor	0.198	-
K _t	Correction factor	0.114	-
W _f	Overhead load $W_f=0.001\gamma h$	To be calculated (0.029/0.039)	
W _t	Earth pressure by load of road surface	0.034/0.022	MPa
γ	Overhead load per unit volume	19.613	kN/m ³
h	Cover depth of piping	1.5/2	m
C	Corrosion allowance	1	mm
D _o	Nominal outside diameter of pipe	304.8	mm
σ	Tensile strength (API 5L X65)	535	N/mm ²
σ_a	Tensile allowable stress (API 5L X65)	151	N/mm ²
η	Welding efficiency of longitudinal joint	1.0*	-

*Radiation Inspection shall be conducted across entire pipeline.

Source: JICA Study Team



Source: Japanese Gas Business Act etc.

Figure 13-42 Relationship between Earth Pressure by Loads of Road and Cover Depth of Piping

Result of the calculation

3.1mm by formula “(i)”

9.9mm by formula “(ii)”

6.3mm by formula “(iii)”

Based on the above results, a tube thickness of 9.9 mm or more is required.

Based on the calculation results of a) to c), it is recommended to have a pipe thickness of 9.9 mm or more. The values of ASME, which is generally used in Tanzania, and the Japanese standard, which the JICA Study Team has used before, are compared, and the larger value is recommended for use in this Project.

(b) Ground Pipe

JICA Study Team calculated the required ground pipe thickness based on a) ASME, b) Japanese Electricity Business Act, c) Japanese Gas Business Act.

Formula to calculate ground pipe thickness differs from that of buried pipe.

Namely, a) ASME allows the thickness of ground pipe and buried pipe to be calculated with the same formula, whilst b) Japanese Electricity Business Act, c) Japanese Gas Business Act provide different formula.

Formula given by Japanese Electricity Business Act is as below.

$$t = \frac{PDo}{2\sigma_a\eta + 0.8P}$$

Formula given by Japanese Gas Business Act is as below.

$$t = \frac{PDo}{2\sigma_a\eta + 0.8P} + C$$

Calculation results

- a) not less than 4.3mm
- b) not less than 8.9mm
- c) not less than 9.9mm

Based on the calculation results of a) to c), it is recommended to have a pipe thickness of 9.9 mm or more, which is the largest amongst the calculated values, for the ground pipe.

(Pressure Loss)

Based on the Japanese experience, pressure loss between the first pressure reduction station and the second pressure reduction station is calculated with the data in Table 13-15.

Regarding the fuel gas pressure, a pressure, which is as low as possible and close to the required minimum pressure of the candidate GTs described in Table 13-11, is tentatively adopted. This is because the lower the gas pressure, the faster the gas flow rate and the larger the pressure loss, so based on this condition the largest pressure loss condition among the candidate GTs will be assumed. Also from the viewpoint of noise influence, and an evaluation based on the condition of high flow velocity, the noisiest condition will be assumed.

Table 13-15 Source Data in Pressure Loss Calculation

Item	Value
Diameter of pipe [in]	12
Thickness of pipe [mm]	11.5
Temperature of pipe [°C]*	33
Pressure of gas [MPa]	3.0
Flow rate of gas [Nm ³ /h]**	55,000

* This is the maximum value at the temperature range 27-33°C for the underground pipeline provided by TPDC.

** This is the maximum consumption value among the candidate GTs.

Source: JICA Study Team

Table 13-16 shows calculation results of pressure loss and flow velocity in the pipe under the above condition.

As shown in Table 13-16, it is determined that the installation of fuel gas compressor is unnecessary, since the pressure loss is sufficiently smaller than the supply pressure. It is confirmed that the noise is not a concern, because the flow velocity in the pipeline is sufficiently low compared to 20 m / s, which is the general index for noise.

This Study is carried out on the premise of installing a 300 MW class GTCC, which is the subject of this project. Regarding future expansion of Kisiwa site, it is recommended that technical study such as gas flow velocity study and pressure loss study be carried out, based on actual pressure loss after the operation.

Table 13-16 Assumed Pressure Loss and Flow Rate in the Gas Pipe

Item	Value
Pressure loss in pipe [MPa]	0.1 (1.0 bar)
Flow velocity in pipe [m/s]	6.0

Source: JICA Study Team

13.4 INSTALLATION OF WATER PIPELINE

TANESCO and MTUWASA had considered the proposed water supply system for Mtwara GTCC Power Plant. JICA Study Team confirmed the contents by document survey, interviews and site survey, and then reviewed them. Outline design was carried out based on the results of the above activities.

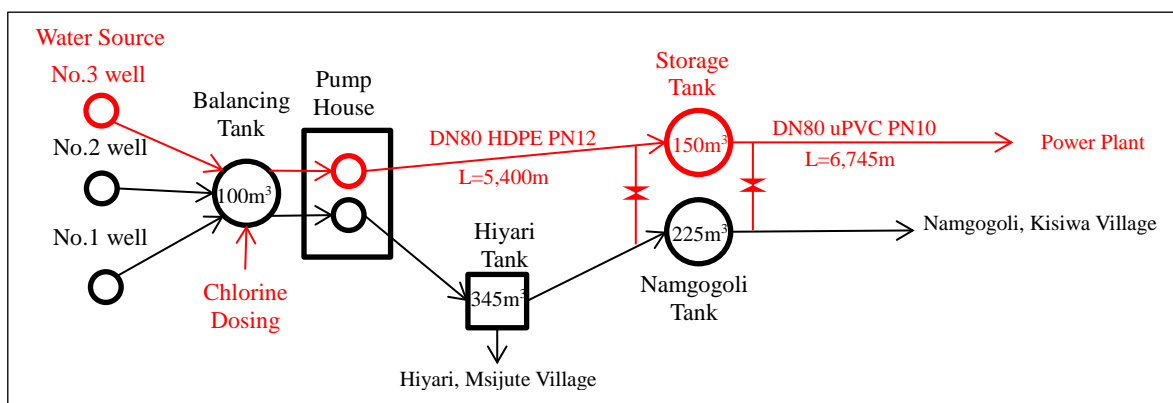
13.4.1 Review of Proposed Water Supply System

(1) Outline of the Water supply system

Outline of the proposed water supply system is shown below in Figure 13-43. New water supply facilities (see red color in Figure 13-43) will be exclusively used by TANESCO. The existing water supply facilities (see black color in Figure 13-43) in this area will not be used by TANESCO except for a few.

- Daily maximum supply volume = $15\text{m}^3/\text{h} \times 24\text{h} = 360\text{m}^3/\text{day}^1$.
- Water source will be No.3 Well which currently exists in Mbuo village. No.1 and No.2 Wells exist near No.3 Well, and will not be used by TANESCO.
- Raw water will be transmitted from No.3 Well to the balancing tank.
- Chlorine will be dosed into the balancing tank
- Treated water will be transmitted to the new storage tank (RC with capacity of 150m^3), next to the Namgogoli tank, by new booster pumps installed in the pump house through a new pipeline (DN80 HDPE PN12).
- Water will be distributed to the new Power Plant by gravity flow through a new pipeline (DN80 uPVC PN10)

Note: In the future, the water demand at Kisiwa and Namgogoli villages might increase. Therefore, the new storage tank (150m^3) should be connected to the existing tank (225m^3) at Namgogoli with valves closed so that the new storage tank can be used as additional water for the future demand.



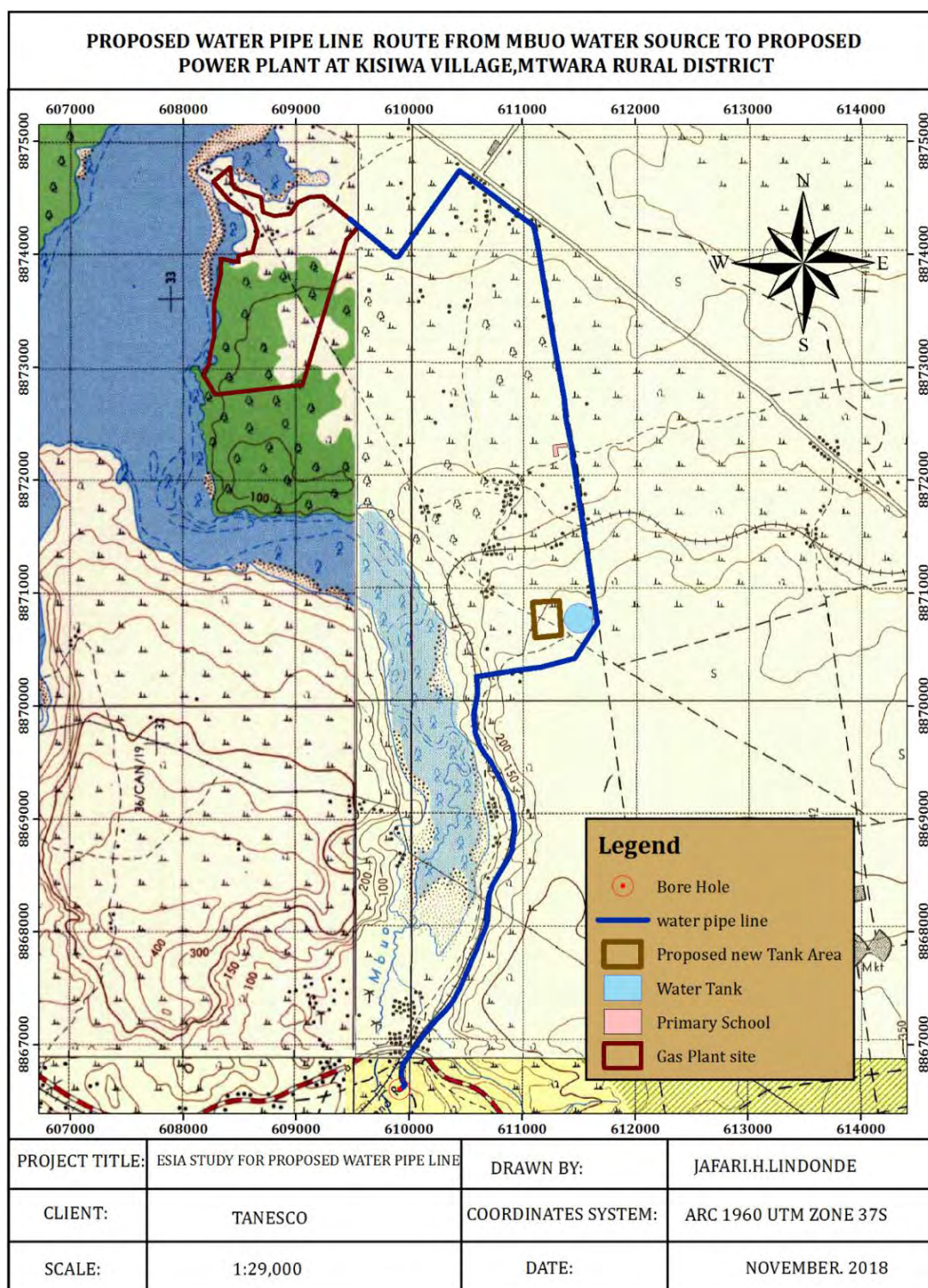
Source: JICA Study Team

Figure 13-43 Proposed Water Supply System for the Mtwara GTCC Power Plant
(black: existing, red: proposed)

¹ $360\text{m}^3/\text{day}$ includes water demand of both $300\text{m}^3/\text{day}$ for the Mtwara GTCC Power Plant and $60\text{m}^3/\text{day}$ for the residents of the Power Plant.

(2) Locations of the Proposed Water Supply Facilities

The location map prepared by TANESCO is shown in Figure 13-44.



Source: ESIA Report for the Proposed Construction of Water Supply Pipeline from Mbuo village to a Proposed Gas Power Plant (11.1km) Located at Kisiwa Village in Mtwara District, Mtwara Region

Figure 13-44 Location Map of the Water Supply Facilities

Two options for water pipeline route were considered by TANESCO, namely “ ‘No’ project alternative” and “Proposed water network route” as follows and no other options are examined.

1) ‘No’ Project Alternative

The ‘No’ project alternative entails retaining the current status without commencing the project in the proposed site/ area. Adopting this option would mean avoiding the negative effects associated with the establishment of the project and missing all the positive benefits.

2) Proposed Water Network Route

The proposed water pipeline will pass along the existing road reserve owned by TARURA to avoid the disturbance to local communities due to acquisition of their land, properties and crops and to minimize the cost of compensation.

(3) Results of Confirmation and Review

Important matters of the results are shown in Table 13-17. They are explained in detail in the following sections.

Table 13-17 Results of Confirmation and Review of Proposed Water Supply System

Item	Results of Confirmation and Review
Water Source	<ul style="list-style-type: none"> - It is difficult to determine whether the required water volume (15m³/hr., 360m³/day) can be adequately pumped from No.3 Well since the appropriate pumping tests have not been conducted. - In the basic design stage, pumping tests shall be conducted to identify the capacity of No.3 Well. In case the No.3 Well does not have adequate capacity, new water source plan shall be considered during the basic design. - Ground water quality satisfies the Tanzanian national standard for drinking water. However since the electrical conductivity (EC) is as high as the upper limit of the standard, water quality analysis must be carried out during the basic design stage.
Balancing Tank and Pump House	<ul style="list-style-type: none"> - The balancing tank and the pump house can be used with simple repair works since they are in relatively healthy states. - New inlet and outlet pipes can be installed into the wall of the balancing tank. - The pump house has enough space to install new booster pumps.
Storage Tank	<ul style="list-style-type: none"> - The planned site has enough space to construct the new tank. - The site currently includes private land, and land acquisition has not been done as of December 2018. But the owner of the land will have to agree to provide the land for the Project.
Pipeline	<ul style="list-style-type: none"> - It was confirmed that, in general, there are no obstacles present along the proposed route which will make construction work difficult. - Some sections currently include private land and land acquisition has not been done as of December 2018. But the owner of the land will have to agree to provide the land for the Project. - The existing water pipeline for Namgogoli and Kisiwa villages in the section along the upgraded collector road may hinder the road construction work. The existing pipeline may need to be replaced.
Electrical Facilities and Instrumentation Devices	<ul style="list-style-type: none"> - Electric power for the facilities will be extended from the existing TANESCO’s 33 kV power source. - Some instrumentation devices such as flowmeter and water level gauge are needed.
Operation and Maintenance	<ul style="list-style-type: none"> - After the facilities are constructed and handed over from TANESCO to MTUWASA, MTUWASA will perform operation and maintenance of the facilities. - TANESCO will pay water tariff to MTUWASA.

Source: JICA Study Team

(4) Water Source

No.3 Well, located in Mbuo village is planned to be used as water source.

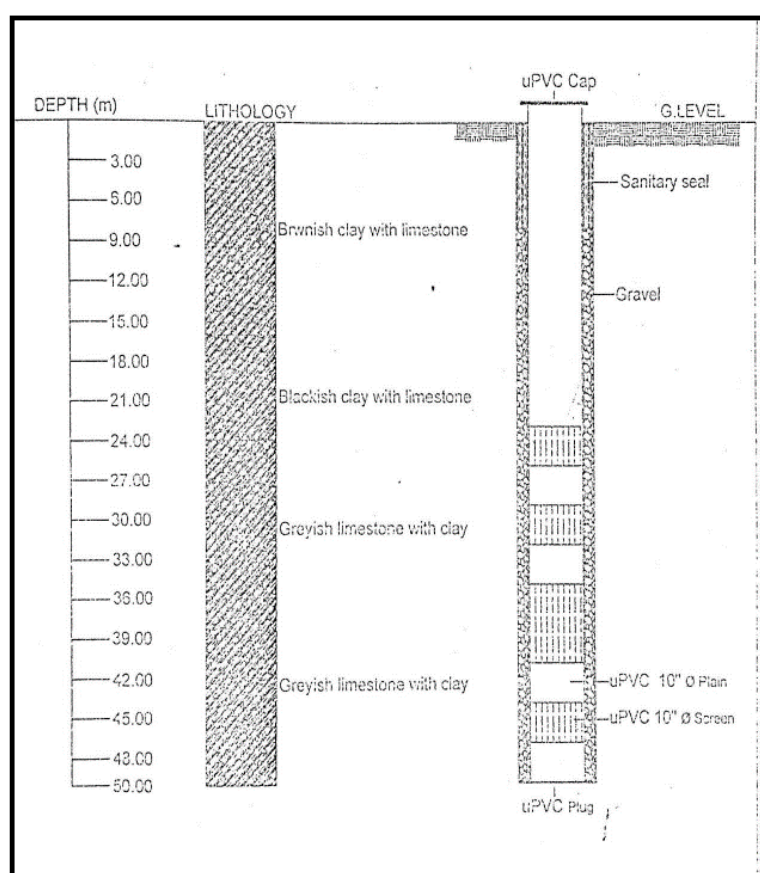
1) Current Situation of No.3 Well

No.3 Well was drilled from November to December 2017, and presently casing/screen, gravel pack are installed. Equipment necessary for intake, such as submersible pump, riser pipe, electrical equipment, etc., have not been installed yet (see Figure 13-45 and Figure 13-46).



Source: JICA Study Team

Figure 13-45 No.3 Well



Source: ESIA Report for the Proposed Construction of Water Supply Pipeline from Mbuo village to a Proposed Gas Power Plant (11.1km) Located at Kisiwa Village in Mtwara District, Mtwara Region

Figure 13-46 Borehole section of No.3 Well

2) Proper Pump Discharge Rate

According to the pumping test carried out by MTUWASA (November 2017) and the available data, it seems that only continuous pumping test has been performed. When pumped at 27m³/hr. for the 12 hour constant discharge test, the dynamic water level lowered to 45.15m, which is within the last screen position (44-47m) and close to the well bottom of 50.00m. As the step drawdown pumping test has not been carried out, the critical discharge rate required

for the proper designing of pump has not been identified. Therefore, it is difficult to determine whether 15 m³/hr. (360m³/day), required for the Project, can be pumped adequately or not.

Also, No.1 and No.2 Well are located about 130 m away from No.3 Well. In case of pumping from all the three wells at the same time, there is a possibility that these wells can interfere with each other and the drawdown of the water level can become larger than the pumping test result of each well.

At the basic design stage, it is necessary to carry out step drawdown pumping test, constant discharge test, water level recovery test and interference test to determine the proper pump discharge rate of No.3 Well.

At the basic design stage, on confirming the result of the interference test and checking the proper pump discharge rate of No.3 Well, if the design volume of 15m³/hr. (360m³/day) can be safely pumped, No.3 Well would be used for the Project. However, if not, the following options shall be considered.

These water sources are available.

- (A) No.3 Well
- (B) Use remaining capacities of No.1 and No.2 Well
- (C) Construct an additional well near the existing No.1, No.2 and No.3 Well
- (D) Construct an additional well in / near the Mtwara GTCC Power Plant

For the water source plan, the options shown in Table 13-18 can be considered by combining these water sources. Options No.1 to No.3 are considered, in case the capacity of No.3 well is 300m³/day or more. Options No.4 to No.7 are considered, in case the capacity is less than 300m³/day. Options No.3, No.6 and No.7 are considered in the case where 300m³/day of water source necessary for the Mtwara GTCC Power Plant will be constructed by JICA Loan, and 60m³/day for the residents of the Power Plant will be constructed by the expenses of Tanzanian side.

Table 13-18 Options for Water Source Plan in case the Capacity of No.3 Well is not adequate

Option No.	Capacity of No.3 well	JICA Loan		Tanzanian Side Expenses		Priority
		Design Volume	Water Source	Design Volume	Water Source	
1	≥300m ³ /day	360m ³ /day	(A) and (B)	-	-	Very Low
2		360m ³ /day	(A) and (C)	-	-	High
3		300m ³ /day	(A)	60m ³ /day	(C) or (D)	High
4	<300m ³ /day	360m ³ /day	(A) and (B)	-	-	Very Low
5		360m ³ /day	(A) and (C)	-	-	High
6		300m ³ /day	(A) and (B)	60m ³ /day	(C) or (D)	Very Low
7		300m ³ /day	(A) and (C)	60m ³ /day	(C) or (D)	High

Source: JICA Study Team

In the basic design stage, after identifying the capacity of No.3 well, the water source plan shall be decided considering the abovementioned options. The higher priority options are options No.2, No.3, No.5 and No.7. On the other hand, options No.1, No.4 and No.6 are very low priority since the No.1 and No.2 Well are in use for water supply for existing water demand. These very low priority options may not be considered.

In the Study, in order to avoid budget deficiency, we estimate that the option No.2 or No.5 with an additional well will have the highest project cost.

3) Candidate Sites for Additional Well

If an option with an additional well is selected, it will be necessary to investigate the new well drilling site at the basic design stage.

The following items should be considered in the investigation.

- Potential area for new water source shall be identified in cooperation with MTUWASA and Ruvuma Basin Water Office.
- If upstream side of No. 3 Well is selected for the drilling site, need to be careful in the distance because of the water quality related to Sulphur, since Mnyundo artesian well is one of Sulphur discharging source.
- Downstream area of No. 3 Well has a risk of seawater intrusion since it is close to the sea.

In case that No.3 Well has an adequate capacity of 360 m³/day or more, an additional well shall be investigated for using as a backup water source.

4) Ground Water Quality

According to the results of No.3 Well's water quality test carried out by MTUWASA (September 2018), the water quality satisfies the Tanzanian national standard for drinking water. Therefore, chlorination is the only water treatment needed.

However, the electrical conductivity (EC) is high at 1,998 µS/cm, which is nearly the upper limit of the standard, which is 2,000 µS/cm. In the Study, by measuring the water in the balancing tank, which is supplied from No.1 Well and No.2 Well with a portable EC meter, the value was estimated to be 1,690 µS/cm. In addition, the sodium content in salt water is estimated to be 188 mg/l which is close to 200 mg/l, the average taste threshold shown in the "WHO Guidelines for Drinking Water Quality".

The wells in Mbuo area are located less than 6 km straight distance away from the coastline of the Kisiwa bay, and the screen position is deeper than 16m below sea level. Therefore, it is necessary to carefully consider the groundwater quality, including the effect of seawater intrusion.

In the basic design stage, it is necessary to again conduct water quality analysis to confirm whether or not it is possible to satisfy the standards only by chlorine dosing.

(5) Balancing Tank and Pump House

As the receiving tank for No.3 Well, the existing balancing tank is planned to be used. A booster pump is planned to be installed at an empty space inside the existing pump house. In addition, for disinfection, a sodium hypochlorite tank is planned to be installed on top of the existing balancing tank.

1) Current Situation of Balancing Tank and Pump House

Raw water from No.1 Well and No.2 Well is transmitted to the balancing tank, and then transmitted to the Hiyari tank by the booster pump installed in the pump house. Although the

concrete structures have some stains and cracks, the existing balancing tank and pump house can be used with simple repair works since they are in relatively healthy states.

2) Piping works for Balancing Tank

New inlet and outlet pipes for the Balancing tank can be installed into the wall of the balancing tank in the same way as the existing pipes (see Figure 13-47).

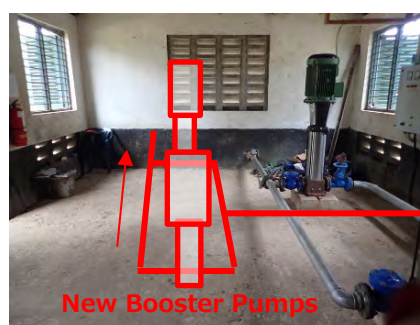
3) Space to install Booster Pump

The pump house has an existing booster pump installed, but there is still space of about 3.3m × 7.0m. The new booster pump facilities can be installed within that space (see Figure 13-48).



Source: JICA Study Team

Figure 13-47 Proposed Piping Works between Balancing Tank and Pump House



Source: JICA Study Team

Figure 13-48 Proposed Booster Pump Installation

(6) Storage Tank

The storage Tank receives water for transmission from the new booster pump and distributes it to the Mtwara GTCC Power Plant. This is planned to be installed at an elevation which provides the water pressure required by the Mtwara GTCC Power Plant.

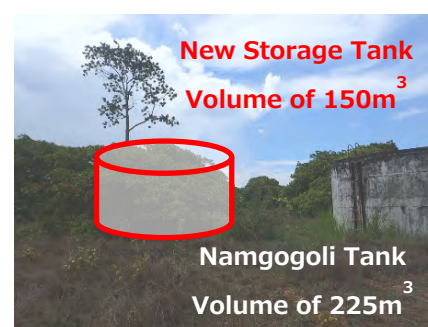
1) Location

The site adjacent to the existing Namgogoli tank of 225m³ volume is planned to be the location of the new tank (see Figure 13-49). This site has enough space to construct the new tank.

This site currently includes private land, and land acquisition has not been done as of December 2018. But according to interviews with TANESCO in December 2018, the owner of the land has agreed to provide it for this project.

2) Volume of Tank

The proposed Volume of the tank is 150m³.



Source: JICA Study Team

Figure 13-49 Proposed Location of the New Storage Tank

3) Connection to the Existing Tank

In the future, the water demand at Kisiwa and Namgogoli villages might increase. Therefore, the new storage tank (150m³) should be connected to the existing tank (225m³) with valves closed, so the new storage tank can be used as additional water for the future demand.

(7) Pipeline

Pipelines are planned to be installed in three sections: first is the raw water transmission pipe from No.3 Well to the balancing tank, second is the transmission pipe from the pump house to the storage tank, and third is the distribution pipe from the storage tank to the Mtwara GTCC Power Plant. The proposed diameter of all sections will be DN 80 and the pipe material will generally be uPVC or HDPE depending on the water pressure.

1) Pipeline Route

JICA Study Team surveyed the proposed pipeline route at the site (see Figure 13-44). As a result of the survey, it was confirmed that, in general, there are no obstacles such as structures, rivers or big plants along the proposed route which can make construction work difficult.

Specifically, the following items were confirmed at the site.

- The existing collector road is approximately 6 to 7m wide. Two meters right of way (ROW) for water pipeline installation should be saved along the road (see photos ①, ② in Figure 13-50).
- Since there are three small canals along the route, the use of high strength pipe material such as Ductile Iron is needed at those places.
- Some sections are currently private land, and land acquisition has not been done as of December 2018. But according to interviews with TANESCO in December 2018, the owner of the land has agreed to provide it for this project (see photo ③ in Figure 13-50).
- There is an existing water pipeline for Namgogoli and Kisiwa villages in the section along the upgraded collector road. The existing pipe may hinder the road construction work. Therefore, the existing pipe may need to be replaced (see photo ④ in Figure 13-50).
- For the section apart from the collector road to the Mtwara GTCC Power Plant, the water pipeline will be installed along the newly constructed road (see photo ⑤ in Figure 13-50).

2) Location of Air Valve and Washout

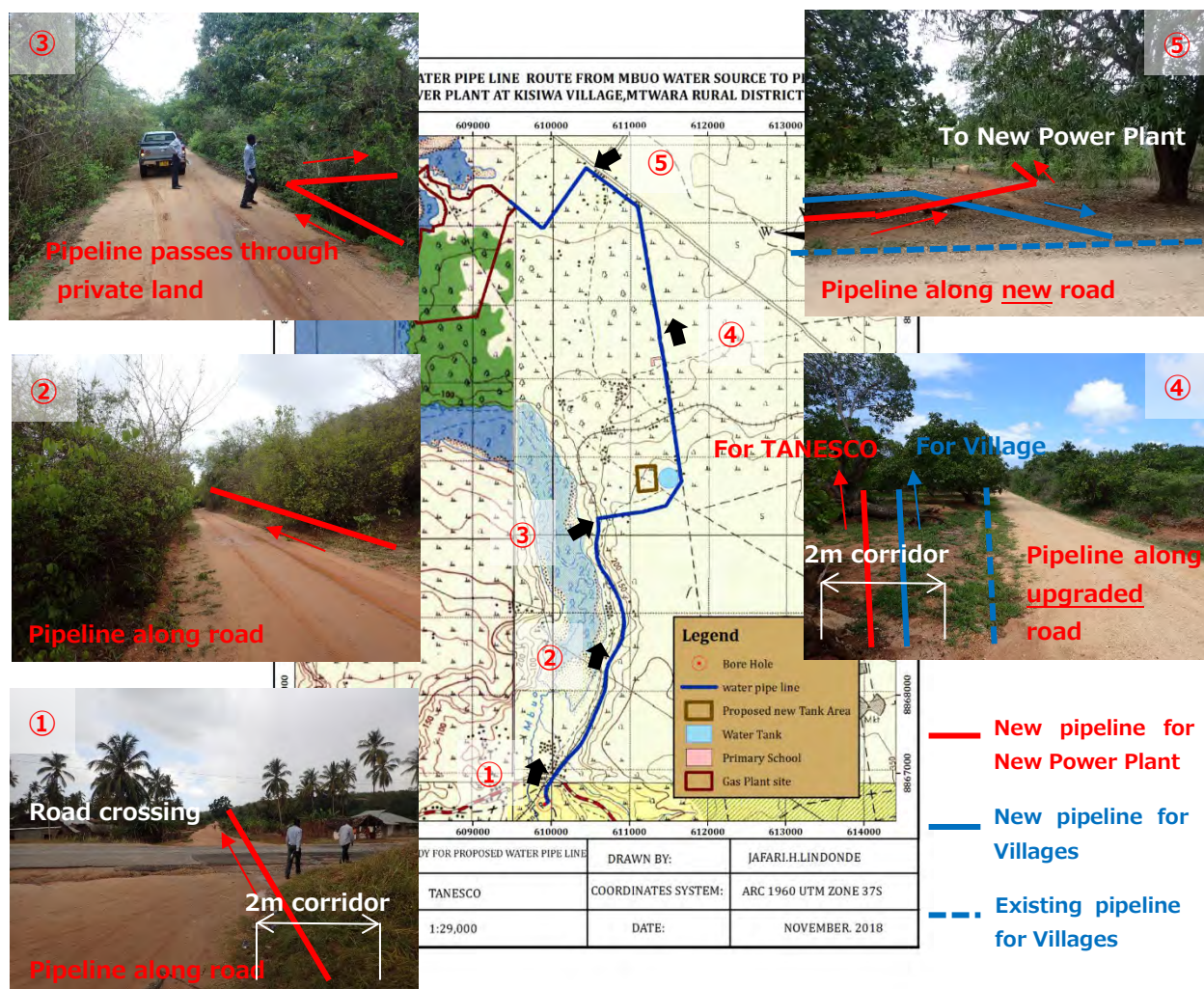
As per “Design manual for water supply and waste water disposal, third edition (March 2009, Ministry of Water and Irrigation)” (hereinafter referred to as “Design Manual”), air valves should be fitted at all high points and at points where there is a significant change in downward slope. Even in flat areas, an air valve is necessary at every 600m to 1000m, since air bubbles are formed as the water pressure drops.

JICA Study Team confirmed on the site that seven air valves have to be fitted on the transmission pipeline of approximately 5,400m length. The air valves will be fitted at all high points of the pipeline.

Also, washouts should be fitted at low points, so as to be able to periodically flush out the pipeline to help remove any matter that tends to accumulate at such points. JICA Study Team confirmed on the site that two washouts have to be fitted on the transmission pipeline.

3) Soil Property

The surface soil property along the pipeline route was mostly sandy soil and cohesive soil. Therefore it is considered that it is possible to carry out excavation using man power. However, rock is exposed on the surface in some parts, and it is difficult to excavate these using man power or ordinary excavating machines. Laying of pipelines should be avoided along these parts, and the pipeline should be laid on the other side of the road.



Source: JICA Study Team

Figure 13-50 Proposed Pipeline Route

(8) Electrical Facilities and Instrumentation Devices

1) Electrical Facilities

Electric power for submersible motor pump and booster pump will be extended from the existing TANESCO's 33 kV power source. Diesel generator will not be used.

2) Instrumentation Devices

According to the interview with TANESCO and MTUWASA in December 2018, the

following devices are necessary: water level gauge for the balancing tank, flowmeter for the outlet of the new booster pump and flowmeter for the tie in point with the new power plant. SCADA system is not necessary.

(9) Operation and Maintenance of Water Supply Facilities

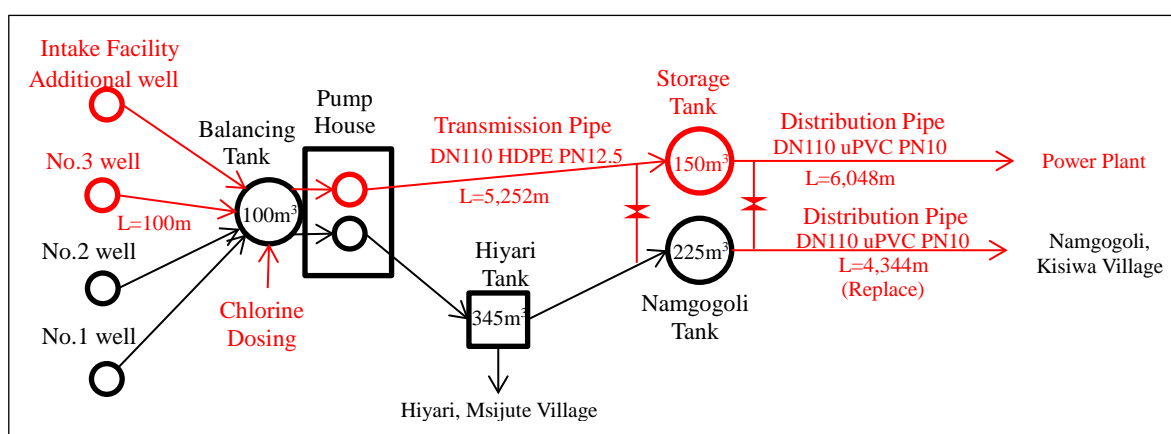
After the water supply facilities are constructed in this project, TANESCO will hand them over to MTUWASA. And then, MTUWASA will operate and maintain the facilities. Water-tariff will be paid by TANESCO to MTUWASA.

13.4.2 Outline Design

(1) Design Concept

1) Water Supply System

Based on the aforementioned review, water supply system including the location of facilities shall be as proposed by TANESCO and MTUWASA. However, an additional well and relevant facilities shall be included for cost estimation, since there is a possibility that No.3 Well may not have adequate capacity. Specifications of facilities such as pipe diameter, pipe material, pump specs and tank capacity shall be considered as per the design criteria and technical calculation. Figure 13-51 shows the new water supply system for the outline design.



Source: JICA Study Team

Figure 13-51 New Water Supply System for Mtwara GTCC Power Plant (black: existing, red: new)

2) Design Criteria

The Study complies with the following design criteria.

- “Design Manual for Water Supply and Waste Water Disposal, Third Edition, March 2009. Ministry of Water and Irrigation”
- “The Design Criteria for Water Supply Facilities, 2012, Ministry of Health, Labour and Welfare”
- Other Tanzanian, Japanese, International standards shall be referred to, as necessary.

3) Design Water Service Volume

The water requirement for the Mtwara GTCC Power Plant will be 360m³/day. To respond to this demand, MTUWASA plans to supply 15m³/hr., i.e., by 24 hours of operation, the supply will be 360m³/day. Therefore, the design water service volume shall be as shown in Table 13-19.

Table 13-19 Design Water Service Volume

Item	Value
Design Maximum Hourly Supply	15 m ³ /hr.
Design Maximum Daily Supply	360 m ³ /day

Source: JICA Study Team

4) Future extension

In case that second phase project of the Mtwara GTCC Power Plant is implemented in the future, it will be necessary to construct new water source and water supply facilities. Specifically, based on water amount required for the second phase, new well(s) will be drilled near the existing well, and pump facility, storage tank, pipeline, etc. will be constructed in parallel with the water supply facilities constructed in this project.

(2) Intake Facilities for No.3 Well

1) Pumping Test and Water Quality Analysis

It is difficult to determine from the result of the existing pumping test whether 15 m³/hr. can be pumped adequately from No.3 Well. Therefore, appropriate pumping tests and water quality analyses shall be carried out in the basic design stage, in order to confirm whether No.3 Well has enough capacity for the project.

2) Intake Pump and Transmission Pipe

[Calculation of Actual Pump Head of Intake Pump]

Actual pump head of intake pump is calculated by the pumping water level of the borehole and the high water level of the balancing tank. Actual pump head shall be 50.15m as shown in the following calculation.

- Ground level at No.3 Well = +8.0m above sea level
- Pumping water level = Static water level - Drawdown = -2.90m – 42.25m = GL-45.15m
(This value shall be revised based on pumping test result at the basic design stage.)
- High water level of Balancing tank = +13.0m above sea level
- Actual pump head = +13.0m – (+8.0m – 45.15m) = 50.15m

[Calculation of Total Pump Head and Raw Water Transmission Pipe Diameter]

The total pump head of intake pump differs depending on the pipe diameter of raw water transmission pipe. Total pump head based on pipe diameter is shown in Table 13-20. From this calculation, a pipe diameter of DN63 and a total pump head of 68.00m is recommended.

Table 13-20 Calculation of Pump Total Lift and Raw Water Transmission Pipe Diameter

Nominal Diameter	Inside Diameter	Velocity	Pipe Length (Raiser pipe + Transmission pipe)	Head Loss of Pipe	Head Loss of Pump	Margin	Total Pump Head of Pump	Note
DN 63	57mm	1.634m/s	50m + 100m	13.39m	3.00m	1.46m	68.00m	Recommend
DN 90	81mm	0.809m/s	50m + 100m	7.75m	3.00m	1.10m	62.00m	
DN 110	101mm	0.520m/s	50m + 100m	6.93m	3.00m	1.92m	62.00m	

* Head Loss on pipe is calculated by the Hazen-Williams formula

$$H = 10.666 * C^{-1.85} * Q^{1.85} * D^{-4.87} * L$$

Where: H: Head Loss (m), C: Friction Coefficient (120 for Plastic pipes based on “Design Manual”), Q: Quantity (m³/s), D: Inside Diameter (m), L: Pipe Length (m)

Source: JICA Study Team

4) Specifications

From the above study, the specifications of Intake pump and raw water transmission pipe shall be as shown in the Table 13-21.

Table 13-21 Specifications of Intake Pump and Raw Water Transmission Pipe

Item	Specifications
Pumping Test and Water Quality Analysis (at basic design Stage)	Preliminary test, Step Drawdown Test, Constant Discharge Test, Recovery Test, Interference Test, Water Quality Analysis for Drinking Water
Intake Pump	Submersible Pump, Q=15m ³ /hr., H=68m, P=4.0kW Raiser pipe: DN50, Galvanized Steel
Raw Water Transmission Pipe	DN63, uPVC PN10

* In case the No.3 Well does not have adequate capacity as per the results of pumping test and water quality analysis, additional well shall be constructed. Based on the results, in case it is decided that only additional well will be used, “intake pump” and “raw water transmission pipe”, mentioned in this table, shall not be constructed.

Source: JICA Study Team

(3) Intake Facilities for Additional Well

If No.3 Well does not have enough capacity, an additional well and raw water transmission facilities shall be constructed.

At first, geophysical prospecting shall be carried out at the two sites to determine the drilling points. Second, at the determined points, borehole drillings, pumping tests and water quality analyses shall be carried out. Intake pump and raw water transmission facilities to transmit water from the additional well to the balancing tank in Mbua shall be constructed.

The tentative specifications is as shown in Table 13-22 and shall be reviewed at the basic design stage.

Table 13-22 Specifications of Intake Facilities for Additional Well

Item	Specifications
Geophysical Prospecting	2 sites, Vertical Electrical Sounding, or Combination with Horizontal Electrical Sounding
Borehole Drilling	2 boreholes, Drilling (DTH & MUD, 12", 50m), Casing and Screen (PVC 10"), Well Development
Pumping Test and Water Quality Analysis	2 boreholes, Preliminary test, Step Drawdown Test, Constant Discharge Test, Recovery Test, Water Quality Analysis for Drinking Water
Intake Pump	Submersible Pump, $Q=15\text{m}^3/\text{hr.}$, $H=65\text{m}$, $P=4.0\text{kW}$ Raiser pipe: DN50, Galvanized Steel
Raw Water Transmission Pump Facilities	Balancing Tank: 1 no., RC structure Pump House: 1 no., RC structure Raw water Transmission Pump: Vertical, Multistage Centrifugal Pump, $Q=15\text{m}^3/\text{hr.}$, $H=50\text{m}$, $P=5.5\text{kW}$ Electrical equipment
Raw Water Transmission Pipe	DN90, uPVC PN110, $L=4,800\text{m}$

Source: JICA Study Team

(4) Balancing Tank, Pump House and Transmission Pipe**1) Balancing Tank**

Detention time is estimated as 3.1 hr., which is sufficient for the operation of intake pumps and transmission pumps. However, since water demand of the supplied area by No.1 and No.2 Wells may increase at a demand of more than 400 m³/day in the future, the volume of the balancing tank shall be reviewed at the basic design stage. An additional balancing tank may be constructed if necessary.

- Effective capacity of tank = 100 m³
- Water demand of No.1 and No.2 Wells = 400 m³/day = 17 m³/hr.
- Total water demand = 15 + 17 = 32 m³/hr.
- Detention time = 100 / 32 = 3.1 hr.

2) Transmission Pump and Transmission Pipe

[Calculation of Actual Pump Head of Transmission Pump]

Actual lift of transmission pump is calculated by the low water level of the balancing tank and the high water level of the storage tank. Actual lift shall be 59.00m as shown in the following calculation.

- Low water level of Balancing tank = +10.0m above sea level
- High water level of Storage tank = +69.0m above sea level
- Actual lift = +69.0m – (+10.0m) = 59.00m

[Calculation of Total Pump Head and Water Transmission Pipe diameter]

The total lift of transmission pump differs based on the pipe diameter of water transmission pipe. Total lift based on pipe diameter is as shown in Table 13-23. From this calculation, a pipe diameter of DN110 and a pump total lift of 99.00m is recommended.

Table 13-23 Calculation of Pump Total Lift and Water Transmission Pipe Diameter

Nominal Diameter	Inside Diameter	Velocity	Pipe Length	Head Loss of Pipe	Head Loss of Pump	Margin	Total Lift of Pump	Note
DN 63	53mm	1.890m/s	5,300m	519.78m	3.00m	1.22m	583.00m	
DN 90	75mm	0.944m/s	5,300m	95.83m	3.00m	1.17m	159.00m	
DN 110	92mm	0.627m/s	5,300m	35.43m	3.00m	1.57m	99.00m	Recommend
DN 160	135mm	0.291m/s	5,300m	5.47m	3.00m	1.53m	69.00m	

* Head Loss on pipe is calculated by the Hazen-Williams formula

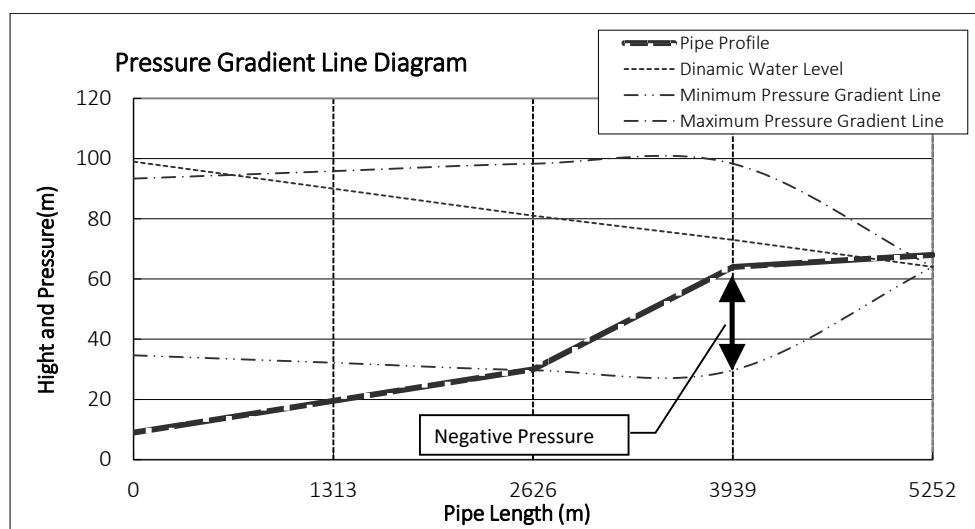
$$H = 10.666 * C^{-1.85} * Q^{1.85} * D^{-4.87} * L$$

Where: H: Head Loss (m), C: Friction Coefficient (120 for Plastic pipes based on "Design Manual"), Q: Quantity (m³/s), D: Inside Diameter (m), L: Pipe Length (m)

Source: JICA Study Team

[Calculation of Water Hammer]

As a result of outline calculation of water hammer phenomena of transmission pump (see Figure 13-52), it can be confirmed that, Negative pressure in transmission pipeline will be less than minus 10m in case that the pump suddenly loses the driving force by accidents such as power failure. Therefore, as a measure to prevent the water hammer, air chamber shall be installed.



Source: JICA Study Team

Figure 13-52 Result of Outline Calculation of Water Hammer Phenomena

3) Chlorine Dosing Equipment

Chlorine dosing shall be carried out at the balancing tank. The balancing tank will be used for both the existing water supply and the new water supply for the Mtwara GTCC Power Plant, and therefore, the capacity of the dosing equipment shall satisfy the water volume for both.

4) Specifications

From the above study, the specifications of Intake pump and raw water transmission pipe shall be as shown in Table 13-24.

Table 13-24 Specifications of Transmission Pump and Water Transmission Pipe

Item	Specifications
Transmission Pump	Vertical, Multistage Centrifugal Pump, Q=15m ³ /hr., H=99m, P=11.0kW Air Chamber 300L
Water Transmission Pipe	DN110, HDPE PN12.5
Chlorine Dosing Equipment	1 set on the Balancing Tank, Gravity Manual Dosing System

Source: JICA Study Team

(5) Storage Tank**1) Effective Volume**

The effective volume of the tank shall be 150m³ as per “Design Manual”. The calculation is as follows.

- Demand = 360m³/day
- Volume of tank: 37.5% of daily water demand = 360m³ × 37.5% = 135m³
- Design volume of tank = 150m³

2) Structure and Water Level

The structure of the tank shall be reinforced concrete (RC) which is commonly used in MTUWASA. The Effective depth is: 3.0m, Shape and size is: Diameter 8.0m

The low water level and the high water level of the tank shall be same as the existing storage tank with a volume of 225 m³. Estimating from the present ground height of the construction site which is 66m to 67m above sea level, the water level values will be the following.

- Low water level: +66m, which is comparable to the ground height
- High water level: +69m, plus the effective depth of 3.0m to the low water level.

3) Piping Works

The tank shall be equipped with drainage pipes and overflow pipes, as well as, inlet and outlet pipes for maintenance.

Inlet and outlet pipes of the new tank and the existing tank (volume of 225m³) shall be connected with closed valves between each other, in order to use the new tank in response to the increasing water demand of Kisiwa and Namgogoli villages, in the future.

The specifications of the storage tank shall be as shown in the Table 13-25.

Table 13-25 Specifications of Storage Tank

Item	Specifications
Effective Volume	150m ³
Structure	Reinforced Concrete (RC) Effective depth: 3.0m, Shape and size: Diameter 8.0m
Water Level	High water level: +69m, Low water level: +66m
Piping Works	Inlet and Outlet Pipe, Drainage and Overflow Pipe, Connection pipe with valves between new tank and existing tank
Ancillary Facilities	Chambers for Inlet and Outlet / Drainage Valves, Ventilators, Manhole for Maintenance

Source: JICA Study Team

(6) Distribution Pipe

Planned ground elevation of the Mtwara GTCC Power Plant will be +8.6m above sea level and the necessary head at the tie-in point with Mtwara GTCC Power Plant will be 15m. Therefore, the required head at tie-in point must be 23.6m or more.

As a result of the calculation shown in Table 13-26, the diameter of distribution pipe shall be DN 110. The specifications shall be as shown in Table 13-27.

Table 13-26 Calculation of Water Distribution Pipe Diameter

Nominal Diameter	Inside Diameter	Velocity	Pipe Length	Head Loss of Pipe	Head at Storage Tank	Head at Tie-in Point	Note
DN 63	57mm	1.633m/s	6,100m	425.35m	66.00m	-369.35m	
DN 90	81mm	0.809m/s	6,100m	76.83m	66.00m	-10.83m	
DN 110	101mm	0.520m/s	6,100m	26.23m	66.00m	39.77m	Recommend
DN 160	147mm	0.246m/s	6,100m	4.22m	66.00m	61.78m	

* Head Loss on pipe is calculated by the Hazen-Williams formula

$$H = 10.666 * C^{-1.85} * Q^{1.85} * D^{-4.87} * L$$

Where: H: Head Loss (m), C: Friction Coefficient (120 for Plastic pipes based on "Design Manual"), Q: Quantity (m³/s), D: Inside Diameter (m), L: Pipe Length (m)

Source: JICA Study Team

Table 13-27 Specifications of Intake Pump and Raw Water Transmission Pipe

Item	Specifications
Water Distribution Pipe	DN110, uPVC PN10

Source: JICA Study Team

(7) Electrical and Instrumentation Devices

As per the specifications of mechanical equipment and requirements of TANESCO and MTUWASA, electrical and instrumentation devices shall be as shown in Table 13-28.

Table 13-28 Specifications of Electrical and Instrumentation Devices

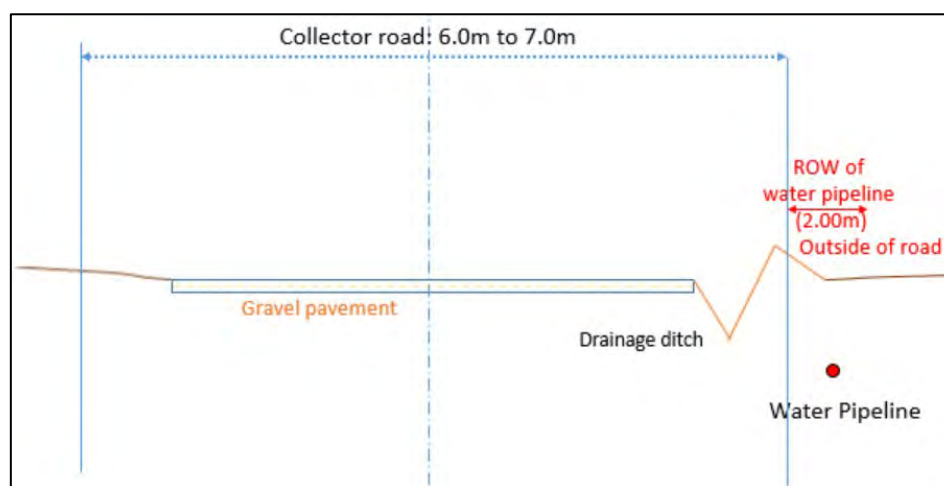
Item	Specifications
Power Receiving and Transforming equipment	Pole Mounted Switch, Pole Mounted Transformer (3 phase-4wires, 33 kV / 230 V, 50kVA), Leading-in Pole
Distribution equipment and Power Plant	Low Voltage Distribution Panel * 3 sets (2 Transmission Pumps and 1 Intake Pump)
Water Level Gauge for No.3 Well	1 set, electrostatic capacitance type
Water Level Gauge for the Balancing Tank	1 set, electrostatic capacitance type
Water Level Gauge for the New Storage Tank	1 set, clear pipe type
Pressure Gauge for No.3 Well	1 set
Pressure Gauge for the Outlet of the new transmission pump	2 sets in total, 1 set for each transmission pump
Flowmeter for No.3 Well	1 set, woltman type, install at No.3 Well
Flowmeter for the Outlet of the new transmission pump	1 set, woltman type, install in the pump house
Flowmeter for the Tie in Point with the Mtwara GTCC Power Plant	1 set, woltman type, install in the new chamber

Source: JICA Study Team

(8) Piping Works**1) Laying Position**

Cover depth of pipe shall normally be 1.0m, as per the standard of MTUWASA.

In the section along the existing collector road, pipes shall be installed within a 2m ROW outside of the collector road, which has a width of about 6m to 7m (see Figure 13-53).

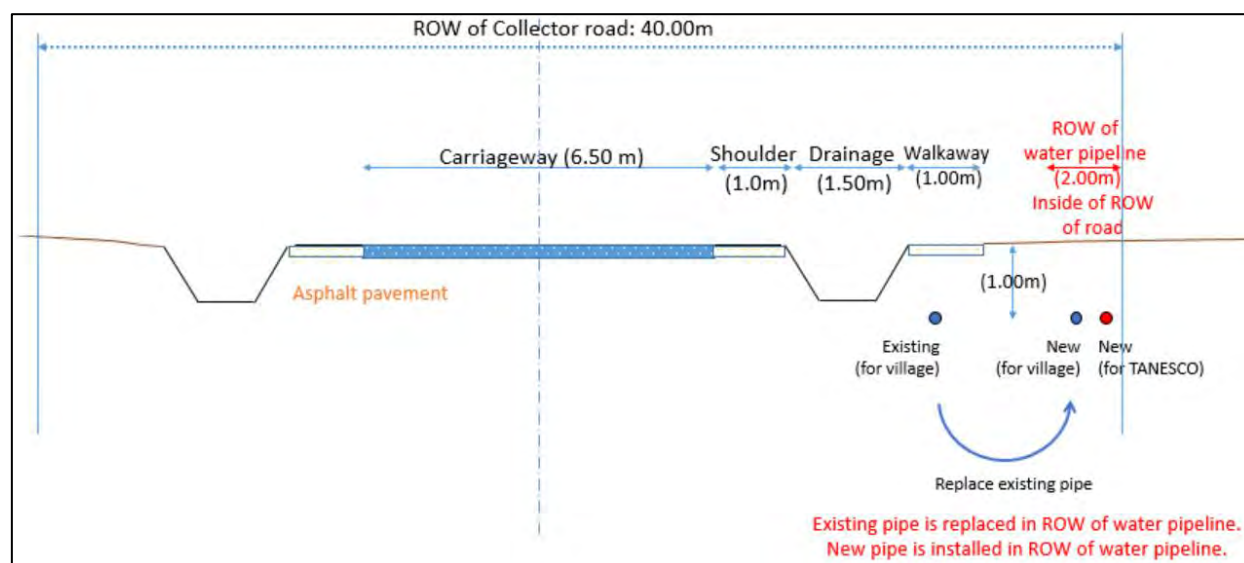


Source: JICA Study Team

Figure 13-53 Concept Cross Section in the Section Along the existing Collector Road

In the section along the upgraded collector road, pipes shall be installed within a 2m ROW inside the ROW (width=40m) of the road. Also, the existing distribution pipe for Namgogoli and Kisiwa villages is assumed to be replaced in the ROW together with the pipes for the Mtwara GTCC Power Plant (see Figure 13-54).

As the location of the existing pipe is not clearly identified in the Study, it may obstruct the upgrading work of the road, and it may become necessary to stop water supply. To avoid these problems, the location of the existing pipe shall be identified by methods such as test excavation during the detailed design for upgrading of the collector road.



Source: JICA Study Team

Figure 13-54 Concept Cross Section in the Section Along the upgraded Collector Road

2) Road Crossing

In the section crossing of the national road and the upgraded collector road, the road administrator does not allow any excavation works. Therefore, the pipe jacking method shall be adopted. Sleeve pipe material shall be Ductile Iron, which is suitable for heavy vehicular traffic load.

3) Canal Crossing

In the sections where the canals are crossed, the pipes will be exposed because they cannot be buried. Pipes in these sections shall be supported by anchor and the pipe material shall be Ductile Iron, which has high strength.

4) Intersection with gas pipeline

A section along the transmission pipeline intersects with the gas pipeline. According to the Japanese design criteria, “The Design Criteria for Water Supply Facilities, 2012, Ministry of Health, Labour and Welfare”, sand erosion by water leakage, which causes damage to the gas pipeline, is unlikely to occur if the intersecting space is more than 0.3m.

At the intersection point, cover depths will be 1.0m for water pipeline and 1.5m for gas

pipeline. Pipe diameter of water pipe will be 0.1m (DN 110), therefore, the space between the water pipeline and gas pipeline will be 0.4m.

5) Ancillary Facilities

As shown in the outline design drawings, seven air valves and two washouts shall be fitted at the appropriate points along the pipeline.

6) Excavation and Backfill

Excavation and backfill for piping works shall be mainly done by man power in order to hire as many village residents as possible based on the ESIA study. However, excavating and backfilling machines shall be used in sections where hard soil or rock is located on the surface. These sections shall be identified at the basic design stage.

Backfilling material shall be as follows based on “Design Manual”:

- Bedding (0.15m) and backfilling up to 0.1m above pipe: 2.0mm single-size gravel.
- Backfilling up to ground level: Selected soil

(10) Outline Design Drawing

Drawing list of the outline design is as shown in Table 13-29.

Table 13-29 Drawing List

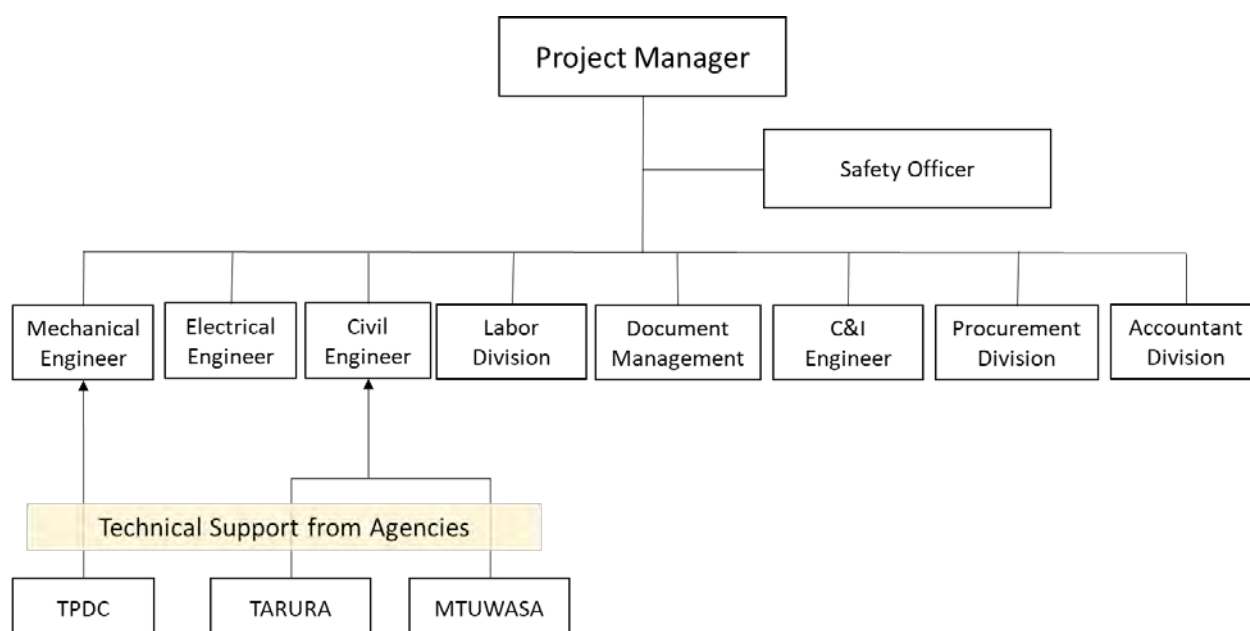
Drawing No.	Drawing Title
1	Layout Drawing of No.3 Well
2	Piping Works of Raw Water Transmission Pipeline
3	Layout Drawing of Receiving Tank and Pump House
4	Electrical Single-Line Diagram
5	Piping Works of Water Transmission Pipeline (1)
6	Piping Works of Water Transmission Pipeline (2)
7	Piping Works of Water Transmission Pipeline (3)
8	Piping Works of Water Transmission Pipeline (4)
9	Piping Works of Water Transmission Pipeline (5)
10	Structural Drawing of Storage Tank
11	Piping Works of Water Distribution Pipeline (1)
12	Piping Works of Water Distribution Pipeline (2)
13	Piping Works of Water Distribution Pipeline (3)
14	Piping Works of Water Distribution Pipeline (4)
15	Piping Works of Water Distribution Pipeline (5)
16	Piping Works of Water Distribution Pipeline (6)
17	Typical Drawing of Piping Works

Source: JICA Study Team

13.5 PROJECT IMPLEMENTATION AND ORGANIZATION STRUCTURE FOR OPERATION & MAINTENANCE OF TPDC, TARURA AND MTUWASA

TANESCO will be responsible for implementing all preconstruction works, procurement, construction and contract management related to three (3) infrastructures development with technical support from TPDC, TARURA and MTUWASA. Project management structure during the construction stage is shown in Figure 13-55.

After the COD of Mtwara GTCC Power Plant, assets of three (3) infrastructures and the operation and maintenance task (O&M) will be transferred to responsible agencies. Current activities and O&M capacity of those organization are described in following section.



Source: JICA Study Team

Figure 13-55 Project Management Structure

13.5.1 Road

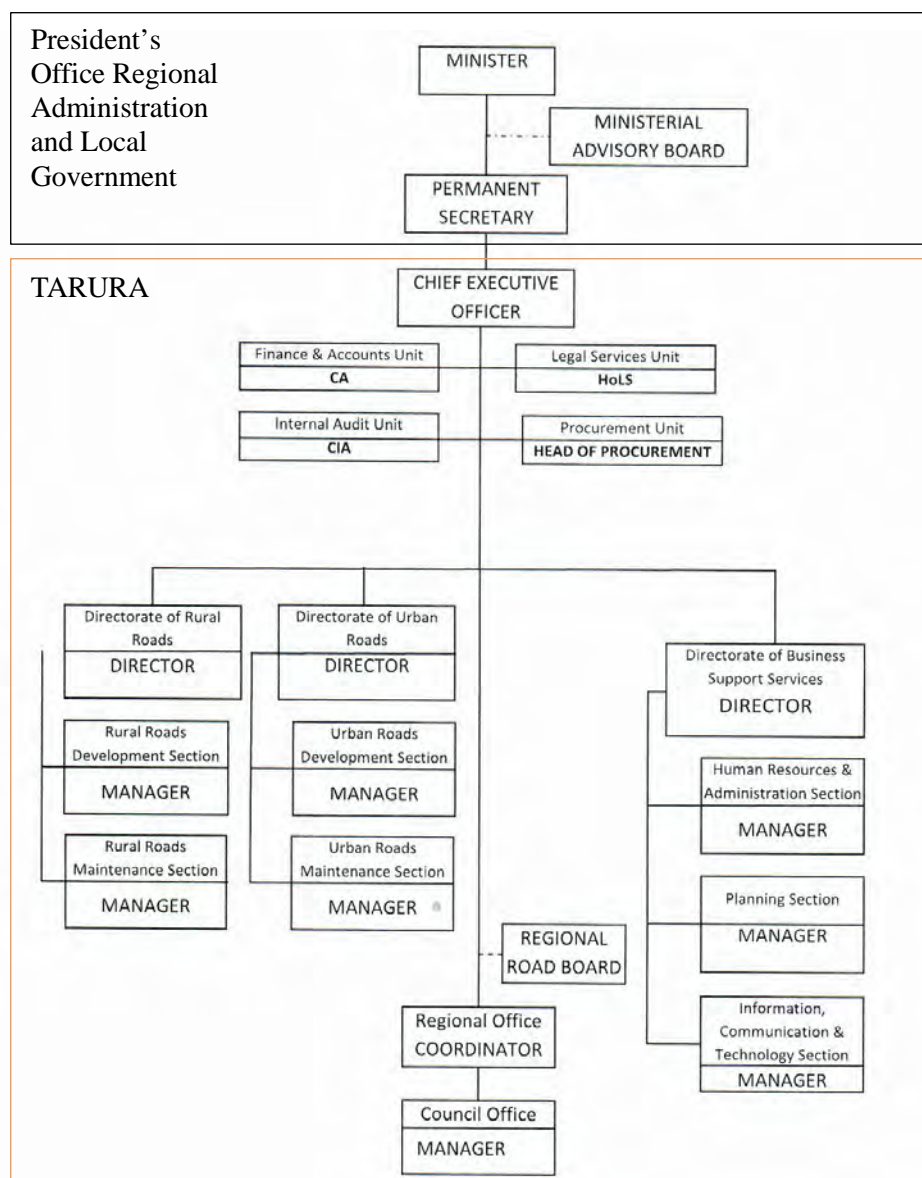
(1) Organizational Activities

After the COD of Mtwara GTCC Power Plant, ownership of property and the operation and maintenance task (O&M) of the targeted road will be transferred to TARURA.

TARURA is headed by the Chief Executive (CE), who is accountable to the Permanent Secretary, President's Office Regional Administration and Local Government. There are three (3) functional Directorates, seven (7) Sections and five (5) Units. The Chief Executive, Directors and Head of Units form the Management Team of the Agency and are all based at the Head Quarter in Dodoma region. TARURA's organization chart is shown in Figure 13-56.

Various road maintenance and operation tasks are performed by the Councils through the respective Council Managers. Regional Coordinators are responsible for monitoring all the Work done by the Councils, and the delegated Accounting Officers are responsible for all procurement related issues of their respective regions. TARURA has twenty six (26) Regional offices and one hundred and eighty four (184) Council offices

The Agency is mandated to execute its functions by providing quality services to the public by developing and maintaining interventions related to the rural and urban roads and the related facilities. To achieve the overall goal of improving rural and urban road network for a sustainable development; the Agency has six objectives in its five years Strategic Plan (2016 – 2021), which when effectively implemented, are expected to positively impact the output of core and support functions of development and maintenance in the rural and urban roads network.



Source: TARURA

Figure 13-56 Organization Chart of TARURA

The targeted road will be managed by TARURA Mtwara District Council (DC) Office and Council Office's organization chart is shown in Figure 13-57. Implementation of road O&M is in charge of Engineer and Technicians of Mtwara DC Office. TARURA recognize the number of O&M staff is not sufficient and they have engaged a number of professionals in recent years. The JICA Study Team recommend TARURA to continue current activities and employ required professionals in council offices, in order to implement of road O&M appropriately.

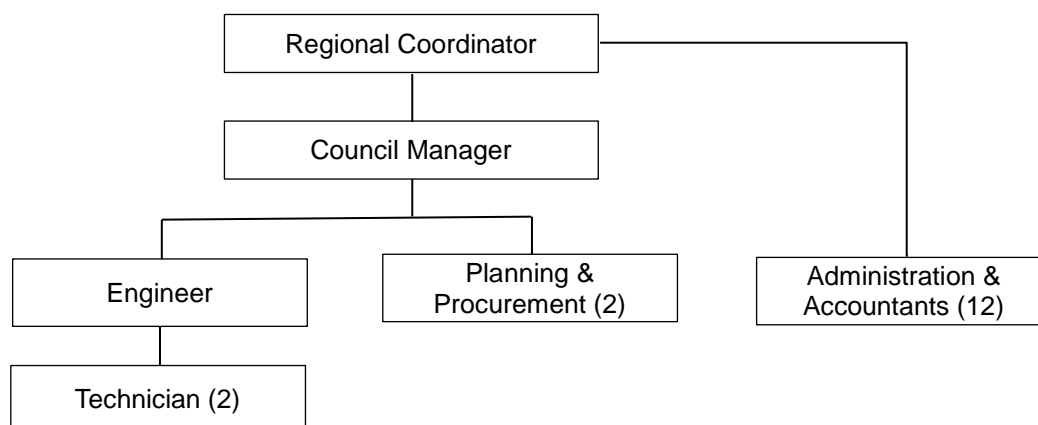


Figure 13-57 Organization chart for Mtwara DC Office

(2) Capacity for O&M

1) Length of Road

According to TARURA's Annual Progress Report for Maintenance Programme (FY2017/2018), the Agency has a mandate of developing and maintaining rural and urban roads network of approximately 108,946.19 Km, as of June 2017.

Summary of road network condition for each surface type that is managed by TARURA is shown in Table 13-30.

Table 13-30 Road Condition as per Road Class and Pavement Type (as of June 2017)

Road Type	Road Condition (Km)			Total (Km)	Percentage (%)
	Good	Fair	Poor		
Paved	1,026.27	283.37	139.91	1,449.55	1.3
Gravel	9,732.45	9,597.37	5,075.58	24,405.4	22.4
Earth	13,853.49	27,374.52	41,863.23	83,091.24	76.3
Total	24,612.21	37,255.26	47,078.72	108,946.19	100.0
Percentage (%)	22.51	34.21	43.28	100.0	

Source: TARURA Fourth Quarter Development Progress Report (FY2017/2018)

2) Guidelines and Manuals for O&M

In accordance with some sections of Operational Guidelines for District Roads Maintenance which was published by Prime Minister's Office Regional Administration and Local Government (PO-LARG), Ministry of Works (MoW) and JICA in December 2014, TARURA is implementing operation and maintenance.

3) Human Resources

According to TARURA's Annual Progress Report of the Maintenance Programme (FY2017/2018), TARURA has 1,447 Staff, of which 1,334 have been seconded from various Government institutions (Ministries, Agencies and Regional Secretariats) to TARURA and 113 have been engaged on contract basis. This is equivalent to 36% of the total Staff

requirement of 4,092. With assistance from the Government, TARURA makes an effort to recruit staff to meet the requirement.

4) Budget

Budget for undertaking maintenance activities in the Financial Year 2017/18 was TZS 283,749,114,460.18. This includes rolled-over maintenance funds of TZS 30,933,290,000.00 from FY 2014/15, 2015/16 and FY 2016/17. The budget comprises of Maintenance Works component, provision sum for Emergency, Monitoring and Supervision and capacity building, purchase of vehicles and houses, stakeholders' meetings, operations of research center, recruitment of staff & renting and renovation of office buildings. The detailed Maintenance budget for the FY 2017/18 is as shown below in Table 13-31.

Table 13-31 Maintenance Budget for FY 2017/18

ACTIVITY	ANNUAL ESTIMATES		
	Target (Km)	Budget TShs. (Mil)	(%) of Total Budget
Maintenance Works:			
Routine maintenance	24,674.68	44,354.00	15.63
Spot improvement	7,477.45	33,988.67	11.98
Periodic maintenance	6,814.29	119,445.71	42.10
Maintenance bridge/culverts	192box, 2551 line, 196bridge, 72 drift & 51252m line drainage	49,955.22	17.61
Sub Total - Maintenance Works	38,966.42km	247,743.59	87.30
Emergency (Provisional)		5,781.14	2.04
Monitoring and Supervision:			0.00
TARURA HQ		1,100.00	0.39
Regional Offices		1,524.34	0.54
Supervision to TARURA-Councils		14,011.71	4.94
Supervision of Road Fund Development projects		453.29	0.16
Administration costs		1,050.00	0.37
Recruitment of Staff		1,935.22	0.68
Sub Total - Monitoring and Supervision		6,062.85	2.14
Non- Works Component			
Capacity building		770.33	0.27
Operations of Road Research Centre		186.79	0.07
Purchase of 4 vehicles for TARURA HQ		560.40	0.20
Purchase of 4 houses for TARURA Staff		705.00	0.25
Annual Stakeholders Meeting		850.00	0.30
Review of development projects designs		35.00	0.01
Road research activities		356.00	0.13
Office renting for Regions and Councils offices	-	389.83	0.14
Renovation of Buildings for TARURA's Regional and Council Offices (Fund from Supervision of Development Projects and Operations Road Research Centre)	-	588.89	0.2
Sub Total (Non – Works)		4,115.65	1.45
Additional Items to Budget			
Purchase of 20 vehicles (RFB additional fund)		2,176.47	0.77
Design, develop and installation of TARURA financial management information system and extension of PORALG WAN to TARURA offices (RFB additional fund)		1205.13	0.42
Purchasing of furniture for Regional and Council offices(RFB additional fund)		2,325.98	0.82
Sub Total (Non – Works)		6,034.18	2.13
Grand Total	38,966.42	283,749.12	100

Source: TARURA Fourth Quarter Progress Report of the Maintenance Programme (FY2017/2018)

(3) Recommended Maintenance Work

According to the Operational Guidelines for District Roads Maintenance (December 2014, POLARG), the following maintenance works will be recommended in order to keep the roads in good condition. TARURA has the capability to do the following maintenance work and TARURA Mtwara District Council Office is in charge of the targeted section of the road of the project.

Following road maintenance works are recommended by the JICA Study Team.

1) Routine Maintenance Work

Routine maintenance is based on regularly patrol (weekly/ bi-weekly) the condition of surface pavement, cut and fill slopes, drainage and culverts to monitor any defects and damage. Especially it is important to monitor conditions of roads after the rainy season in Tanzania.

The result of routine inspection should be informed to the TARURA Mtwara District Council Office for follow up maintenance works to be undertaken either continually throughout a year or certain intervals.

- Monitoring (crack, rut depth)
- Cleaning of pavement surface
- Patching up the damaged road surface (repair potholes)
- Reshaping the road surface
- Repairing and cleaning road side ditches, slopes and traversal drainage structures (culverts)

2) Periodic Maintenance Work

Periodic maintenance is based on detailed inspection performed at appropriate time intervals such as seasonally or yearly. Defects and damage will be reported for repairs or remedies.

- Inspection
- Road surface repairs (seal material grouting, overlay, pavement millings (RAP), etc)
- Sub-base repairs
- Repairs of structures

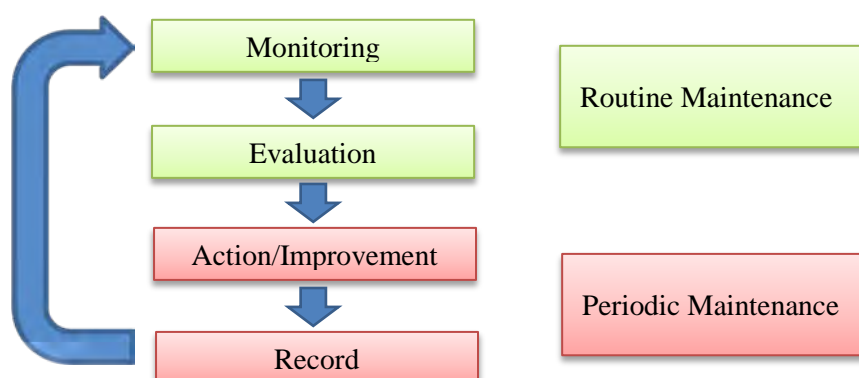
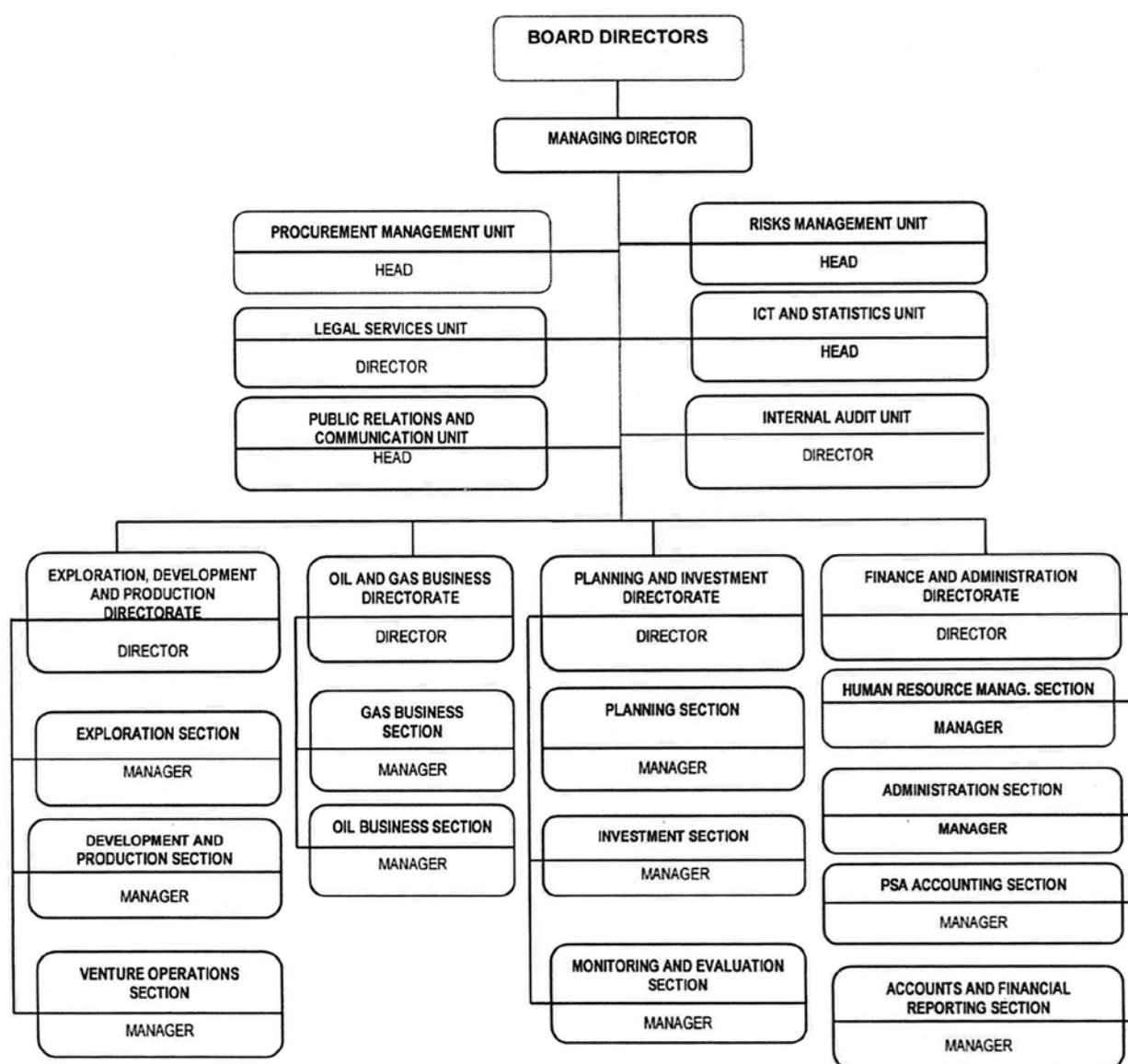


Figure 13-58 Road Maintenance Cycle

13.5.2 Gas Pipeline

(1) Organizational Activities

TPDC is the national oil company of Tanzania and began operations in 1973. TPDC is a wholly owned government parastatal, with all its shares held by the Treasurer Registrar. The organization structure of TPDC is shown in Figure 13-59. There are 6 units and 4 directorates under the managing director. After COD of the Mtwara GTCC Power Plant, ownership of gas pipeline from BVS01 to Mtwara GTCC will be transferred from TANESCO to TPDC. TPDC owns gas production facilities and gas pipelines, collects gas charges from consumers, and allocates O&M budgets to GASCO.

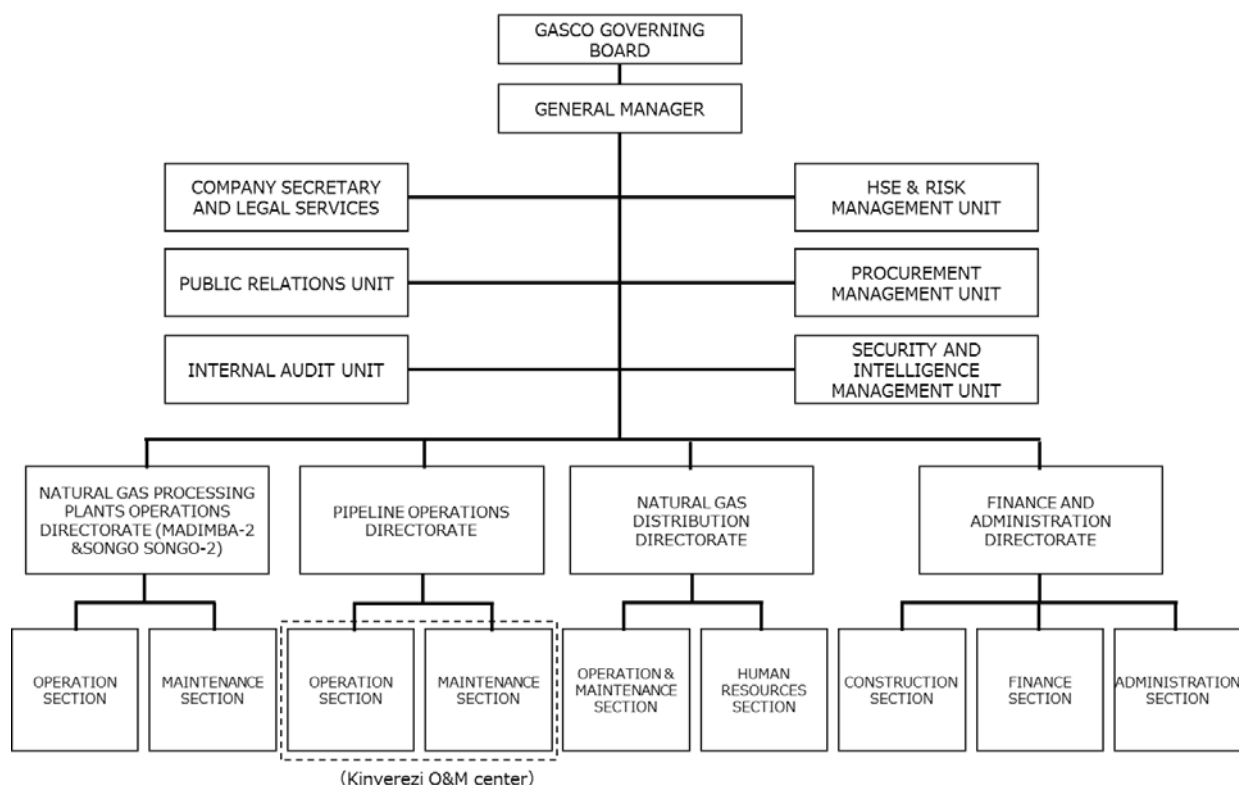


Source: JICA Study Team

Figure 13-59 Organization Structure of TPDC

GASCO is a subsidiary of TPDC, and is responsible for O&M of gas production facilities and gas pipelines owned by TPDC. The organization structure of GASCO is shown in Figure 13-60. Pipeline operations directorate and natural gas distribution directorate are responsible for O&M of high pressure gas pipelines and low pressure gas pipelines respectively. The value of 3 bar defines the high pressure and low pressure for the gas pipeline. In this project, pipeline operations directorate will be responsible for O&M of the gas pipeline from BVS01 to Mtwara GTCC and the O&M center which is located in Kinyerezi will be in charge of O&M of the gas pipeline.

In addition, through conversation with TPDC, JICA Study Team confirmed that GASCO has a great deal of experience and no serious accidents have occurred.



Source: JICA Study Team

Figure 13-60 Organization Structure of GASCO

(2) Capacity for O&M

1) Length of gas pipeline

According to the interview with TPDC, the length of gas pipeline owned by TPDC is shown Table 13-32. The total length of gas pipeline is almost 570 km. In this project, the length of gas pipeline from BVS01 to Mtwara GTCC is about 13 km which is about 2 % of total length.

As described in Section 13.5.2(1), for GASCO, O&M of gas pipeline and pressure reduction station is not difficult. Therefore, additional workforce and cost for O&M is limited and this project does not have a major impact on the operation and maintenance of GASCO.

Table 13-32 Length of Gas Pipeline owned by TPDC

Item	gas pipeline Name	Length [km]
1	Mtwara to Dar es Salaam	551
2	Dangote Distribution	2.7
3	Goodwill Distribution	1.65
4	Ubungo to Mikocheni Distribution	6.2
5	Permanent Connection to Power Plants	6.4
Total	-	567.95

Source: JICA Study Team

2) Guidelines and Manuals for O&M

GASCO has its own internal Standard Operation Procedures (SOPs) for undertaking O&M of gas pipeline which also is in line with acceptable international standards of oil and gas industry. In addition, TPDC requires EPC contractor who will be responsible for undertaking construction of the gas pipeline to develop O&M manuals as per as built drawings.

3) Human Resources

According to the interview with TPDC, the total number staff at TPDC and GASCO are 175 and 171, respectively. Almost all the staff of GASCO are in charge of O&M for gas processing plants and gas pipelines except a few supporting staff, who work in administration, finance and so on. There are existing gas pipelines for Dar es Salaam and Dangote factory near the gas pipeline route of this project. Therefore, GASCO will be able to carry out O&M of gas pipeline of this project with a slight increase in workload.

4) Budget

According to the recent financial statement of TPDC, the consolidated cost of sales is as shown below. From this table, it can be inferred that TPDC stably allocates adequate O&M Budget.

Table 13-33 Consolidated Cost of Sales of TPDC

Item	2018 (TZS 'm)	2017 (TZS 'm)
Purchase of natural gas	186,326	121,929
Pipeline and plants maintenance	29,068	25,836
Depreciation of gas processing plant & pipeline	81,157	80,864
Depletion of natural gas properties	3,916	346
Profit Sharing Agreement carried expense	4,340	4,818
Total	304,807	233,793

Source: Report of the Controller and Auditor General on the Consolidated and Separate Financial Statements of Tanzania Petroleum Development Corporation for the year ended 30 June 2018

(3) Recommended Maintenance Work

In order to keep facilities in good condition, the following work and maintenance are recommended. GASCO has the ability to do the following work and maintenance.

1) Routine Maintenance Work

Monitoring of gas pressure and gas flow

2) Periodic Maintenance Work

- (a) Visual inspection along the gas pipeline (pipeline : once a day, pressure reduction station : once a week)
- (b) Leak check of gas along the gas pipeline (once every two years)
- (c) Current measurement between gas pipeline and ground (once every two years)
- (d) Repair and replacement of damaged facilities (every time a trouble occurs)

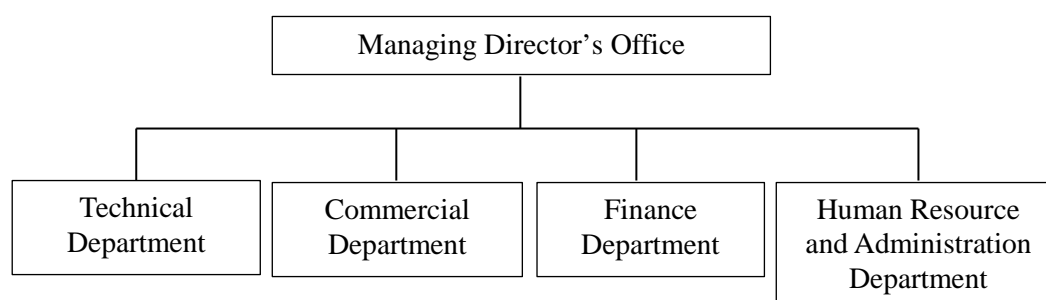
13.5.3 Water Pipeline

(1) Organizational Activities

After the COD of the Mtwara GTCC Power Plant, ownership of property and the operation and maintenance task (O&M) of the targeted water pipelines will be transferred to MTUWASA.

MTUWASA, Mtwara Urban Water and Sanitation Authority, is one of the executive agencies owned by the Ministry of Water in Tanzania. MTUWASA is a water utility organization, authorized to provide water supply and Sanitation disposal services in the urban part of the Mtwara Municipal. MTUWASA is headed by the Minister for water, Executive board and Managing director. There are four (4) functional Directorates, four (4) Officers and one (1) auditor.

MTUWASA's staff composition is shown in Figure 13-61. Technical department is responsible for the O&M work of the water facilities.



Source: ANNUAL REPORT FOR THE YEAR 2017/2018

Figure 13-61 Organization Chart of MTUWASA

(2) Capacity for O&M

1) Water Supply Facilities

According to MTUWASA's ANNUAL REPORT FOR THE YEAR 2017/2018, the major facilities for water supply in MTUWASA consist of twelve (12) boreholes, five (5) pumping

stations, twelve (12) storage tanks and transmission and distribution main pipeline of 248.82km (see Table 13-34).

Newly constructed facilities in this project are: borehole, pumping station, storage tank and pipeline, which are similar in kind to the existing facilities. Therefore, MTUWASA has enough technical capacity to maintain them.

Table 13-34 Water Supply Facilities of MTUWASA

Item	Number	Note
Borehole	12 nos.	2 of them are not working
Pumping Station	5 nos.	
Storage Tank	12 nos.	
Transmission and Distribution Main	248.82km	

Source: ANNUAL REPORT FOR THE YEAR 2017/2018

2) Human Resources

According to MTUWASA's ANNUAL REPORT FOR THE YEAR 2017/2018, MTUWASA has 55 staff in total, and the technical department has 19 staff who are responsible for O&M work (see Table 13-35).

New facilities will be constructed in the same area as the existing facilities in Mbuo, Namgogoli and Kisiwa, especially pump facilities will be constructed in the existing pump station in Mbuo. Therefore, MTUWASA's staff will be able to carry out the additional O&M work with a slight increase in workload.

Table 13-35 Staff Composition of MTUWASA

Department	Permanent Employees	Contract Employees	Total Employees
Managing Director's Office	1	2	3
Technical Department	16	3	19
Commercial Department	19	0	19
Finance Department	3	3	6
Human Resource and Administration Department	7	1	8
Total	48	9	55

Source: ANNUAL REPORT FOR THE YEAR 2017/2018

3) Budget

Table 13-36 shows the breakdown of the expenses of FY 2015-2017. Expenses for undertaking maintenance and repair activities were between TZS 53,241,919 and 81,358,938, which accounts for 1.9% to 4.0% of the total expenses. The average of the three fiscal years is 2.6%. Certain amount of expenses for maintenance and repair work is spent.

In Japan, the expense for maintenance work was 8.8% of the total expense, on an average for all utilities, in FY 2018. However, it was 5% or less for 60.8% of the utilities. Expenses for maintenance work in MTUWASA are almost same as the Japanese utilities.

Table 13-36 Expenses for from FY 2015 to 2017 (TZS)

	2017	2016	2015	Total
Water production expenses	833,667,506	781,665,174	356,789,000	1,972,121,680
Water distribution expenses	244,609,836	225,199,155	198,000,690	667,809,681
Maintenance & Repair expenses	67,594,647	53,241,919	81,358,938	202,195,504
Personal expenses	865,861,489	794,641,340	608,286,151	2,268,788,980
Administration expenses	616,455,876	749,430,905	485,311,457	1,851,198,238
Event & Donation	11,650,500	6,196,500	7,618,150	25,465,150
Business promotion	42,963,849	35,211,983	13,410,975	91,586,807
Financial expenses	8,534,064	11,144,373	9,631,072	29,309,509
Creditors expenses			213,976,151	213,976,151
Tangible asset	287,339,216	173,255,501	56,605,900	517,200,617
Total	2,978,676,983	2,829,986,850	2,030,988,484	7,839,652,317
Percentage	2.3%	1.9%	4.0%	2.6%

Source: Report of the Controller and Auditor General on the Financial Statements of the Mtwara Urban Water Supply and Sanitation Authority for the Year (2017, 2016, 2015)

(3) Recommended Maintenance Work

The following maintenance and repair works are recommended in order to keep the facilities in good working condition. MTUWASA has the technical capability to do the following maintenance work.

1) Routine Work

Routine maintenance and repair works are listed below;

- Monitoring of flowrate and pressure.
- Visual checking the condition of facilities.
- Cleaning of facilities.
- Minor repairing of damaged facilities such as leakage of pipes.

2) Periodic Works

Periodic maintenance and repair works are listed below;

- Water quality analysis (pH, conductivity, E.coli, etc.) of raw water and treated water.
- Water level measurement and recording of No.3 Well
- Repair and replacement works for damaged facilities

Water quality analysis should be conducted as shown below as per “Design Manual for Water Supply and Waste Water Disposal, Third Edition, March 2009. Ministry of Water and Irrigation”.

- Samples for water quality analysis should be collected from the balancing tank, pump house and storage tank.
- Maximum interval between successive samples should be 1 month.

Water level measurement and recording of No.3 Well should be conducted at least once a month to check the groundwater condition and its chronological change. The records are fundamental information to judge if the pumping discharge is adequate. The work is recommended to carry out at the same time with water sampling work for water quality analysis to keep both records for comparison purpose in case of necessity.

Repair and replacement works should be performed with an annual budget secured based on the results of daily maintenance work.

13.6 ENVIRONMENTAL IMPACT ASSESSMENT

Based on the JICA's Guidelines for Environmental and Social Considerations (April, 2010), JICA Study Team has reviewed the ESIAs and RAP for the gas pipeline, access road, and water pipeline using the Environmental Checklist as shown in Table below. Taking into account the characteristics of these associated infrastructures, it was decided to conduct the environmental review with the Environmental Checklist.

13.6.1 Environmental Checklist of the Associated Facility: Gas Pipeline

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1)ESIA and Environmental Permits	(a)Have ESIA reports been already prepared in official process?	Y	ESIA has been prepared already. (ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED CONSTRUCTION OF NATURAL GAS PIPELINE FROM BVS-1 AT HIYARI TO THE PROPOSED 300MW GAS POWER PLANT AT KISIWA VILLAGE IN MTWARA DISTRICT, MTWARA REGION, September 2019)
		(b)Have ESIA reports been approved by authorities of the host country's government?	N	ESIA has not been submitted to the authority yet.
		(c)Have ESIA reports been unconditionally approved? If conditions are imposed on the approval of ESIA reports, are the conditions satisfied?	NA	-
		(d)In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	N	Aside from the ESIA Certificate, the following permits are also required (Table 3.2, ESIA p. 32): <ul style="list-style-type: none"> - Permission from the Ministry of Infrastructure to transport heavy load from the port of entry to the site - Working permit for employees of the suppliers and its permitted sub-contractors - Wastewater discharge permit - Building permit - Permit for felling trees - Permission to transmit gas from Hiyari to Kisiwa Village <p>These permits will be obtained after the ESIA approval.</p>
	(2)Explanation to the Local Stakeholders	(a)Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?	Y	In accordance with the regulation 17 of the ESIA and Audit Regulations, 2005, providing directives and procedures for public participation in the ESIA process, stakeholder consultation was conducted. The different stakeholders were engaged through the following methods: <ul style="list-style-type: none"> - Public meetings - Individual meetings - Focus Group Discussions - Project status reports - Project brochures or leaflets - Notices in convenient places <p>(RAP p65-68)</p> <p>The main stakeholders consulted during the Study included but not limited to:</p> <ul style="list-style-type: none"> - Mtwara Regional Office - Mtwara District Office - TPDC Madimba Gas Plant and TPDC Head Office - Focus Group Discussion with Wards and Village Leaders at Mayanga and Naumbu Wards, and Hiyari, Mbuo, Namgogoli and Kisiwa Villages. - Community involvement at this stage also involved public meetings at Hiyari, Mbuo, Namgogoli and Kisiwa villages. <p>Meetings were held in an area that is convenient for the interested parties. The venues were particularly convenient for the affected communities. Venues and times of the meetings for affected communities were selected by the help of local leaders agreed upon with the PAPS with the advice of the village leaders and consideration of the attendance of women and other vulnerable groups. (RAP p.65)</p> <p>Issues raised in the meeting with the communities include:</p> <ul style="list-style-type: none"> - Request for CSR activities in the communities; - Proper waste management; - Proper compensation and timely payment; - Community involvement; - HIV and STD prevention; - Benefit for the local community; - Improvement of Health facility; - Noise, vibration and dust during implementation; - Upgrading of the existing road to tarmac; and - Use of casual labor from the community.
			Y	(ESIA p.62-79) The list of participants and minutes of stakeholder meetings are attached in Appendix III.

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)				
				Date	Venue	Stakeholder	Major comments	Response
				06/5/2019	Mtwara RAS office	RAS – Mtwara Region	<ul style="list-style-type: none"> • Make sure sensitization meetings are done to the project affected people before land acquisition processes. • During land acquisition process make sure village leaders are involved effectively in order to solve some disputes at village levels 	<ul style="list-style-type: none"> • Sensitization meetings were held during Resettlement Action Plan and ESIA studies and will continue through RAP implementation and project life cycle • Local leaders shall be involved in all RAP implementation
				06/5/2019	Mtwara RAS office	Assistant RAS- Infrastructure	Improvement of Mikindani road should be considered as an alternation to a road from Hiyari to Kisiwa	Both port and road shall be used during transportation of materials, machineries and equipment to the site.
				6/05/2019	DED office	DED - Mtwara District Council	<ul style="list-style-type: none"> • The design of the TL route should consider offsetting Dangote land. • Developer should avoid delaying the compensation payments. • Education and awareness raising on project impacts should be given a priority • Waste management should be taken into consideration 	<ul style="list-style-type: none"> • Dangote Company Limited is consulted. • TANESCO shall pay compensation upon satisfaction that the PAPs are genuine. • Awareness and sensitization meetings were conducted and will continue throughout the RAP implementation. • The district council does not have defined dumpsite but municipal landfill will be used.
				6/05/2019	Mtwara DC Office	District Commissioner – Mtwara	<ul style="list-style-type: none"> • I would suggest TANESCO to provide us with timeframe of implementing this project so that we know how to address villagers. • We have made some sensitization meetings on the same project so whenever you are facing any challenge let us communicate • Valuers should note that there is no concept of “this is no body’s land” because every land has owner so make sure all owners participate during valuation. 	<ul style="list-style-type: none"> • The timeframe for implementing the project will be provided • Further sensitization meetings shall be done during RAP and the project implementation. • Where complains rises public meetings will be called upon to resolve the issues at the beginning
				29/04/2019	TPDC Mtwara Office	Tanzania Petroleum Development Corporation	<ul style="list-style-type: none"> • Observe well the proposed wayleave corridor so that we can avoid or minimise adverse impacts at the planning and designing stage. • The design of the gas pipeline will pass through number of houses but this after considering all alternatives. • All crops and other properties found within the corridor should be marked to avoid complains during verification. 	<ul style="list-style-type: none"> • The design is done together. • This impact is considered low but irreversible. • All properties within the project area are marked with spray
				07/05/2019	Kisiwa Village Office	Naumbu ward Councillor and Mtwara DC Chairman	<ul style="list-style-type: none"> • We need this project so let its construction start for development of the nation. • Weed this project but it should provide employment to local people. 	<ul style="list-style-type: none"> • Noted and we appreciate that. • Noted
				06/05/2019	Kisiwa village Office	PAPs and Village leaders in Kisiwa village in Mayanga Ward	<ul style="list-style-type: none"> • TANESCO has valued our properties for construction of 300MW power plant but we are not yet compensated. So please pay us the previous compensation before acquiring another land. • Compensation process should be transparent to minimize complains and conflicts and enough time should be given for people to prepare for valuation exercise to enable very PAP to participate in the exercise himself /herself. • The project will affect our livelihoods because most of us depend on cashew nuts. • Some PAPs do not have the Identity Cards what will be the procedures in the compensation payment. 	<ul style="list-style-type: none"> • TANESCO is in the process of approving payments. • Compensation will be paid following the approval by Chief Government Valuer. All arising grievances will be addressed. • Compensations will be given for all crops to be affected by the proposed project. • They will be attested by the village leaders.
				08/05/2019	Mbuo Office	PAP in Mbuo and Village leaders in Ndumbwe Ward	We ask the project to help on construction of secondary school, dispensary, village office and water project as agreed by TANESCO and project financiers Mbuo PAPs wanted to know if they will be allowed to continue with farming activities in areas beyond the project areas	<p>The project will prepare a livelihood restoration programme on which agreed projects will be implemented (dispensary, school classrooms, water, etc.) depending on the availability of funds.</p> <p>The project will give notice before construction begins to allow those with crops to harvest.</p>

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)				
				08/05/2019	Namgogoli Office	Namgogoli village in Naumbu ward	<ul style="list-style-type: none"> • Employments opportunities to arise during construction and operation phases of the project should be given to natives so as to realise benefits of the project. • Compensation should be fair according to kind of properties affected by the project and should be prompt. • We need the village to benefit from the project by helping village projects such as construction secondary school, dispensary, village water supply project, and improvement of access roads • We want to know if our primary school building will be affected by the project 	<ul style="list-style-type: none"> • Some employment opportunities which does not require skilled personnel shall be given local people. • Compensation will be paid following the approval by Chief Government Valuer. All grievances will be addressed including those people who were not paid. • The project will prepare a livelihood restoration programme on which every affected village will advise on the type of project to be implemented (dispensary, school classrooms, water, etc.) depending on the availability of funds. • Avoiding the school structure shall be the priority to minimise adverse impacts of the project
				08/05/2019	Kisiwa Office	Kisiwa village in Naumbu Ward	<ul style="list-style-type: none"> • Project should help our village school we have shortage of class room at primary school • Compensation processes should be transparent to minimize or avoid conflicts with the project • Provide employments to PAPs in the village as a priority 	<ul style="list-style-type: none"> • The project will prepare a livelihood restoration programme on which every affected village will advise on the type of project to be implemented (dispensary, school classrooms, water, etc.) depending on the availability of funds. • Compensation process shall be done transparently following the laid down procedures as per Land Act and Land Regulations. • The contractor will be advised to hire local people for specific tasks e.g. labours need to be hired from the village
				08/05/2019	Mtwara DC Office	TAASISI YA KUSAIDIA SHUGHULI ZA WANAWAKE MTWARA (MTWARA WOMEN EMPOWERMENT ORGANISATION) - (TAKUA)	<ul style="list-style-type: none"> • We advise TANESCO and other project counterparts to conduct awareness to communities on social impacts of the project such as spread of HIV/ AIDS. • We are ready to sensitise women to see this project as an opportunity for them to employ themselves i.e. mamantilie to improve their livelihoods. • Project developers, contractors and other key stakeholders should cooperate with local leaders in order control some unnecessary grievances 	<ul style="list-style-type: none"> • Awareness rising is being conducted in collaboration with Community Development Officers from Mtwara District Council. • NGOs shall be involved so as to ensure project shall be zero impacts to women and women engages in activities that will improve their livelihoods. • Noted and TANESCO shall supervise this to ensure that local leaders are well informed and involved.
				08/05/2019	Mtwara DC Office	TANZANIA COMPANION ON NATURE DEVELOPMENT	<ul style="list-style-type: none"> • We proved capacity building on livelihood improvement and entrepreneurship skills to communities in Mtwara. So involving us in this project will help TANESCO to implement Livelihood Restoration Programs. • There are farmers that depends on cashew nuts only so after land acquisition TANESCO should in contact us to train PAPs on alternatives sources of income. • Community sensitization programs on HIV/AIDS should be established to avoid. • Youths found at the villages within project areas should be considered during recruitment of unskilled labours 	<ul style="list-style-type: none"> • Noted and we will work collaboratively ensure communities get alternative activities and implement Livelihood Restoration Programs. • Alternative means of incomes earning shall be trained. • Sensitization and awareness programs shall be coordinated. • Noted and contractor shall be given condition to employ local people
				08/05/2019	Mtwara DC Office	MTWARA SOCIETY AGAINST POVERTY ORGANISATION (MSOAPO)	<ul style="list-style-type: none"> • Build capacity of the PAPs on proper ways to utilize compensation money. • Community engagement in every stage of the project will help such project to be perceived as their own project. • Education on environmental conservation should be provided to project affected people 	<ul style="list-style-type: none"> • After compensation payment is done, TANESCO shall engage various NGOs to train PAPs on ways to utilize compensation money. • Noted and all local leaders and public shall be engaged during project design and implementation. • Awareness rising on environmental conservation will be continuously provided
				7/09/2019	Dangote Office	DANGOTE CEMENT LIMITED	<ul style="list-style-type: none"> • The Gas pipeline should not pass through our land. • If the pipeline is to be laid on the boundary line we have no problem but piece of land that will be acquired by TPDC as their corridor from our land should be totally removed from 	<ul style="list-style-type: none"> • It was agreed that the gas pipeline shall be laid in the boundary line between Dangote and TANROADS land which is being used as quarry site. • This is noted and TPDC will do the needful after acquisition process is completed

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)				
							Dangote's ownership so that we cannot keep on paying for land rent	
				04/09/2019	TANROADS Regional Office at Mtwara	TANROADS	The project corridor shall not affect the operation of the quarry site. Thus, we have no reservation on implementation of this national project. However, boundary of the gas pipeline should be well marked to control encroachment	Noted, TPDC will need 10m-15m corridor from TANROADS area. So, the corridor shall be well demarcated
		(b)Have the comments from the stakeholders (such as local residents) been reflected to the project design?	Y	Among those mentioned in the stakeholder meetings, some opinions are already incorporated in the project, i.e. upgrading of the road, HIV and STD issues, waste management, job creation and livelihood restoration.				
	(3)Examination of Alternatives	(a)Have alternative plans of the project been examined with social and environmental considerations?	Y	The section "6.5.4: Alternative Routes" describe the alternative analysis for 2 routes from safety, social and economic point of view. And "6.5.3: Alternatives Connection Points (BVS)" describes the comparison of 2 connection points from safety, social and economic point of view.				
2 Pollution Control	(1)Air Quality	(a)Do air pollutants, (such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust) emitted from the proposed infrastructure facilities and ancillary facilities comply with the country's emission standards and ambient air quality standards? Are any mitigating measures taken?	N	The gas pipeline will not generate air emissions during normal operation. However, in case of gas leak, it may generate fugitive methane emissions (Section. 6.4.3 Impacts during Operation Phase - Negative Impacts) Mitigation Measures: - Application of cathode protection system to prevent corrosion. (ESIA p.86)				
		(b)Do the electric and heat source at accommodation use fuel with low emission factor?	NA	There is no emission source anticipated during operation.				
	(2)Water Quality	(a)Do effluents or leachates from various facilities, such as infrastructure facilities and the ancillary facilities comply with the country's effluent standards and ambient water quality standards?	NA	There is no emission source anticipated during operation.				
	(3)Wastes	(a)Are wastes from the infrastructure facilities and ancillary facilities properly treated and disposed of in accordance with the country's regulations?	NA	There is no waste to be generated anticipated during operation.				
	(4)Soil Contamination	(a)Are adequate measures taken to prevent contamination of soil and groundwater by the effluents or leachates from the infrastructure facilities and the ancillary facilities?	NA	There is no source of soil contamination anticipated during operation.				
	(5)Noise and Vibration	(a)Do noise and vibrations comply with the country's standards?	NA	There is no source of noise and vibration anticipated during operation.				
	(6)Subsidence	(a)In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	NA	The gas pipeline will not need water during operation.				
	(7)Odor	(a)Are there any odor sources? Are adequate odor control measures taken?	NA	There is no source of odor anticipated during operation.				
3 Natural Environment	(1)Protected Areas	(a)Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	NA	The project site is not located within a protected area. The closest protected area from the project area is the Naliendele forest reserve which is about 70 kilometers away. (ESIA p.120). There is "Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP)" about 20km to the eastern side of the project area, which was established under Act No. 29 of 1994 of Marine Parks and Reserves of Tanzania. The content in ESIA report need to be revised, section 4.6: Current zoning, which mentions that the project area is located in MBREMP.				
	(2)Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	N	The project site is mostly characterized by shrubs and thickets. However, during vegetation survey in many areas along the proposed pipeline route vegetation were observed to be modified by ongoing human activities such as cultivation, harvesting of forest products, grazing and clearing for habitats. This was evidenced by the presence of exotic species, mainly crops, in most areas with few regenerating wood species spotted, those that generate after being heavily harvested. (ESIA p. iv)				
		(b)Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	N	Since the proposed pipeline route passes across disturbed vegetation and inhabited areas, no big wild animals or signs of their presence was observed during the Study period. Most animals observed during the survey include birds, lizards, butterflies, grasshoppers, ants of various kinds and many other invertebrates. In particular, and commonly observed were the brown wild rats (Rattus norvegicus) found in farms and thickets. Also one Pale-billed Hornbill (Tockus pallidirostris) was observed in the dense thickets along the pipeline route, closer to the proposed power plant area. This species is almost endemic to the Miombo woodlands and is classified under IUCN class as least concern (LC). (ESIA p. iv) Please see the description above, (2) Ecosystem (a).				

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(c)Is there a possibility that changes in localized micro-meteorological conditions, such as solar radiation, temperature, and humidity due to a large-scale timber harvesting will affect the surrounding vegetation?	N	The impacts of the project on the bio-physical environment is potentially very small as the project is situated in the urban center where no big wildlife is expected; vegetation clearance will be done but the vegetation to be cleared is common grass and bushes. (ESIA p.xi)
		(d)Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	N	The gas pipeline will not require water during operation.
	(3)Hydrology	(a)Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?	N	The construction of the gas pipeline project will involve underground laying of 12 inches (12”) pipeline with a total length of 13km through Mbuo and Namgogoli villages. (ESIA p.33)
	(4)Topography and Geology		N	There is no possibility that the project will affect surface water and groundwater flow.
		(a)Is there a possibility the project will cause large-scale alteration of the topographic features and geologic structures in the project site and surrounding areas?	N	Please see the description above, i.e. (3) Hydrology (a).
4 Social Environment	(1)Resettlement	(a)Does the project implementation cause involuntary resettlement? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	Y	<p>The construction of the proposed gas pipeline will start from the BVS 01 to the proposed the Kisiwa site. The gas pipeline will have a diameter of 12 inches with total way leave corridor of 30m i.e. 15m from either side of the centerline. The length of the proposed gas pipeline is approximately 11.5km. The number of PAPs and number of affected HHs are shown right table. (RAP p.v)</p> <p>It is proposed that the minimization shall be done in this project to fill the gap between the legal requirements of Tanzania and JICA guidelines. (ESIA p.31)</p>
		(b)Has adequate explanation on compensation and resettlement assistance been given to affected people prior to resettlement?	Y	<p>The following methodology for engaging stakeholders is described in the RAP. And consultation activities with affected people have been done.(RAP p.69) RAP.5.3.1 Process of the Stakeholder Engagement</p> <p>The different stakeholders were engaged through the following methods:</p> <ul style="list-style-type: none"> - Public meetings - Individual meetings(during household survey) - Administration of household questionnaire - Focus Group Discussions - The media (newspapers, local and national radio stations to be used during discloser process) - Project brochures or leaflets - Notices in convenient places
		(c)Has the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards been developed based on socioeconomic studies on resettlement?	Y	Buildings have be assessed under Tanzania law, but the compensation will be paid based on full replacement cost In-kind compensation will be considered as an option for public structures and for those proved to be vulnerable people who wish for the in-kind compensation. (RAP p.32)
			Y	<u>Payment of compensation of properties at depreciation rate</u> (RAP p. 113) According to our legislation, the values normally makes negotiation and pay top up allowance during compensation period if the property or structure is valued at depreciation rate. Also, compensation payments are effected by complying with the national laws (Land Act No. 5 of 1999, Land Regulations, 2001,).
		(d)Are the compensations going to be paid prior to the resettlement?	Y	According to “Table 35: Tentative RAP Implementation Schedule”, “3.2 Effecting Compensation of properties to all project affected persons and institutions” reads as payment which comes before relocation.
		(e)Are the compensation policies prepared in document?	Y	RAP Table 2: Comparison between National Policies and Legislations versus International Policies on Resettlement and Compensation describe how to align the project policy with JICA Guidelines. (RAP p.31)
		(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, the people below the poverty line, ethnic minorities, and indigenous peoples?	Y	<p>The preparation of the RAP has demanded extensive public consultation and participation of PAPs and stakeholders in the whole process. The resettlement has considered the following important aspects in the Plan:</p> <ul style="list-style-type: none"> - Plan for in-kind compensation for public structures and identified critical vulnerable people. (RAP p.98) <p>Vulnerable PAPs will be provided with the following:</p> <ul style="list-style-type: none"> - Special assistance to enable them rightfully to get their compensation including opening up bank account.

Number of PAPs, Loss of Houses and Graves

Gas pipeline project			
Villages	No. of PAPs	Number of Houses affected	Number of Graves
Mnyundo	32	0	0
Mbuo	29	0	0
Kisiwa	15	0	0
Namgogoli	68	8	0
TOTAL	144	8	0

Source: This RAP study, May, 2019

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				<ul style="list-style-type: none"> - Assistance in lodging the complaints and seeking legal advice when needed - They will be given priority for employment on project-related jobs as long as they are able to deliver the required level of service. - The properties of these vulnerable group will be compensated in kind (RAP p.116)
		(g)Are agreements with the affected people obtained prior to resettlement?	Y	As shown in Table 35: Tentative RAP Implementation Schedule of RAP, explanation about the compensation rate will be done (3.6) with the PAPs and the valuation will be done base on the agreed rate. Compensation (2.1) (RAP p.124)
		(h)Has the organizational framework been established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	Y	Chapter 7 of RAP describes the organizational framework to be applied to the project. This is the typical organizational framework applied in Tanzania and used for the land acquisition of the Kisiwa site as well.
		(i) Are any plans developed to monitor the impacts of resettlement?	Y	Chapter 11 of RAP describes the monitoring and evaluation of this project, which include both internal and external monitoring.
		(j) Is the grievance redress mechanism established?	Y	Chapter 8 of RAP describes the grievance mechanism of this project, which has 4 stages to resolve a complaint: starting from village committee, district committee, land tribunal & court of law, with court of law as the final measure.
	(2)Living and Livelihood	(a)Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	Y	<p>Chapter 10 of RAP describes the income and livelihood restoration strategies. With 10% of the compensation budget, such measures as follows are proposed(Majority of the PAPs depend on agriculture (farming activities) for their livelihood while a small group of PAPs have additional income from employment or informal businesses and fishing activities.)</p> <ul style="list-style-type: none"> - Access to agricultural extension services will be provided to affected communities in order to improve production for the remaining land. - Provide agricultural trainings on how to grow crops and have good harvest and where possible high yield seeds will be provided. - Training on modern fishing methods to maximize their income earnings - Encourage PAPs to be involved in beekeeping to increase their income. <p>(RAP p.113 and 114)</p>
	(3)Heritage	(a)Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	Unknown	<p>There are no cultural or historical sites within the project area that are recognized or recorded at the regional and/or central government levels (ESIA, p. 54)</p> <p>There are no graves that will be affected by the project (ESIA, p. 55)</p>
	(4)Landscape	(a)Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	Y	<p>Removal of vegetation such as trees, stockpiling of construction materials and wastes changes the landscape of the area. During construction it is anticipated that these will have impact of the natural landscape of the area, thus reducing/affecting the scenic value of the proposed project area. This impact is expected to be long term lasting for a project lifetime. (ESIA p.74)</p> <p><u>Mitigation measure</u> Avoid felling large trees (ESIA, p. 84)</p>
		(b)Is there a possibility that landscape is spoiled by construction of high-rise buildings such as huge hotels?	N	<p>The construction of the gas pipeline project will involve underground laying of a 12 inches (12”) pipeline with a total length of 13km through Mbuo and Namgogoli villages.(ESIA p.33)</p> <p>There are no buildings to be constructed in this project.</p>
	(5)Ethnic Minorities and Indigenous Peoples	(a)Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	Y	The major ethnic group in Mtwara district is the Makonde (the majority) the indigenous in spite in some wards like Nanyamba, Nanguruwe, Mpapura, Mayanga, Madimba, and Mahurunga to there are other minority tribes who are either business persons or Public and Private workers, but all of them speak Swahili language as their means of communications. The people dwelling in this project area non- indigenous and of different tribes as mentioned beforehand. (ESIA p.54)
		(b)Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	NA	Same as above
	(6)Working Conditions	(a)Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	N	<p><u>Construction Phase</u> On-going activities during construction do pose hazards and may lead to accidents to workers. Operating machines and equipment without use of proper personal protective equipment (PPE), hazards from falling trees, metals cuts, non-barricaded trenches and many others are identified as possible hazards which can result to accidents to workers onsite. Following work safety procedures helps to minimize the significance of the impact. (ESIA, p. 77)</p> <p><u>Operation Phase</u> Occupational health and safety risks during operation are minimized as compared to construction phase. The impact is confined to workers during maintenance of the pipeline; however, during operation maintenance is conducted by well trained personnel with proper PPE. Therefore, the impact is considered positively high during operation that in other phases of the project. (ESIA, p. 79)</p> <p><u>Mitigation Measures:</u></p> <ul style="list-style-type: none"> - Worker’s health and safety will be monitored through an occupational injury and illness reporting program, accident and near-misses reporting and investigation protocols. - Provision of proper work instructions and safety measures for each job

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				- Improved pit latrines facilities at site will be provided including washing water. The number of workers engaged will determines the number of the toilets to be provided. (ESIA, pp. 86-88)
		(b)Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	Y	The following measures will be taken. - Post proper signs at site to warn workers of safety requirements as regards to machines operation, moving parts, High voltage, sharp edge, deep hole, etc. - First Aid box will be provided and have a trained person to handle site emergencies and incidences. - Safe and clean drinking water will be provided at all worksites. - Personal protective equipment (PPEs) such as safety helmets, safety masks, safety boots, uniforms and hand gloves will be provided to the workers based on hazard exposed. (ESIA p.96)
		(c)Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	Y	The following measures will be taken. - Providing proper work instructions and safety measures for each job - Only trained workers will be allowed to operate machine and equipment - Monitoring of workers' health and safety through occupational injury and illness reporting program (e.g. accident, near-miss) (ESIA p.96)
		(d)Are appropriate measures being taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	Y	The following measures will be taken. - The contractor should make sure that campsite is fenced properly to avoid any trespassing of local communities - Security guards will work within the campsite only without interfering areas beyond the campsite - Security guards will be trained on the best ways communicate with local communities - If in any case the security guards needs to patrol the gas pipeline, the local leaders shall be consulted and integrated during the patrol (ESIA, p. 88)
5 Others	(1)Impacts during Construction	(a)Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	Y	Mitigation Measures for pollution during construction phase are described in the following sections. Noise, Vibration (7.1.2.4) Air pollution (7.1.2.1 and 7.1.2.5) Soil erosion and pollution (7.1.2.2) Wastes (7.1.2.6) Water (in ESMP under liquid waste generation)
		(b)If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	Y	Mitigation measures for impact on biological environment is described in the following section. Loss of vegetation (7.1.2.3) - Construction footprint will be kept to a minimum and focused only on the gas pipeline's right of way for project construction activities. - Sensitize the contractor and developer's management to plant trees and vegetation and restoring some of original vegetation on the bare space when the construction is completed. - Before excavation activities, the top soil around vegetation to be cleared should be kept separately so that after the construction activities it can be spread to land which is not used for restoring the original vegetation. - After the construction, during vegetation rehabilitation time, the project developer should try to raise the seedlings of natural vegetation to be planted after the construction works are completed.
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	Y	Mitigation measures for social impacts are described in the following sections. Public health (7.1.2.9) Increased Traffic Congestion (7.1.2.10) Occupational Health and Safety (7.1.2.8)
	(2)Monitoring	(a)Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	Y	Chapter 9 of ESIA describes about the monitoring considering the potential impacts. And ESIA states "Monitoring involves the continuous or periodic review of mitigation activities to determine their effectiveness. Consequently, trends in environmental degradation or recovery can be established and previously unforeseen impacts can be identified and dealt with during the project lifecycle". (ESIA p.103)
		(b)What are the items, methods and frequencies of the monitoring program?	Y	Table 9.1: Environmental and Social Monitoring Plan (EMP) of ESIA provides for the items, methods and frequencies of the monitoring program. The following items are included. Monitoring during Pre-construction phase - Whether appointment of the Health, Safety and Environment (HSE) Officer has been done and carries out his/her responsibility. - Checking whether maintenance of construction equipment has been done and complies with emission standards thus ready for work at site; - Checking whether training and sensitization of the staff on safety and environmental issues is carried out; - Checking whether HIV/AIDS sensitization campaign are being carried out; Construction phase - Check if mitigation measures are being implemented; - Check whether HIV/AIDS sensitization campaigns are done in regular periods - Check if occupational health and safety measures (conditions at materials storage places, work sites, equipment, personal protective equipment (PPE), etc.) are implemented. - Check if measurement of air quality, vibration and noise levels and socioeconomic aspects, etc. are done and analysis is done to compare with baseline data on as indicated in the ESIA study and mitigation measures are reviewed accordingly.

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				<p>Environmental and Social Monitoring During Operation</p> <p>Developer will be responsible for monitoring the environmental and social impacts after construction and handing over of the proposed project. In addition, NEMC may undertake compliance audit once a year on the project activities. Among other things, the appointed Experts should deal with include:</p> <ul style="list-style-type: none"> - Checking air pollution from the emissions complies with the standard levels - Checking whether environmental control measures are functioning as proposed or need to be reviewed for improvement; - Checking fire risks and protections are in good order all the time so as to contain any fire outbreak within the project area. Any fire risks are or potential are eliminated such as gas leakage, designated storage, designated smoking and non-smoking areas, etc.;
	(2)Monitoring	(c)Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	Y	Table 9.1: Environmental and Social Monitoring Plan (EMP) of ESIA provides for the responsibility and monitoring cost.
		(d)Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	Unknown	During construction and operations phases of the project team of experts will be conducting Monitoring on implementation of ESMP and reports of the monitoring will be submitted to the relevant regulatory authorities (ESIA, p. 106)

13.6.2 Environmental Checklist of the Associated Facility: Access Road

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)																																																																								
1 Permits and Explanation	(1)ESIA and Environmental Permits	(a)Have ESIA reports been already prepared in official process?	Y	ESIA report has been prepared.																																																																								
		(b) Have ESIA reports been approved by authorities of the host country's government?	N	ESIA report has not been submitted to the authority yet.																																																																								
		(c)Have ESIA reports been unconditionally approved? If conditions are imposed on the approval of ESIA reports, are the conditions satisfied?	NA																																																																									
		(d)In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	N	Aside from the ESIA Certificate, the following permits are also required (Table 3.2, ESIA p. 32): - OSHA certificate of Registration of workplace and compliance license, as per OSHA Act 2003 - Permit for felling trees from the Tanzania Forest Service These permits will be obtained after the ESIA approval.																																																																								
	(2)Explanation to the Local Stakeholders	(a)Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?	Y	The main stakeholders consulted during the Study included but not limited to: - Mtwara Regional Commissioner Office - Mtwara District Commissioner Office - Mtwara District Council - TARURA Office Mtwara - Tanzania Forest Services Mtwara - Focus Group Discussion with Wards (Naumbu, Ndumbwe and Mayanga, and Village leaders at Hiyari, Namgogoli, Mbuo and Kisiwa - Community involvement at this stage also includes public meetings at Hiyari, Mbuo, Namgogoli and Kisiwa villages.																																																																								
1 Permits and Explanation	(2)Explanation to the Local Stakeholders	(a)Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?		The summary of the participants attended consultation is as follows: <table><tr><th>S/N</th><th>Village/Institution</th><th>No. Male</th><th>No. Female</th><th>Total</th><th>Venue</th><th>Date</th><th>Time</th></tr><tr><td>1.</td><td>Mbuo</td><td>75</td><td>22</td><td>97</td><td>Village Executive Officer’s Office</td><td>22nd October, 2018</td><td>10:00am</td></tr><tr><td>2.</td><td>Hiyari</td><td>48</td><td>15</td><td>63</td><td>Village Executive Officer’s Office</td><td>22nd October, 2018</td><td>12:00pm</td></tr><tr><td>3.</td><td>Namgogoli</td><td>92</td><td>31</td><td>123</td><td>Village Executive Officer’s Office</td><td>23rd October, 2018</td><td>10:23am</td></tr><tr><td>4.</td><td>Kisiwa</td><td>70</td><td>24</td><td>94</td><td>Kisiwa Secondary School area</td><td>23rd October, 2018</td><td>10:23 to 11:37am</td></tr><tr><td>5.</td><td>Regional Administrative Secretary</td><td>2</td><td>1</td><td>3</td><td>RAS’s Office</td><td>18th October, 2018</td><td>9:30am</td></tr><tr><td>6.</td><td>District Commissioner</td><td>2</td><td>-</td><td>2</td><td>District Commissioner’s Office</td><td>22nd October, 2018</td><td>9:00am</td></tr><tr><td>7.</td><td>Mtwara District Council</td><td>5</td><td>-</td><td>5</td><td>District Executive Directors Office</td><td>18th October, 2018</td><td>1:00pm</td></tr><tr><td>8.</td><td>Tanzania Forest Services</td><td>4</td><td>-</td><td>4</td><td>District Forest Manager’s Office</td><td>25th October, 2018</td><td>8:30am</td></tr></table> <p>(ESIA p.76)7</p> <p>Issues raised in the meeting with the communities include:</p>	S/N	Village/Institution	No. Male	No. Female	Total	Venue	Date	Time	1.	Mbuo	75	22	97	Village Executive Officer’s Office	22nd October, 2018	10:00am	2.	Hiyari	48	15	63	Village Executive Officer’s Office	22nd October, 2018	12:00pm	3.	Namgogoli	92	31	123	Village Executive Officer’s Office	23rd October, 2018	10:23am	4.	Kisiwa	70	24	94	Kisiwa Secondary School area	23rd October, 2018	10:23 to 11:37am	5.	Regional Administrative Secretary	2	1	3	RAS’s Office	18th October, 2018	9:30am	6.	District Commissioner	2	-	2	District Commissioner’s Office	22nd October, 2018	9:00am	7.	Mtwara District Council	5	-	5	District Executive Directors Office	18th October, 2018	1:00pm	8.	Tanzania Forest Services	4	-	4	District Forest Manager’s Office	25th October, 2018	8:30am
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				<div><div><div><div><div>- Proper compensation and timely payment;</div><div>- Compensation rate for properties;</div><div>- Timeframe of the project implementation</div><div>- Benefit for the local community;</div><div>- Local employment opportunity;</div></div></div><table><tr><th>Major concerns/comments</th><th>Response</th></tr><tr><td>All facilities for the power plant should pass on the same corridor</td><td>It is not possible for gas pipeline to share way leave with access road due to technical issues such as Dangote quarry site which uses explosives that will interfere with the gas pipeline, and the corrosion of gas pipeline if it is close to water supply system and road corners.</td></tr><tr><td>Awareness program should be conducted for all village leader and community</td><td>Noted and more awareness programs will be carried out to educate communities regarding the project.</td></tr><tr><td>Provide us with timeframe of implementing this project so that we know and prepare ourselves.</td><td>Time frame for project implementation is not yet known until all permits are granted from relevant institutions and compensation payment done</td></tr><tr><td>How will people benefit from the project?</td><td>Employment opportunities, improved road to serve communities and proposed power plant project</td></tr><tr><td>Will the project provide the villages with schools, hospitals and other important social services like other projects?</td><td>Short term employment will be provided.</td></tr><tr><td>We want to know about the prices of each plant, trees farms and houses</td><td>Mtwara District council will provide the price list to the village offices soon, before the valuation process takes place</td></tr></table><div>(ESIA p.77-86)</div></div></div>	Major concerns/comments	Response	All facilities for the power plant should pass on the same corridor	It is not possible for gas pipeline to share way leave with access road due to technical issues such as Dangote quarry site which uses explosives that will interfere with the gas pipeline, and the corrosion of gas pipeline if it is close to water supply system and road corners.	Awareness program should be conducted for all village leader and community	Noted and more awareness programs will be carried out to educate communities regarding the project.	Provide us with timeframe of implementing this project so that we know and prepare ourselves.	Time frame for project implementation is not yet known until all permits are granted from relevant institutions and compensation payment done	How will people benefit from the project?	Employment opportunities, improved road to serve communities and proposed power plant project	Will the project provide the villages with schools, hospitals and other important social services like other projects?	Short term employment will be provided.	We want to know about the prices of each plant, trees farms and houses	Mtwara District council will provide the price list to the village offices soon, before the valuation process takes place																																																																																																														
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		(b)Have the comments from the stakeholders (such as local residents) been reflected to the project design?	Y	Among those mentioned in the stakeholder meetings, some opinions are already incorporated in the project, i.e. job creation and livelihood restoration. (RAP p.113-118)																																																																																																																												
	(3)Examination of Alternatives	(a)Have alternative plans of the project been examined with social and environmental considerations?	Y	The section “6.5 Analysis of Alternative” describe the alternative analysis for 2 routes from social (e.g. compensation and disturbance to other public infrastructures) and economic (e.g. construction cost) point of view. “6.5.4 Alternative design” describes the comparison of pavement materials from durability, economic, safety, environment, storm water drain, and ease of construction.																																																																																																																												
2 Pollution Control	(1) Air Quality	(a)Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken?	Y	<div><div><div>Details of baseline air quality measurements are presented in Appendix 2. Results show that dust (PM10) concentration of the existing ambient air quality is above the TBS standard level. SOx and NOx concentration levels are below detectable levels. During operation, increase in traffic movement will also generate more exhaust gases which are harmful to human health, burning gases like Co, Co2 are more likely to increase (ESIA p. 100) Baseline air quality is as follows:</div><div><table><tr><th colspan="8">Morning Session</th></tr><tr><th rowspan="2">Measuring Location</th><th colspan="2">GPS Coordinate</th><th rowspan="2">Measuring Time</th><th colspan="4">Ambient Dust Levels</th></tr><tr><th>Latitude (°)</th><th>Longitude (°)</th><th>0.3 (µg/m³)</th><th>0.5 (µg/m³)</th><th>5 (µg/m³)</th><th>Total Dust PM10 (µg/m³)</th></tr><tr><td>Dar - Mtwara junction of road site road at 0 km</td><td>-10.25900</td><td>40.02418</td><td>10:12 AM</td><td>0.019</td><td>0.021</td><td>0.236</td><td>0.28</td></tr><tr><td>Along the proposed road site at 2km</td><td>-10.24125</td><td>40.01430</td><td>10:48 AM</td><td>0.020</td><td>0.023</td><td>0.691</td><td>0.73</td></tr><tr><td>Along the proposed road site at 4 km</td><td>-10.22422</td><td>40.01475</td><td>10:54 AM</td><td>0.023</td><td>0.023</td><td>0.25</td><td>0.30</td></tr><tr><td>Water sub storage tank (5.75 km)</td><td>-10.21656</td><td>40.02040</td><td>11:20 AM</td><td>0.026</td><td>0.025</td><td>0.21</td><td>0.26</td></tr><tr><td>Namgogoni primary school (7.75 km)</td><td>-10.20282</td><td>40.01840</td><td>11:34 AM</td><td>0.025</td><td>0.025</td><td>0.33</td><td>0.38</td></tr><tr><td>At Kisiwa Village office</td><td>-10.18297</td><td>40.01264</td><td>11:47 AM</td><td>0.027</td><td>0.025</td><td>0.22</td><td>0.27</td></tr><tr><td>Access road to power plant</td><td>-10.17843</td><td>40.00651</td><td>11:54 AM</td><td>0.027</td><td>0.026</td><td>0.51</td><td>0.56</td></tr><tr><td>Middle point of access road</td><td>-10.18052</td><td>40.00198</td><td></td><td>0.033</td><td>0.015</td><td>0.14</td><td>0.19</td></tr><tr><td>At the end of access road to power plant area</td><td>-10.18209</td><td>39.99083</td><td>12:11PM</td><td>0.033</td><td>0.032</td><td>0.16</td><td>0.23</td></tr><tr><td colspan="7">TBS standard</td><td>0.20</td></tr><tr><td colspan="7">WHO/IFC Guideline</td><td>0.05</td></tr></table></div></div></div>	Morning Session								Measuring Location	GPS Coordinate		Measuring Time	Ambient Dust Levels				Latitude (°)	Longitude (°)	0.3 (µg/m³)	0.5 (µg/m³)	5 (µg/m³)	Total Dust PM10 (µg/m³)	Dar - Mtwara junction of road site road at 0 km	-10.25900	40.02418	10:12 AM	0.019	0.021	0.236	0.28	Along the proposed road site at 2km	-10.24125	40.01430	10:48 AM	0.020	0.023	0.691	0.73	Along the proposed road site at 4 km	-10.22422	40.01475	10:54 AM	0.023	0.023	0.25	0.30	Water sub storage tank (5.75 km)	-10.21656	40.02040	11:20 AM	0.026	0.025	0.21	0.26	Namgogoni primary school (7.75 km)	-10.20282	40.01840	11:34 AM	0.025	0.025	0.33	0.38	At Kisiwa Village office	-10.18297	40.01264	11:47 AM	0.027	0.025	0.22	0.27	Access road to power plant	-10.17843	40.00651	11:54 AM	0.027	0.026	0.51	0.56	Middle point of access road	-10.18052	40.00198		0.033	0.015	0.14	0.19	At the end of access road to power plant area	-10.18209	39.99083	12:11PM	0.033	0.032	0.16	0.23	TBS standard							0.20	WHO/IFC Guideline							0.05														
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2 Pollution Control	(1) Air Quality	(b)Does an industrial area already exist near the route, is there a possibility that the project will make air pollution worse?	N	There is cement factory to the south - east of the route. However, the result of the baseline survey is that the observed air quality is within acceptable levels of Tanzania's Environmental Management (Air Quality Standards) Regulations (2007). (ESIA p.64)																																																																																												
	(2) Water Quality	(a)Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?	N	The proposed road will not cross any river/stream. (ESIA p. 63) The proposed road will not entail any new and undue interference with the hydrologic and drainage aspects of the project area during operation phase. The change from gravel surfacing to bituminous surfacing will improve drainage of the area, especially with improvement of roadside drainage and cross drainage. (ESIA p.93) The discharges points are to be well designed to avoid accelerate erosion downstream with a mitigation measure. (ESIA p.109) Mitigation Measure (ESIA p. 108) Proper drainage channel will be constructed to drains the storm water runoff to the specific area such as rivers																																																																																												
		(b)Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater?	Y	The change from gravel surfacing to bituminous surfacing will improve drainage of the area, especially with improvements to roadside drainage and cross drainage. (ESIA p.93) The cleaning works has to be carried out by the district Council as a part of operation and maintenance of the drains to reduce blockage of the covered drains due to solid waste dumping. The design will provide controlled and effective storm water dispersion by the installation of adequate and appropriate drainage structures (ESIA p.109).																																																																																												
		(c)Do effluents from various facilities, such as parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?	NA	The project will not have any facilities generating effluent such as parking and service area. (Sec 2.4.2)																																																																																												
	(3) Wastes	(a)Are wastes generated from the project facilities, such as parking areas/ service areas, properly treated and disposed of in accordance with the country's regulations?	Y	Types, amounts and treatment/disposal of wastes during the operational phase are as shown in Table below (ESIA p.32) <table><tr><th>Waste</th><th>Type</th><th>Amount</th><th>Treatment/Disposal</th></tr><tr><td>Solid Waste (Degradable)</td><td>Vegetation (Trees and Grasses)</td><td>5kg per month</td><td>For Trees: Source of energy for cooking for residents near the project roads For Grasses: collected by communities for feeding cattle</td></tr><tr><td>Solid Waste (non-Degradable)</td><td>Scrap metals, drums, Asphalt concrete, Tins, grasses and plastics</td><td>3 kg per month</td><td>Sold to Recyclers or taken to the dumpsite at Mangamba</td></tr><tr><td>Liquid</td><td>Oils and greases</td><td>None</td><td>Car maintenance will be done at proper garages</td></tr></table> Y It is anticipated that during operation of the road solid waste will be generated by the road users. The improper treatment of wastes during rain periods may drain to storm water drainage system which may result to blockage. (ESIA p. 100) Mitigation measures (ESIA p. 106) <ul style="list-style-type: none">- Ensure facilities for proper handling and storage of wastes are provided in areas with population like at the bus stops to avoid improper solid waste disposal.- The contractor who is responsible to collect waste in Mtwara District shall be engaged and ensure disposal is done under supervision of Mtwara District Council.	Waste	Type	Amount	Treatment/Disposal	Solid Waste (Degradable)	Vegetation (Trees and Grasses)	5kg per month	For Trees: Source of energy for cooking for residents near the project roads For Grasses: collected by communities for feeding cattle	Solid Waste (non-Degradable)	Scrap metals, drums, Asphalt concrete, Tins, grasses and plastics	3 kg per month	Sold to Recyclers or taken to the dumpsite at Mangamba	Liquid	Oils and greases	None	Car maintenance will be done at proper garages																																																																												
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(4)Noise and Vibration	(a)Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	Unknown	<u>Baseline Ambient Noise Levels</u> The noise levels along the project area tend to vary from different locations at different time of measurement. The noise level ranges from 50.4dBA to 73.9dBA during the morning session and during the afternoon were 54.3dBA to 71.9dBA. The highest noise was recorded at the junction of highway road and the proposed road. TBS Noise Standard is from 55-70dB (day time) (ESIA p.63; App 2) Noise Impact during Operation Transport noise and vibration can cause a range of impacts on people and communities from general interference with everyday activities to more significant effects like sleep disturbance to the nearby houses. The nearby Namgogoli primary school (during the day) will be disturbed by the moving heavy trucks.(ESIA p. 100) <table><tr><th colspan="7">Afternoon Session</th></tr><tr><th rowspan="2">Measuring Location</th><th colspan="2">GPS Coordinate</th><th rowspan="2">Measuring Time</th><th rowspan="2">Ambient Noise Level (dB)</th><th rowspan="2">Atmospheric Temperature (°C)</th><th rowspan="2">Relative Humidity (%)</th></tr><tr><th>Latitude (°)</th><th>Longitude (°)</th></tr><tr><td>Dar - Mtwara junction of road site road at 0 km</td><td>-10.25900</td><td>40.02418</td><td>16:17 PM</td><td>64.7</td><td>31.8</td><td>46.5</td></tr><tr><td>Along proposed road at 2km</td><td>-10.24125</td><td>40.01430</td><td></td><td>55.6</td><td>31.8</td><td>44.7</td></tr><tr><td>Along proposed road at 4 km</td><td>-10.22422</td><td>40.01475</td><td>16:00 PM</td><td>71.9</td><td>32.0</td><td>44.4</td></tr><tr><td>Water sub storage tank. (5.75 km)</td><td>-10.21656</td><td>40.02040</td><td>15:33 PM</td><td>67.5</td><td>32.4</td><td>42.5</td></tr><tr><td>Namgogori primary school (7.75 km)</td><td>-10.20282</td><td>40.01840</td><td>15:10 PM</td><td>69.8</td><td>31.3</td><td>45.2</td></tr><tr><td>At Kisiwa Village office</td><td>-10.18297</td><td>40.01264</td><td>14:41 PM</td><td>69.6</td><td>30.9</td><td>48.4</td></tr><tr><td>Access road to power plant</td><td>-10.17843</td><td>40.00851</td><td>14:39 PM</td><td>58.8</td><td>32.7</td><td>42.5</td></tr><tr><td>Middle point of access road</td><td>-10.18052</td><td>40.00188</td><td>14:30 PM</td><td>55.3</td><td>34.7</td><td>35.5</td></tr><tr><td>At the end of access road to power plant area</td><td>-10.18209</td><td>39.99083</td><td>14:00 PM</td><td>54.3</td><td>36.1</td><td>32.1</td></tr><tr><td colspan="4">TBS Standard</td><td>55-70dB (Day time</td><td>-</td><td>-</td></tr><tr><td colspan="4">WHO/IFC Guideline</td><td>55dB (Day time 07:00-22:00)</td><td>-</td><td>-</td></tr></table>	Afternoon Session							Measuring Location	GPS Coordinate		Measuring Time	Ambient Noise Level (dB)	Atmospheric Temperature (°C)	Relative Humidity (%)	Latitude (°)	Longitude (°)	Dar - Mtwara junction of road site road at 0 km	-10.25900	40.02418	16:17 PM	64.7	31.8	46.5	Along proposed road at 2km	-10.24125	40.01430		55.6	31.8	44.7	Along proposed road at 4 km	-10.22422	40.01475	16:00 PM	71.9	32.0	44.4	Water sub storage tank. (5.75 km)	-10.21656	40.02040	15:33 PM	67.5	32.4	42.5	Namgogori primary school (7.75 km)	-10.20282	40.01840	15:10 PM	69.8	31.3	45.2	At Kisiwa Village office	-10.18297	40.01264	14:41 PM	69.6	30.9	48.4	Access road to power plant	-10.17843	40.00851	14:39 PM	58.8	32.7	42.5	Middle point of access road	-10.18052	40.00188	14:30 PM	55.3	34.7	35.5	At the end of access road to power plant area	-10.18209	39.99083	14:00 PM	54.3	36.1	32.1	TBS Standard				55-70dB (Day time	-	-	WHO/IFC Guideline				55dB (Day time 07:00-22:00)	-	-
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(ESIA, Appendix 2)

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Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				<p><u>Mitigation Measures</u> (ESIA p. 109)</p> <ul style="list-style-type: none"> - Instructing road users to avoid running of vehicle engines or hooting especially when passing through sensitive areas such as residential areas and schools. - Trucks shall be kept in good condition to reduce noise generation. - During road maintenance it is recommended that all generators and heavy duty equipment be insulated or placed in enclosures to minimize ambient noise levels.
3 Natural Environment	(1)Protected Areas	(a)Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	NA	<i>The project site is not located within a protected area. There is “Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP) “about 20km to the eastern side of the project area, which was established under Act No. 29 of 1994 of Marine Parks and Reserves of Tanzania.</i>
	(2)Ecosystem	(a)Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	N	<p>The characteristic terrestrial vegetation of the project area was classified into Coastal thickets/bush lands and secondary vegetation consisting of cashew farmlands. This vegetation type is characterized by an assemblage of woody plants and shrubs with scattered emergent trees with small patches of evergreen forest canopy. (ESIA p.65)</p> <p>The closest forest reserves to the project site are Naliendele and Ziwani forest reserves, which are approximately 65 km away. (ESIA p. 70-71).</p> <p>It is estimated that a total area of about 452 000 m² will be cleared during construction of the proposed project (Q/A)</p>
		(b)Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	N	<p>Fauna: No big and wild animals were found around the proposed project area since the large part of the area is not forestry. Through consultation with local community the animals expected to be found in the project area by local names include; pig, ngedere, fisi (Hyaenidae), Dik dik, chui (Panthera Pardus), swala (Alcelaphinae), sungura (Oryctolagus cunicus), lizards, butterflies, grasshoppers, snakes. Two species of birds identified are Kanga (Numididae) and Kware (Francolin). (ESIA p.66)</p> <p>Flora: Please see the description above, (2) Ecosystem (a).</p> <p>Based on the field work, no animal was identified to be vulnerable, threatened or endangered according to the 2004 IUCN red list (ESIA p. 70)</p> <p>The vegetation type or characteristics to be removed are; Ocotea usambarensis, Dalbegia melanoxylon, Ficus spp, Adansonia digitata, Eucalyptus, azadirachta indica, Bombax rhodognaphalon, Acacia nilotica, Acacia umbrella, Conifora Africana. Other tree crops are cashew nut trees, avocado trees, mango trees, baobab trees, coconut trees, pineapple and grasses. (ESIA, Chapter 4)</p>
		(c)If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	NA	The impacts of the project on the bio-physical environment is potentially very small as the project is situated in the area where no big wildlife is expected; vegetation clearance will be done but the vegetation to be cleared is common grass and bushes.
		(d)Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?	NA	No big and wild animals were found around the proposed project area. (ESIA p.66)
		(e)Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?	Y	<p>Loss of Vegetation</p> <p>Land clearance to obtain the 20m of road reserve each side from the centerline will involve uprooting trees, clearance of grasses which falls within the corridor of impact as well as displacing huge masses of topsoil. Detours to provide access to traffic during construction phase will further cause loss of vegetation. (ESIA p.96)</p> <p>Mitigation measures are to be taken:</p> <p>Topsoil shall be stockpiled and used for reinstating flora along the road.</p> <p>Close supervision of earthworks shall be observed in order to confine land clearance within the proposed new corridor of impact boundaries.</p> <ul style="list-style-type: none"> - The road design shall try as practicable to offset the route so as to avoid felling all big trees that take many years to grow or other flora of outstanding importance. - Consultation with Tanzania Forest Services and Mtwara District Council shall be made so as they can conduct inventory and resource assessment studies of the number trees need to be cleared during construction period. (ESIA p.100)
		(f) In cases the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	N	<p>The project site is located in area which has already been affected by the human intervention such as agriculture and settlement. The project is basically— upgrade from gravel standard to Double Surface Dressing level according to the provisions of the Road Act of 2007. The existing rough road is used by communities of Hiyari, Namgogoli, Mbuo, Kisiwa and Mgao (ESIA p.20)</p> <p>Therefore, it is not expected to result in extensive loss of natural environments.</p>
	(3)Hydrology	(a)Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	Y	<p>The proposed road will not entail any new and undue interference with the hydrologic and drainage aspects of the project area. The change from gravel surfacing to bituminous surfacing will improve drainage of the area, especially with improvement to roadside drainage and cross drainage. This will result into a minor negative impact on the natural hydrological regime of the area and might cause floods at some areas. Other negative hydrologic and drainage impacts are not foreseen. (ESIA p.93)</p> <p>Mitigation measures for the interference with local hydrology are as follows:</p> <ul style="list-style-type: none"> - Good design features shall be adopted to ensure that the changes of the hydrological regimes are minimized and that any impacts are insignificant. - The design will provide controlled and effective storm water dispersion by installation of adequate and appropriate drainage structures. - The discharges points shall be well designed to avoid accelerate erosion downstream.

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)																								
				- To reduce blockage of the covered drains due to solid waste dumping, the cleanness shall be performed by the district Council as part of operation and maintenance of the drains. (ESIA p.101)																								
	(4)Topography and Geology	(a)Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?	Y	The proposed project is classified as collector road and the road reserve widths are 40m consisting of 20m from either side of the center of the road way. It has about 11.3km from Hiyari Village near Dangote cement factory through Namgogoli Village, Kisiwa Village to the proposed power plant. (ESIA p.19) The soils within the proposed project area are red clay soils (ESIA p.60), that are vulnerable to soil erosion. In order to minimize the potential impact of slope failures or landslides, mitigation measures are to be taken as described below, i.e. (4) Topography and Geology (b).																								
		(b)Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?	Y	Construction works would accelerate erosion problems in most cut sections. Nevertheless, all cuts in the sloping grounds should be refurbished firmly and provided with the vegetation cover to reduce the effect of soil erosion. (ESIA p.88) Mitigation measures are to be taken: <ul style="list-style-type: none">- Unnecessary ground clearance and sensitive re-alignments shall be avoided.- Lined drainage channels at sensitive terrains shall be provided to control speed and volumes of storm-water. The discharge points shall be carefully chosen to avoid erosion of arable land and creation of gullies.- The contractor should plant grass or any other vegetation cover to minimize exposed soil surface.- Proper grading to promote sheet flow and minimize flow concentration on unconsolidated soil. Directing flow to properly designated channels. (ESIA p.98)																								
		(c)Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	Y	Please see the description above, i.e. (4) Topography and Geology (b).																								
4 Social Environment	(1) Resettlement	(a)Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	Y	The proposed access road with length of approximately 11.3km will be constructed from Hiyari village to the proposed project area via Mbuo and Namgogoli villages. According to TARURA, the proposed construction of access road will have a total reserve or way leave corridor of 40m i.e. 20m from either side of the centerline. (RAP p.v) The project would most likely involve among other things affect about 165 PAPs who will be required to vacate, 41 houses will be affected (physically relocated) at Kisiwa Village center and 37.28ha of land will be lost during construction of the project. Crops which will be affected are cashew nut trees, banana, pineapple, cassava, coconut, mango and avocado trees and peas. (ESIA p.87) The number of PAPs and number of affected HHs are shown in right table. (RAP p.vi) <table><tr><th colspan="4">Access road project</th></tr><tr><th>Villages</th><th>No. of PAPs</th><th>No. Houses affected</th><th>Graves</th></tr><tr><td>Hiyari</td><td>11</td><td>0</td><td>0</td></tr><tr><td>Mbuo</td><td>12</td><td>0</td><td>0</td></tr><tr><td>Kisiwa</td><td>86</td><td>41</td><td>0</td></tr><tr><td>Namgogoli</td><td>56</td><td>0</td><td>0</td></tr></table> The route of access road is determined as described in the ESIA and the extent of compulsory resettlement is however not very high since the survey team has considered avoidance of affecting residential areas and residential houses, in order to minimize the social disruption. (ESIA p.87)	Access road project				Villages	No. of PAPs	No. Houses affected	Graves	Hiyari	11	0	0	Mbuo	12	0	0	Kisiwa	86	41	0	Namgogoli	56	0	0
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Namgogoli	56	0	0																									
(b)Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?	Y	The following methodology for engaging stakeholders is described in the RAP. And consultation activities with affected people have been done.(RAP p.69) RAP.5.3.1 Process of the Stakeholder Engagement The different stakeholders were engaged through the following methods: <ul style="list-style-type: none">-Public meetings- Individual meetings(during household survey)- Administration of household questionnaire- Focus Group Discussions- The media (newspapers, local and national radio stations to be used during discloser process)- Project brochures or leaflets- Notices in convenient places																										
(c)Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	Y	Buildings will be assessed as allowed under the Tanzania law, but compensation will be paid based on full replacement cost. In-kind compensation will be considered as an option for public structures and for those proved to be vulnerable people who wishes for the in-kind compensation. (RAP p.32) <u>Payment of compensation of properties at depreciation rate</u> (RAP p. 113) According to our legislation, the valuers normally makes negotiation and pays top up allowance during compensation period if the property or structure is valued at depreciation rate. Also, compensation payments are effected by complying with the national laws (Land Act No. 5 of 1999, Land Regulations, 2001.). Affected structures will be valued and compensated in the form of cash equal to cost of building a new structure equivalent to replacement of lost asset same as the project financed by the World Bank (Q/A).																										

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(d)Are the compensations going to be paid prior to the resettlement?	Y	According to “Table 35: Tentative RAP Implementation Schedule”, “3.2 Effecting Compensation of properties to all project affected persons and institutions” reads as payment which comes before relocation. (RAP p.124-125)
		(e)Are the compensation policies prepared in document?	Y	RAP Table 2: Comparison between National Policies and Legislations versus International Policies on Resettlement and Compensation describe how to align the project policy with JICA Guidelines. (RAP p.31) RAP is developed based on the gap analysis in line with Tanzanian and JICA guidelines for Environmental and Social Considerations.
		(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?	Y	The preparation of the RAP has demanded extensive public consultation and participation of PAPs and stakeholders in the whole process. The resettlement has considered the following important aspects in the Plan: - Plan for in-kind compensation for public structures and identified critical vulnerable people. (RAP p.98)
			Y	Vulnerable PAPs will be provided with the following: - Special assistance to enable them rightfully to get their compensation including opening up bank account. - Assistance in lodging the complaints and seeking legal advice when needed - They will be given priority for employment on project-related jobs as long as they are able to deliver the required level of service. - The properties of these vulnerable group will be compensated in kind (RAP p.116)
		(g)Are agreements with the affected people obtained prior to resettlement?	Y	As shown in Table 35: Tentative RAP Implementation Schedule of RAP, explanation about the compensation rate will be done (3.6) with the PAPs and the valuation will be done base on the agreed rate. Compensation (2.1) (RAP p.124)
		(h)Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	Y	Chapter 7 of RAP describes the organizational framework to be applied to the project. This is the typical organizational framework applied in Tanzania and used for the land acquisition of the Kisiwa site as well.
		(i) Are any plans developed to monitor the impacts of resettlement?	Y	Chapter 11 of RAP describes the monitoring and evaluation of this project, which include both internal and external monitoring.
		(j) Is the grievance redress mechanism established?	Y	Chapter 8 of RAP describes the grievance mechanism of this project, which has 4 stages to resolve a complaint from village committee, district committee, land tribunal & court of law to court of law as a final measure.
	(2)Living and Livelihood	(a)Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?	Y	The proposed road project will facilitate easy transportation, and also increase the communication among the communities along the project area (road users from Hiyari to Kisiwa villages). The improved road may attract more investment on vehicles to provide services along the road. Therefore, the prices of travel will be lowered and will save time spent on journey. (ESIA p.91) During the wet season, the existing road does not allow free passage of vehicles due to the nature of its soil, which causes the stacking of cars. The improvement of this road may lead to the introduction of new transport route from Mtwara town to Mgao Village and provide transport services in the area hence serve the large community. At present, the bodaboda are the only means of transport from Dangote bus stop to Kisiwa, and the transport costs are very high. The introduction of new public transport cars will lower transport costs. (ESIA p.92)
		(b)Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary?	Y	Chapter 10 of RAP describes the income and livelihood restoration strategies. With 10% of the compensation budget, such measures as follows are proposed(Majority of the PAPs depend on agriculture (farming activities) for their livelihood while a small group of PAPs have additional income from employment or informal businesses and fishing activities.) - Access to agricultural extension services will be provided to affected communities in order to improve production for the remaining land. - Provide agricultural trainings on how to grow crops and have good harvest and where possible high yield seeds will be provided. - Training on modern fishing methods to maximize their income earnings - Encourage PAPs to be involved in beekeeping to increase their income. (RAP p.113 and 114)
		(c)Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?	Y	During the construction phase, there will be presence of migrant workers in the areas where the project will be implemented. Increased interaction of immigrant construction workers and local communities poses a risk of new cases of HIV/AIDS, STDs infection and unwanted pregnancies. (ESIA p.91) Mitigation measures to be taken: - Keeping worksites clean - Establishing and implementing HIV/AIDS awareness and prevention programs - Including AIDS awareness in the workers' orientation - Provide protection to workers (ESIA p.100)
		(d)Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)?	Y	Road deaths, injuries and damage to property are most tangible negative impacts on the community environment and may be reduced or increased as a result of road projects. The project roads transverse villages and the effects of road on the safety of these settlements, depends on the location. (ESIA p.92)

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				Mitigation measures to be taken: - Education concerning safety road will be provided from time to time - Road safety sign will be placed in dangerous area - Student will be given education on the safely use of road (ESIA p.101)
		(e)Is there any possibility that roads will impede the movement of inhabitants?	N	Please see the description above, i.e. (2) Living and Livelihood (c) and (d).
		(f) Is there any possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?	NA	There are no such structures in the project component. (ESIA p.23-24)
	(3) Heritage	(a)Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	Unknown	Basing on the literature review, consultations and walk through during survey of the proposed access road there was neither recognized nor recorded cultural heritage site within or nearby the project site. No graveyards found within the way leave. (ESIA p. 74)
	(4) Landscape	(a)Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	Y	Scenic quality deterioration will occur due to stock piling of construction materials and discoloration of plant leaves and houses in the vicinity of the roads due to windblown dust. Excavation work as well as presence of construction vehicles, plant and equipment will also add to scenic quality deterioration. Scenic quality deterioration will also occur off-site, at the sources of construction materials, the quarries and sand mines. If these are not made good they may become an eyesore. Scenic quality deterioration can destroy the economic and aesthetic value of public and/or private property including land. <u>Mitigation measures (ESIA p. 109)</u> - Detailed understanding of the geology/rock formations will be done through geotechnical investigation studies. - Grading/profiling of embankments and cuttings shall be required to merge with the surrounding landscape character
	(4) Landscape	(a)Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?		- Integrate new earthworks into the surrounding landform and to create a natural fit, rounding the top of the earthworks - Consider landscape when fixing the vertical and horizontal road alignments - Explore altering alignments to reduce the need to import fill and to balance scale and sectional geometry.
	(5)Ethnic Minorities and Indigenous Peoples	(a)Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	Y	The major ethnic group is the Makonde (the majority), the indigenous in spite in some wards like Nanyamba, Nanguruwe, Mpapura, Mayanga, Madimba, and Mahurunga having other minority tribes who are either business persons or Public and Private workers, but all of them speak Swahili language for communication. Most of the residents are engaged in the subsistence farming. (ESIA p.72) Referring to the Socio - economic profile of Mtwara Region, the majority of the indigenous people of the Mtwara were of Bantu origin, however the most dominant groups are the Makonde of Newala, Tandahimba, Masasi and Mtwara Rural.
		(b)Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	NA	The major ethnic group in Mtwara district is the Makonde (the majority) and there are no indigenous peoples and no tribes that need special attention.
	(6)Working Conditions	(a)Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	N	There will be no violation of any laws by following the standard JICA tender document during construction. During mobilizations and construction phase, the proposed project will require workers; hence the proponent and contractor shall ensure the requirements of the Occupational Health and Safety Act No. 5 of 2003 (OSHA) are adhered. (ESIA p.106) <u>OHS Mitigation Measures (ESIA p. 108)</u> - Education concerning safety road will be provided from time to time - Road safety sign will be placed in dangerous area - Student will be given education on the safely use of road
		(b)Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	Y	The following measures will be taken. - Establishing occupational safety and health induction course to the workers - Appropriate working gear such as nose, ear mask and clothing - A well-stocked First Aid kit (administered by medical personnel) shall be maintained at each quarry sites and each active work section along the road. - The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing some health education to the workforce. - During construction the contractor shall ensure that the materials storage area is hygienically kept with adequate provision of facilities including waste disposal receptacles, and fire fighting equipment. (ESIA p.106)
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	Y	The following measures will be taken. - Training and enforcement to workers to wear PPEs shall be done. (ESIA p.106) - Training of workers on spill response and management.(ESIA p.108)

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(6) Working Conditions	(d) Are appropriate measures being taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	Unknown	<p>The proposed project will require security guard at the material storage area. If the security guards are from a different area other than Mtwara, interaction with the communities within the project area may have the potential to affect the rights and safety of individuals. At the most extreme, the use of lethal force may threaten the right to liberty and security of the person if it happens. (ESIA p. 98)</p> <p><u>Mitigation Measures (ESIA p. 108)</u> Ensure that the contractor shall:</p> <ul style="list-style-type: none"> - assess risks posed by its security arrangements to those within and outside the project site - be guided by the principles of hiring, rules of conduct, training, equipping, and monitoring of such workers, and by applicable law. - make reasonable inquiries to ensure that those providing security are not implicated in past abuses. - consider hiring Security guards from legally authorized companies like SUMA JKT, KK Security etc.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	Y	<p>Mitigation Measures for pollution during construction phase are described in the following sections.</p> <p>Noise, Vibration and Dust (7.4.4) Air pollution (7.4.5) Wastewater and soil pollution (7.4.3) Wastes (7.4.8) Soil erosion (7.4.2), Land degradation (7.4.9)</p>
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	Y	<p>Mitigation measures for impact on biological environment is described in the following section.</p> <p>Loss of vegetation (7.4.10)</p> <ul style="list-style-type: none"> - Close supervision of earthworks shall be observed in order to confine land clearance within the proposed new corridor of impact boundaries. - Topsoil shall be stockpiled and used for reinstating flora along the road. - The road design shall try as practicable to offset the route so as to avoid felling all big trees that take many years to grow or other flora of outstanding importance - Consultation with Tanzania Forest Services and Mtwara District Council shall be made so as they can conduct inventory and resource assessment studies of the number of trees need to be cleared during construction period
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	Y	<p>Mitigation Measures for pollution during construction phase are described in the following sections.</p> <p>Land acquisition and resettlement (7.3) Loss of employment (7.3) Relocation of public utilities (7.4.1) Impact on disturbance to road users (7.4.13) Safety training (e.g. traffic safety and public health) Public health (7.4.12) Increased in Road Accidents (7.4.7) Occupational Health and Safety (7.4.6)</p>
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	Y	<p>Chapter 9 of ESIA describes about the monitoring considering the potential impacts. And ESIA states “It ensures compliance with regulatory measures and understanding the degree of implementation of ESMP and its effectiveness.” (ESIA p.111)</p>
		(b) What are the items, methods and frequencies of the monitoring program?	Y	<p>Table 9.1: Environmental and Social Monitoring Plan (EMP) of ESIA provides for the items, methods and frequencies of the monitoring program. The following items are included.</p> <p><u>Monitoring during Pre-construction phase</u></p> <ul style="list-style-type: none"> - Checking noise level and air quality before the construction starts; - Checking the rate for compensation for utilities. <p><u>Construction phase</u></p> <ul style="list-style-type: none"> - Soil erosion along the road side - Amount of solid waste generated - Biomass - Vibration level - Frequency of illness of construction workers - Employment opportunity (to local people and gender) - Protection against Safety and health risk - Dust suppression <p><u>Environmental and Social Monitoring During Operation</u></p> <ul style="list-style-type: none"> - Road accidents where they occur and road signs <p>Environmental and Social Monitoring Plan for the proposed access road is as follows:</p>

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)																																																																																																																																																																																															
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(ESIA, p120-121)

(ESIA, p120-121)

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(c)Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	Y	Table 9.1: Environmental and Social Monitoring Plan for the proposed access road of ESIA provides for the responsibility and monitoring cost.
		(d)Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	Unknown	

13.6.3 Environmental Checklist of the Associated Facility: Water pipeline

Category	Environmental Item	Main Check Items	Yes: Y / No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1)ESIA and Environmental Permits	(a)Have ESIA reports been already prepared in official process?	Y	ESIA has been prepared already.
		(b)Have ESIA reports been approved by authorities of the host country's government?	N	ESIA has not been submitted to the authority yet.
		(c)Have ESIA reports been unconditionally approved? If conditions are imposed on the approval of ESIA reports, are the conditions satisfied?	NA	-
		(d)In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	N	<p>Aside from the ESIA Certificate, the following permits are also required (Table 8, ESIA p. 34):</p> <ul style="list-style-type: none"> -Permit for crossing on government institutions land -Permit for crossing on private or individual land -Permit for crossing on private or individual forest -Permit for sharing road reserve under TANROAD -Permit for sharing road reserve under TARURA -Water drilling permit -Water use permit -Other permits from ERB, CRB for contractors <p>These permits will be obtained after the ESIA approval.</p>
	(2)Explanation to the Local Stakeholders	(a)Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?	Y	<ul style="list-style-type: none"> • In accordance with the regulation 17 of the ESIA and Audit Regulations, 2005, providing directives and procedures for public participation in the ESIA process, stakeholder consultation was conducted. • Several methodologies were used during the stakeholder consultation process. The fieldwork which is necessary to formalize and record public opinion about the potential impacts of the project was undertaken by ESIA team of experts. Key informant interviews and issuance of questionnaires were conducted to seek the public opinion. The ESIA experts explained the structure of the proposed development to the identified stakeholders and responded to their questions as appropriate. At the same time, the ESIA experts also inquired of the local environmental history of the site and adjacent areas in order to identify potential environmental impacts. The exercise was conducted through interviews with key informants, field surveys and discussions. (ESIA p.49) <p>The main stakeholders consulted during the study included but not limited to:-</p> <ul style="list-style-type: none"> - Regional Office . Mtwara Regional Office - District Office . Mtwara District Council - Affected Area: Ward and Village officials and residents <p>Meetings were held in an area that is convenient for the interested parties. The venues were particularly convenient for the affected communities. Venues and times of the meetings for affected communities were selected by the help of local leaders agreed upon with the PAPs with the advice of the village leaders and consideration of the attendance of women and other vulnerable groups.</p> <p>Number of stakeholder attended in the stakeholder meetings</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)								
				S/N	Village/Institution	No. Male	No. Female	Total	Venue	Date	Time	
				1.	Mbuo	75	22	97	Village Executive Officer’s Office	22nd October, 2018	10:00am	
				2.	Hiyari	48	15	63	Village Executive Officer’s Office	22nd October, 2018	12:00pm	
				3.	Namgogoli	92	31	123	Village Executive Officer’s Office	23rd October, 2018	10:23am	
				4.	Kisiwa	70	24	94	Kisiwa Secondary School area	23rd October, 2018	10:23am to 11:37am	
				5.	Regional Administrative Secretary	2	1	3	RAS&s Office	18th October, 2018	09:30am	
				6.	District Commissioner	2	-	2	District Commissioner’s Office	22nd October, 2018	09:00am	
				7.	Mtwara District Council	5	-	5	District Executive Directors Office	18th October, 2018	13:00pm	
				8.	Tanzania Forest Services	4	-	4	District Forest Manager’s Office	25th October, 2018	08:30am	
				(ESIA p.55)								
Major issues raised by the respondents in line with the proposed development was the issue of compensation in case the development may passes through their land and properties, most of stakeholders consulted had no objection provided the project proponent complies with the available rules and regulations. Moreover, the issues highlighted as being the key potential negative impacts have been highlighted noted and their relevant mitigation measures have been provided. (ESIA p.54)												
		(b)Have the comment from the stakeholders (such as local residents) been reflected to the project design?	Y	As mentioned above, the major concern is compensation and it is expected that the project proponent will comply with the available rules and regulations as this is a public project.								
				The list of concerns and comments raised and how these were responded to are presented in Table 14 (ESIA, p.51-53)								
				Stakeholder	Comments					Response		
				RAS Mtwara	• He suggested on using the same wayleave with the gas pipeline					• The water pipeline cannot use the same way leave with gas pipeline due to technicality issues such as corrosions etc.		
				Mtwara District Council	• He emphasized on the involvement of communities which will be directly affected. • People should be given a timeframe as to when this project will start. • The project proponent should provide fair and prompt compensation to identified PAPs. • You should not entertain no man’s land since every land in the village belongs to someone.					• Noted • Noted • Noted • Noted		
				DED	• A big challenge which is normally faced in such projects is the issue of compensations; so many people are aware with the laws abiding to compensation, MTUWASA should observe that issue. • He suggested that all facilities that is water, road and gas to use the same route instead of each one to follow their own route. • PAPs should be involved from the initial stage to avoid any contradictions; whereby this will avoid bad outcome of the project.					• Noted and MTUWASA will acquire land by following legal procedures as per national land laws. • Noted • Noted and that’s why during this ESIA study we will do public meetings and focus group discussion in all villages around our proposed water pipeline		
				MTWARA DISTRICT COUNCIL OFFICE (Land officer, Environmental officer, Officer and Community Development Officer)	• The project proponent should provide fair and prompt compensation to identified PAPs. • Before the beginning of the project people should be provided with education especially around the villages where this project will pass through.					• Noted and MTUWASA will acquire land by following legal procedures as per national land laws. • Noted		
				MTWARA DISTRICT - Villages of Mbuo, Namgogoli and Kisiwa	• They appreciate the education which they have received from MTUWASA regarding this project from initials stage. • The project should follow all procedures which are required by the government. • The villagers wanted to know how the valuation and compensation will be done for those who will be affected by the project • Other projects did not provide us with employment opportunities hence MTUWASA should take them into consideration when it comes to employment for unskilled and semi-skilled employment. • They asked to be involved fully during the valuation exercise • The government should invent measures that can be used in reducing of negative impacts for instance the influx of people in project area can lead to an increase in diseases hence there should be ways to educate them in all stages of the projects e.g providing them with brochures continuously and put cinema for the villagers.					• Noted • Noted • Compensation will be done where required as per national land law • We will advise the contractor that community will be considered first regarding employment on activities which they are capable to carry out (unskilled and semi-skilled labours). • Noted • Noted		

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
3 Natural Environment	(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	N	There are no nationally and/or internationally recognized protected areas within the project site. (ESIA p. 43)
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	N	The project site is characterized mostly with shrubs and exotic species as identified in Table 11: Identified Flora along the water pipe route (ESIA p. 41) There are no ecologically important habitats (e.g. primary forests, tropical forests) within the project site. (ESIA p. 43)
		(b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?		There are no nationally and/or internationally recognized protected areas, no ecologically important habitats (e.g. primary forests, tropical forests) within the project site. (ESIA p. 43) According to interviews with the villager's, surrounding the project area and through observation along the proposed pipeline route there are no any major wildlife. Commonly seen wildlife in the area includes birds, monkeys, Pheasant, rabbits, reptiles, insects and snakes. (Table 11, ESIA p. 44) The Mtondo, Msufi and Mkongo trees within the project area are protected by Tanzanian law due to its vulnerability.(ESIA, p. 44) Appropriate consideration will be taken for these species.
		(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?		The proposed water pipeline will pass areas occupied by natural vegetation with few grasses and shrubs. Clearance of vegetation in project areas will be necessary prior to construction phase. Therefore, although vegetation will be lost in some areas, it will be small in terms of the overall land covered and is the vegetation lost are common vegetation that are available elsewhere. (ESIA p.60) The proposed project will cover 11.1km for 2m wayleave about 5.5 acres and about 30m x 30m (0.22 acre) for water storage tank (about 5.72 acres). This area would have to be cleared. (ESIA p. 60)
		(d) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	N	Operation phase of this proposed project will abstract water from borehole at the Mbuo village which is near to the Mbuo River. Water supply balance of the borehole near the Mbuo River show that it is not anticipated that the use of groundwater will affect the river. (ESIA p. 64)
	(3) Hydrology	(a) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect surface water and groundwater flows?	N	Water supply balance of the borehole near the Mbuo River show that it is not anticipated that the use of groundwater will affect the river. (ESIA p. 64) The proposed water pipeline to be laid will have 63mm and 110mm in nominal diameter to ensure consistent flow of water throughout the project implementation phase. (RAP p.v)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?		In terms of location, the proposed water pipeline will traverse through Mbuo, Namgogoli and Kisiwa villages. The proposed pipeline will cover 11.1km with 3m wayleave, which is equivalent to about 8.23acres. The number of PAPs and number of affected HHs is shown below. Only 2 persons will be affected by the loss of land. (RAP p. vi) The project will compensate for the lost land and other properties according to the Land Act of 1999 and land laws of 2001, based on the valuation report approved by the Chief Government Valuer. The project will avoid as much as possible the destruction or use of local people's properties.
		(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?		The types of methodologies for engaging stakeholders are described in the RAP. Consultation activities with affected people have been conducted.(RAP p.69) RAP.5.3.1 Process of the Stakeholder Engagement The different stakeholders were engaged through the following methods: - Public meetings - Individual meetings(during household survey) - Administration of household questionnaire - Focus Group Discussions - The media (newspapers, local and national radio stations to be used during discloser process) - Project brochures or leaflets - Notices in convenient places
		(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic		Buildings be assessed as allowed by the Tanzania law, but the compensation will be paid based on full replacement cost In-kind compensation will be considered as an option for public structures and for those proved to be vulnerable people who wishes for the in-kind compensation. (RAP p.32)

Water pipeline project			
Villages	No. of PAPs	No. Houses affected	Graves
Hiyari	0	0	0
Mbuo	2	0	0
Kisiwa	0	0	0
Namgogoli	0	0	0
TOTAL	2	0	0

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)												
		studies on resettlement?		<u>Payment of compensation of properties at depreciation rate</u> (RAP p. 113) According to our legislation, the valuers normally make negotiation and pay top up allowance during compensation period if the property or structure is valued at depreciation rate. Also, compensation payments are effected by complying with the national laws (Land Act No. 5 of 1999, Land Regulations, 2001.).												
		(d)Is the compensations going to be paid prior to the resettlement?	Y	According to “Table 35: Tentative RAP Implementation Schedule”, “3.2 Effecting Compensation of properties to all project affected persons and institutions” reads as payment which comes before relocation.												
		(e)Is the compensation policies prepared in document?		RAP Table 2: Comparison between National Policies and Legislations versus International Policies on Resettlement and Compensation describe how to align the project policy with JICA Guidelines. (RAP p.31)												
		(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?	Y	Vulnerable Groups are included in RAP, not ESIA. Refer to Ch6.13 (Potential impact on vulnerable groups) and Ch10.6 (Income and livelihood restoration strategies) of RAP for related facilities The following important aspects are considered for resettlement in the Plan: - Plan for in-kind compensation for public structures and identified critical vulnerable people. (RAP p.98) Vulnerable PAPs will be provided with the following: - Special assistance to enable them to rightfully get their compensation including opening up bank account. - Assistance in lodging the complaints and seeking legal advice when needed - They will be given priority for employment on project-related jobs as long as they are able to deliver the required level of service. - The properties of these vulnerable group will be compensated in kind (RAP p.116)												
		(g)Are agreements with the affected people obtained prior to resettlement?	Y	As shown in Table 35: Tentative RAP Implementation Schedule of RAP, explanation about the compensation rate will be done (3.6) with the PAPs and the valuation will be done base on the agreed rate. Compensation (2.1) (RAP p.124)												
		(h)Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	Y	Chapter 7 of RAP describes the organizational framework to be applied to the project. This is the typical organizational framework applied in Tanzania and used for the land acquisition of the Kisiwa site as well.												
		(i) Are any plans developed to monitor the impacts of resettlement?	Y	Chapter 11 of RAP describes the monitoring and evaluation of this project, which include both internal and external monitoring.												
		(j) Is the grievance redress mechanism established?	Y	Chapter 8 of RAP describes the grievance mechanism of this project, which has 4 stages to resolve a complaint: starting from village committee, district committee, land tribunal & court of law, with the court of law being the final measure.												
	(2) Living and Livelihood	(a)Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	Y	Chapter 10 of RAP describes the income and livelihood restoration strategies. With 10% of the compensation budget, such measures as follows are proposed(Majority of the PAPs depend on agriculture (farming activities) for their livelihood while a small group of PAPs have additional income from employment or informal businesses and fishing activities.) - Access to agricultural extension services will be provided to affected communities in order to improve production for the remaining land. - Provide agricultural trainings on how to grow crops and have good harvest and where possible high yield seeds will be provided. - Training on modern fishing methods to maximize their income earnings - Encourage PAPs to be involved in beekeeping to increase their income. (RAP p.113 and 114)												
		(b)Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water area uses?	N	<table><tr><td>Water supply balance of the wells near the Mbuo River (ESIA p. 39)</td><td></td><td>Volume of water</td></tr><tr><td rowspan="4">It is not anticipated that the use of groundwater will not affect others. And since the groundwater will be used below the capacity leaving enough margins, it is not anticipated that land subsidence will be induced by this project.</td><td>Current capacity</td><td>1,200m3/day (in future 1,850m3/day)</td></tr><tr><td>Current demand</td><td>400m3/day</td></tr><tr><td>Demand of Kisiwa site</td><td>300m3/day</td></tr><tr><td></td><td></td></tr></table>			Water supply balance of the wells near the Mbuo River (ESIA p. 39)		Volume of water	It is not anticipated that the use of groundwater will not affect others. And since the groundwater will be used below the capacity leaving enough margins, it is not anticipated that land subsidence will be induced by this project.	Current capacity	1,200m3/day (in future 1,850m3/day)	Current demand	400m3/day	Demand of Kisiwa site	300m3/day
Water supply balance of the wells near the Mbuo River (ESIA p. 39)		Volume of water														
It is not anticipated that the use of groundwater will not affect others. And since the groundwater will be used below the capacity leaving enough margins, it is not anticipated that land subsidence will be induced by this project.	Current capacity	1,200m3/day (in future 1,850m3/day)														
	Current demand	400m3/day														
	Demand of Kisiwa site	300m3/day														
(3)Heritage	(a)Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country’s laws?		Basing on the literature review, consultations with local leaders and elders and walk through during survey of the proposed water pipeline site there was neither recognized nor recorded cultural heritage site within or nearby the project site. No graveyards were found within the way leave. (ESIA p. 48)													
(4)Landscape	(a)Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?		No buildings will be constructed in this project, but water tank will be installed 73m above the sea level with the capacity of 150m3 at Namgogoli village.(ESIA p.16) The new water tank will not spoil the landscape as there is an existing tank at Namgogoli village already and local residents are familiar with it.													
(5)Ethnic Minorities and	(a)Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous		The major ethnic group in Mtwara District is the Makonde. Other ethnic groups include Nanyamba, Nanguruwe, Mpapura, Mayanga, Madimba, and Mahurunga. There are other minority tribes who are either business persons or public and private workers. All these groups speak Swahili language (ESIA p. 46)													

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	Indigenous Peoples	peoples?		The ethnics groups mentioned above that are present within the proposed project site do not identify themselves as indigenous peoples. (ESIA p. 46)
		(b)Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?		The major ethnic group in Mtwara district is the Makonde (the majority). (ESIA p.46) The ethnics groups mentioned above that are present within the proposed project site do not self-identify as indigenous peoples.
	(6)Working Conditions	(a)Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?		<u>Occupational Health and Safety Mitigation Measures</u> <ul style="list-style-type: none"> - Provision of personal protective equipment (PPEs) - Provision of proper work instructions and safety measures for each job - Provision of first Aid box will be provided and have a trained person to handle site emergencies and incidences. - Engagement of trained workers only to operate specific machines and equipment - Maintenance of equipment - Comply with occupational health and safety related laws (ESIA p. 71)
		(b)Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	Y	Hard measures include: <ul style="list-style-type: none"> - Providing appropriate PPEs such as safety helmets, safety masks, safety boots, uniforms and hand gloves - Providing a well-stocked First Aid kit at each workplace - Posting appropriate safety signs (ESIA p.63)
		(c)Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	Y	Soft measures include: <ul style="list-style-type: none"> - Establishing occupational safety and health induction course - Providing proper work instructions and safety measures for each job - Only trained workers will be allowed to operate machines and equipment - Medical personnel shall be responsible for primary medical treatment (ESIA p.63)
		(d)Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	Y	Presence of employed staff may lead to the violation of security and safety of the project area during operation phase. Only a small number of staff who will be employed during operation phase (only two) and all of them will be employed locally from the village. (ESIA p. 64)
5 Others	(1) Impacts during Construction	(a)Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	Y	Mitigation Measures for pollution during construction phase are described in the following sections. Noise, Vibration, Air Pollution (7.2.7) <ul style="list-style-type: none"> - The nuisance of noise, vibration and dust will be transient and good work practice can minimize them. - The impacts of noise and dust emissions will further be minimized by proper choice of machinery (i.e. fitted with noise and dust silencers or reducers) - Dust at work places within or close to human habitation should be critically minimized by periodic water sprinkling on working sections. The contractor shall advise or notify local households on dust, noise, vibration and other dangers.
				Waste and water pollution(7.2.6) <ul style="list-style-type: none"> - Adequate number of waste bins shall be provided at the construction sit - Only inert materials or readily decomposable materials shall be disposed by burial. - No burning of waste materials which produces black smoke shall be approved. Plastics shall not be burned. - The construction sites shall have adequate mobile toilets system
		(b)If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	Y	Mitigation measures for impact on biological environment is described in the following section. Deforestation (7. 2.5) <ul style="list-style-type: none"> - Close supervision of earthworks shall be observed in order to confine land clearance within the proposed new corridor of impact boundaries. - Topsoil shall be stockpiled and used for reinstating flora along the road. It is assumed that displaced fauna will return once the work is over or seek another habitat locally. - The pipeline design shall try as practicable to offset the route so as to avoid felling all big trees that take many years to grow or other flora of outstanding importance
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	Y	Mitigation measures for social impacts are described in “Risks to public health, spread of HIV, AIDS and other STD`s.” on page 71. <ul style="list-style-type: none"> - Sensitization programs for workers and local community. - Encourage periodic health checks (examination) for permanent staff and Medical examination for newly recruited employees and periodic health examination of workers. - A nearby health center/dispensary should be assisted by the Contractor to provide health education, preventive health care and primary treatment of ailments and infectious diseases. - Where feasible and practicable, provide protection i.e. condoms to be distributed and placed strategically for easy access of the workforce.)
		(d)If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?		During the construction phase, the project will have potential impact on the existing road network and surrounding communities. As part of the project design, the most appropriate routes for installation of water pipelines and construction of water tank and pump house have to be determined. Mitigation measures: (ESIA p. 62) <ul style="list-style-type: none"> - installation of speed bumps, - driver training - community awareness

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	Y	Chapter 9 of ESIA describes about the monitoring considering the potential impacts. (ESIA p.76)
		(b) What are the items, methods and frequencies of the monitoring program?	Y	Table 17: Environmental and Social Monitoring Plan of ESIA for the proposed construction of water pipe line provides for the items, methods and frequencies of the monitoring program. The following items are included. Construction Phase: Noise, Dust, Solid waste, water, HIV and STDs and so on Operation Phase: Noise from Pump station, HIV and STDs.
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	Y	Table 17: Environmental and Social Monitoring Plan of ESIA for the proposed construction of water pipe line provides framework for the responsibility and monitoring cost.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?		
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Dam and River Projects checklist should also be checked.		
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).		

