CHAPTER 8 PUBLIC HEALTH AND HYGIENE

8.1 MORBIDITY IN TABORA REGION

As for the outpatient department, malaria is the most common disease in the Tabora Region, followed by acute respiratory infection (ARI), pneumonia, diarrhoea, eye infections and intestinal worms. Malaria is also the most common in inpatient departments, followed by anaemia, pneumonia and diarrhoea. The composition of major diseases in theTabora Region is not much different from that of the Tanzania Mainland.

8.2 PERCEPTION, KNOWLEDGE AND PRACTICE OF PEOPLE ON HEALTH AND HYGIENE

(1) Memorable Events of Diseases and Care Seeking Behaviour

According to socio-economic survey by the JICA Study Team, 259 out of 313 cases utilised health facilities: 77.8% of diarrhoea cases, 88.1% of malaria cases and 79.3% of non-communicable Disease (NCD) cases.

(2) Knowledge on Causes of Diarrhoea

More than 90% of the respondents know at least one cause of diarrhoea in Igunga and Tabora Rural Districts and Tabora Urban Municipal. On the other hand, 15 out of 45 respondents do not know of them at all in the Sikonge District. In all districts except Sikonge, more than 80% of the respondents regard “drinking contaminated water” as a cause of diarrhoea. However, only 42 out of 300 respondents reply “using contaminated hands to eat” results in diarrhoea. People have limited knowledge on causes of diseases.

(3) Knowledge on Prevention of Diarrhoea

Over 90% of the respondents have at least a bit of knowledge on diarrhoea prevention in Igunga and Tabora Rural Districts and Tabora Urban Municipal. On the contrary 16 out of 45 respondents do not know anything. In four districts except Sikonge and Urambo, more than 80% of the respondents know “using safe water” is a way of diarrhoea prevention. However, only 67 out of 300 respondents say “washing hands properly with use of running water and soap” can prevent diarrhoea. People have limited knowledge on disease prevention.

(4) Practice of Prevention of Diarrhoea

67 out of 234 respondents do not actually use safe water. As for proper handwashing, use of proper latrine and proper refusal of disposal, 37 out of 67, 40 out of 97 and 16 out of 23 do not practice these despite possession of the knowledge.

(5) Opportunities to Get Knowledge on Health and Hygiene

People have got the knowledge from TV and radio programmes most frequently, followed by health facilities. On the other hand, few of them have relevant information and knowledge on health and safe water from school teachers and village health workers (VHW), who are supposed to be facilitators of health promotion at frontline level.

8.3 CURRENT SITUATION OF HEALTH EDUCATION IN TABORA REGION

(1) Frontline Facilitators of Health Education

At the frontline level, health education is done by VHW or Village Health Committees (VHC) in village level, while “Health Teachers” facilitate it at school level. Their activities are regularly supported and supervised by health workers at dispensaries or health centres and Council Health Management Team (CHMT). District Education Officer or District Community Development Officer also participates in the supportive supervision in some districts.

(2) Health Education at Community Level

VHWs or VHCs cannot always perform well. As a tool for dissemination of knowledge on health,

leaflets and posters are utilised at all districts, but it is not effective for illiterates. VHWs or VHCs are forced to provide health education depending on their memories and experiences due to the absence of teaching guides or educational aids.

(3) School Health Activities

Current performance of school health is not so good in the Tabora Region. There is a school that is utilising posters produced locally as educational aids. However, generally there are no teaching guides or educational aids. Problems are also identified in practice of hygiene and sanitation. Instruction of proper handwashing is not implemented in schools that have difficulty in access to water.

(4) Implementation Structure of Health Education at District Level

At present, the district councils in the Tabora Region formulate the rural water and sanitation activities in each separate sector such as water, health and education and incorporate them into the District Annual Plan. However, it is inferred that they cannot review the actual performance of the activities and approaches critically and utilise lessons learned effectively for better planning in the following financial year.

8.4 Access to Health Service, Safe Water and Sanitation

(1) Distribution of Health Facilities

The Tabora Region has seven (7) hospitals, 19 Health Centres and 206 Dispensaries. However, many of the villages still do not have any facilities.

(2) Human Resources for Health

In the Tabora Region, 811 out of 1,576 posts for medical doctors, assistant medical officers, clinical officers and nurses (51.5%) are filled in 2008. It can be said that the situation in Tabora Region is better in terms of occupancy of the posts, but there are still a lot of vacancies.

(3) Access to Safe Water

The water supply coverage of the Tabora Region is 49.1%, almost the lowest level in Tanzania. However, the results of a socio-economic survey by the JICA Study Team reveal that many people are satisfied with the quality of drinking water that they use.

(4) Access to Sanitation

66.1% of the villages use the traditional pit latrine. 18.9% use either the traditional pit latrine or no toilet.

8.5 Discussions – Problem Identification

(1) Planning of Health Education

For effective planning of health education in the Tabora Region, it is necessary for all district councils to review the following points: 1) what is the effective approach to let villagers and school children know the health information and knowledge, and 2) how have the trained VHWs/VHCs and Health Teachers perform so far. Effectiveness of tools for health education and sensitisation should be reviewed as approaches for the frontline level. Evaluation of performance is a huge challenge for all districts.

(2) Implementation of Health Education

VHWs and Health Teachers provide education without any teaching guides or educational aids. Even if participatory approaches are adopted at district level, they do not have any tools to effectively implement them at frontline level. As for school health, Sanitation Clubs are not formed at most of the schools in Tabora Region. Some teachers do not know even a term of "Sanitation Club".

(3) Monitoring and Supportive Supervision of Health Education

Without any teaching guides or educational aids, most of VHWs/VHCs and Health Teachers technically depend upon monitoring and supportive supervision from district level. Currently CHMT implements monitoring and supportive supervision based upon the roster, an overall schedule of supervision. However, it is very difficult for him/her to cover the activities in schools that are much more than the health facilities. Moreover, formats of the school visit checklist are not adequate to effectively supervise the lectures and practices.

8.6 CONCLUSION – IMPLICATION FOR BETTER HEALTH PROMOTION

There is room for improvement of health education at any phases of the cycle. In the planning stage it is necessary to review the current approach for health education to seek what is most effective. Reinforcement of evaluation mechanism is a requisite. In the phase of implementation, it is essential for VHWs/VHCs and Health Teachers to have teaching guides and educational aids for health education. It is also necessary to seek diversity of tools for health education and sensitisation. It can also be effective to share the experiences regularly.

As for monitoring and supportive supervision of health education, it is necessary to reschedule involving other relevant sectors. District Water and Sanitation Team (DWST), a district inter-sectoral body, is a good opportunity to enable such collective approaches.

CHAPTER 9 DETAILED SURVEY AND OUTLINE DESIGN ON THE PRIORITY PROJECT

A detailed survey was carried out on the Priority Project (refer, Chapter 6) selected from the rural water supply plan which was formulated in the Study for designing water supply schemes and estimation of approximate implementation costs.

9.1 DETAILED SURVEY

9.1.1 TEST WELL DRILLING

Test well drilling was carried out in seven (7) villages, six (6) target villages and one additional village (Ufuluma Village in Tabora Rural District). Two (2) test wells were basically allocated to each water source, therefore, a total of 14 test wells were planned to be drilled. A second test well will be drilled if the first well is not successful. In addition, three (3) test wells were sunk in Igunga District to evaluate the groundwater quality. Thus, the total number of test wells becomes 17 in maximum. The result of test well drilling is shown in Table 9. 1. The result of water quality analyses is shown in Table 9.2.

Table 9.1 Result of Test Well Drilling

Village	Well No.	Depth (m)	Yield (m3/h)	Fluoride (mg/L)	Evaluation
Nzega District					
Isanga	No. 1	85	3.7	2.40	Yield: suitable for Level-2 by 2 wells
	No. 2	80	3.0	1.10	Fluoride: A～B
Sikonge District					
Usunga	No. 1	98	0.2	1.46	Yield: Insufficient forLevel-2 but sufficient for Level-1, Fluoride: A
	No. 2	150	0.8	2.53	Yield: Insufficient forLevel-2 but sufficient for Level-1, Fluoride: B
Mpombwe	No. 1	79	Dry	—	Unsuccessful
	No. 2	92	0.1	1.10	Yield: Insufficient, Fluoride: A, Unsuccessful
Tabora Rural District					
Mpumbuli	No. 1	50	Dry	—	Unsuccessful
	No. 2	130	9.0	3.95	Yield: suitable for Level-2, Fluoride: B
Mabama	No. 1	79	14.0	1.50	Yield: suitable for Level-2, Fluoride: A
	No. 2	82	0.8	2.24	Yield: Insufficient forLevel-2 but sufficient for Level-1, Fluoride: B
	No. 3	86	Scarce	3.20	Yield: Insufficient for both Level-2 and Level-1, Fluoride: B
Ufuluma	No. 1	86	Scarce	—	Unsuccessful
Tabora Municipality					
Kakola	No. 1	108	6	1.61	Yield: suitable for Level-2, Fluoride: B
Igunga District（for Confirmation of Water Quality）					
Igumo		80	15.2 (1.0)	7.00	Yield: suitable for Level-1, Fluoride: C
Buhekela		70	Dry	-	Unsuccessful
Kagongwa		82	Dry	-	Unsuccessful

Note on Fluoride content

A： within the WHO Guideline (F＜1.5 mg/L)

B： more than the WHO Guideline but within the Tanzania Health Standard (1.5＜F＜4 mg/L)

C： more than the Tanzania Health Standard (4 mg/L＜F)

Table 9.2 Result of Water Quality Analyses

Aspects and Items			Unit	WHO Guideline (2008)	Tanzania Health Standard (2008)	Nzega District		Sikonge District			Tabora Rural District			Tabora Urban	Igunga District
						Isanga 1	Isanga 2	Mpombwe	Usunga 1	Usunga 2	Mpumbuli	Mabama 1	Mabama 2	Kakola	Igumo
Microbial asptects	1	Total coliform bacteria	count/100mL	-	0	0	0	0	0	0	0	0	0	0	0
	2	Escherichia coli.	count/100mL	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals that of health significance	3	Cadmium (Cd)	mg/L	0.003	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	4	Lead (Pb)	mg/L	0.01	0.10	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	5	Arsenic (As)	mg/L	0.01	0.05	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	6	Fluoride (F)	mg/L	1.5	4	2.4	1.1	1.1	1.46	2.53	3.95	1.5	2.24	1.61	7
	7	Nitrate (NO3)	mg NO_3/L	50	100	0.479	0.17	0.477	1	0.9	0.5	0.29	1.76	0.02	0.291
	8	Nitrite (NO2)	mg NO_2/L	3/0.2	-	0.01	0.01	0.02	0.6	0.01	0.01	0.01	0.02	0.01	0.01
	9	Nickel (Ni)	mg/L	0.07	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	10	Manganese (Mn)	mg/L	0.4	0.5	0.01	0.01	1.5	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Acceptability aspects	11	Total hardness	mg/L	-	600	300	300	225	200	125	200	325	200	425	250
	12	Calcium (Ca)	mg/L	-	-	80	60	50	60	40	50	100	70	160	60
	13	Magnesium (Mg)	mg/L	-	100	24.3	36.48	24.3	12.16	6.08	18.24	18.24	6.08	6.08	24.32
	14	Iron (Fe)	mg/L	-	1.0	0.01	0.01	3.02	0.64	0.01	0.02	0.01	0.02	0.01	0.01
	15	Zinc (Zn)	mg/L	-	15.0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	16	Copper (Cu)	mg/L	2.0	3.0	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001
	17	Chloride (Cl)	mg/L	-	800	88.6	53.1	88.6	194.97	53.17	212.7	124.07	141.8	159.5	70.9
	18	TDS	mg/L	-	2,000	475.2	377.8	459.2	468	134	685	592	590	600	570.9
	19	Ammonium (NH3-NH4)	mg/L	1.5	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	21	pH	-	-	6.5-9.2	7.6	7.4	7.6	7.5	7.8	7.7	7.1	7.2	7.7	7.8
	22	Taste	dilution	-	not objectional	no	no	no	no	no	no	no	no	no	no
	23	Odour	dilution	-	not objectional	no	no	no	no	no	no	no	no	no	no
	24	Colour	mg Pt/L	15	50	0	0	0	0	0	0	0	0	0	0
	25	Turbidity	NTU	5	30	0.99	2.53	942	1575	3.03	0.861	3.81	0.664	0.964	0.44
	26	Temperature (T)	^{0}C	-	-	28.6	28.7	28.8	26.5	26	28	26	26	25	28.7
	27	Conductivity (EC)	nS/m	-	-	86.4	68.7	83.5	93.7	268	137.5	118.3	118.1	120	103.8
Items related to characteristics of	28	Sodium (Na)	mg/L	-	-	60.2	18.8	86.9	119.37	3.22	220.5	121.9	176.41	79.81	121.4
	29	Potasium (K)	mg/L	-	-	1.5	2.4	3.3	7.7	2.2	4.9	1.7	6	2.1	4.6
	30	Biocarbonate (HCO3)	mg/L	-	-	300	300	200	200	50	200	325	200	300	250
	31	Sulphate (SO4)	mg/L	-	600	0.01	0.01	1.7	8	9.6	250	0.01	70	48	18.72

(1) Evaluation of groundwater yield

A suitable groundwater source for Level-2 was obtained in four (4) villages: Isanga Village in Nzega District, Mpumbuli Village and Mabama Village in the Tabora Rural District, and Kakola Village in Tabora Municipality. However, no suitable groundwater source was obtained in three (3) villages: Usunga Village and Mpombwe Village in Sikonge District and Ufuluma Village in Tabora Rural District.

(2) Evaluation of Water Quality

"Items related to Health Significance" except for Fluoride contents are lower than those of the WHO Guideline (2008) and Fluoride contents and others are lower than those of the Tanzania Health Standard (2008).

9.1.2 Field Survey in the Target Villages for Level-2 Water Supply Scheme

Level-2 water supply schemes will be constructed in four (4) villages where a suitable groundwater source was obtained by the test well drilling: Isanga Village in Nzega District, Mpumbuli Village and Mabama Village in Tabora Rural District, and Kakola Village in Tabora Urban. The Level-1 water supply schemes will be constructed in other villages where no suitable groundwater source was obtained.

Although the Level-2 water supply schemes will be constructed in the four (4) villages, some Sub-Villages in those villages are excluded from the service area of the Level-2 schemes due to unsuitable dwelling types, and topographical and hydrogeological conditions. Such Sub-Villages will be supplied water by Level-1 instead of Level-2.

As a result, the only entire area of Isanga Villages can be covered by the Level-2 water supply scheme. The level-2 scheme cannot cover the whole Sub-Villages of other villages, therefore, such Sub-Villages are to be covered by Level-1 water supply schemes.

9.1.3 Field Survey in the Target Villages for Level-1 Water Supply Scheme

Considering the study results described above, the Level-1 schemes were planned to be constructed in 19 villages. Three (3) villages out of 19, both Level-2 and Level-1 schemes will be constructed. A field survey was carried out to select the proposed sites for the Level-1 schemes considering the population, dwelling type (dense or scarce), topographical and hydrogeological conditions and opinion of community people. Finally, 115 sites were selected as the proposed sites for the Level-1 schemes. Finally, the total number of the Level-1 schemes became 114.

9.2 Revision of Water Supply Plan for the Priority Project

The plan was revised considering the study results described in 9.1.1and 9.1.2 above. The Level-2 schemes were reduced from six (6) to four (4) and the Level-1 schemes became 114 sites from 174 sites. Those are shown in Table 9.3.

Table 9.3 Water Supply Plan for the Priority Project

District /Municipality	Ward	Village	Population		Population served by existing WSS (2009)	Coverage by existing WSS (2009) (%)	Coverage by existing WSS (2020) (%)	To be served by the project (2020)	Number of Level-2 Sub-projects	Population served by Level-2 (2020)	Number of Level-1 Sub-projects	Population served by Level-1 (2020)	Population served by the Project (2020)	Total Population served (2020)	Coverage (by the Project: (2020) (%)	Coverage* (Target Population: (2020) (%)
			2009	2020												
Igunga	Mwisi	Busomeke	3,618	5,227	250	7	5	4,977	0	0	7	1,750	1,750	2,000	34	38
	Mwisi	Kalemala	2,429	3,509	0	0	0	3,509	0	0	5	1,250	1,250	1,250	36	36
Nzega	Ijanija	Makomelo	1,005	1,319	250	25	19	1,069	0	0	6	1,069	1,069	1,319	81	100
	Lusu	Isanga	1,491	1,956	0	0	0	1,956	1	1,956	0	0	1,956	1,956	100	100
	Miguwa	Kitangili	2,664	3,496	0	0	0	3,496	0	0	10	2,500	2,500	2,500	72	72
	Wela	Wela	1,753	2,301	500	29	22	1,801	0	0	7	1,750	1,750	2,250	76	98
Sikonge	Igigwa	Kasandalala	2,282	3,332	250	11	8	3,082	0	0	7	1,750	1,750	2,000	53	60
	Kipanga	Usunga	1,894	2,766	250	13	9	2,516	0	0	5	1,250	1,250	1,500	45	54
	Pangale	Mpombwe	3,435	5,015	250	7	5	4,765	0	0	8	2,000	2,000	2,250	40	45
Tabora Rural	Kizengi	Mpumbuli	2,157	3,148	0	0	0	3,148	1	2,658	3	490	3,148	3,148	100	100
	Mabama	Mabama	4,329	6,321	500	12	8	5,821	1	5,471	2	350	5,821	6,321	92	100
	Ufuluma	Ufuluma	5,741	8,382	250	4	3	8,132	0	0	7	1,750	1,750	2,000	21	24
Tabora Urban	Kakola	Kakola	2,015	3,483	0	0	0	3,483	1	2,983	2	500	3,483	3,483	100	100
	Misha	Misha	759	1,312	0	0	0	1,312	0	0	5	1,250	1,250	1,250	95	95
	Uyui	Uyui	3,138	5,424	250	8	5	5,174	0	0	8	2,000	2,000	2,250	37	42
Urambo	Imalamakoye	Imalamakoye	2,509	4,292	1,000	40	23	3,292	0	0	4	1,000	1,000	2,000	23	47
	Kapilula	Kapilula	1,568	2,682	0	0	0	2,682	0	0	5	1,250	1,250	1,250	47	47
	Kiloleni	Kalembela	3,131	5,356	0	0	0	5,356	0	0	7	1,750	1,750	1,750	33	33
	Kiloleni	Kiloleni	1,653	2,828	250	15	9	2,578	0	0	6	1,500	1,500	1,750	53	62
	Uyowa	Nsungwa	6,911	11,821	250	4	2	11,571	0	0	10	2,500	2,500	2,750	21	23
Total			54,482	83,970	4,250	7.8	5.1	79,720	4	13,068	114	27,659	40,727	44,977	48.5	53.6

9.3 OUTLINE DESIGN OF WATER SUPPLY SCHEMES

9.3.1 Basic Concept

(1) The Target Year of the Project, Population to be Served and Water Demand

The target year of the Project is set 2020 as agreed in the discussion of the Scope of the Works of the Project. The population to be served and water demand were estimated as shown in Table 9.4.

Unit water demand is 25 L/capita/day. Water demand for the institutional facilities was not considered, since the user of such facilities were mostly people in the community where the facilities were located.

Table 9.4 Water Demand and Pumping Plan for the Target Villages of Level-2

District /Municipality	Village	Population to be Served	Water Demand (m^3/day)	Pumping Rate (m^3/hour))	Operation Hour (hour)
Nzega District	Isanga	1,956	48.90	3.36	16
Tabora Rural District	Mupumbuli	3,148	66.45	6.09	12
	Mabama	6,321	136.78	12.54	12
Tabora Municipality	Kakola	3,483	74.58	5.86	14

(3) Manual and Guideline used for Outline Design of Water Supply Facilities

The Design Manual (MoW, 2007) was applied for the outline design of water supply facilities. The Japanese Design Standard for Waterworks Facilities was applied for the items not described in the Design Manual.

9.3.2 DESIGN CONDITIONS

The specifications of the deep wells are shown in Table 9.5.

Table 9.5 Specification of Deep Wells

	Level-2	Level-1	
Type	-	Type-A	Type-B
Target area	-	District other than Sikonge	Sikonge District
Drilling method			
- Sediments	(already drilled)	Mud-rotary method	
- Granite, Gneiss (hard rock)		Down-the-Hole method	
Drilling depth	75～125m	90m in average	150 m in average
Drilling diameter	8 inches	7-5/8 inches	
Diameter of casing	6 inches	4 inches	
Material of casing/screen pipe	uPVC	uPVC	
Opening ratio of screen pipe	4%	4%	
Pumping method	Submesible pump	Hand pump	

The annular space between the wall of the borehole and casing/screen pipe is packed by gravel. The space on the gravel packing is filled by cement milk to prevent deterioration by surface water. The water quality of the water source is evaluated applying the WHO Guidelines (2008) for the items related to health significance except for Fluoride, and the Tanzania Health Standard (2008) for other items and Fluoride.

Design conditions for the Level-2 and the Level-1 water supply schemes are shown in Table 9.6 and Table 9.7, respectively.

Table 9.6 Design Conditions of the Level-2 Water Supply Schemes

1. Time period of water consumption: 6 hours (from 6:00 to 9:00a.m. and 3:00 to 6:00p.m.)		
2. Design Flow Daily average flow Daily maximum flow Hourly maximum flow	 Daily average flow = Daily water demand + Distribution losses 10% Daily maximum flow = Daily average flow Hourly maximum flow = Daily maximum flow / 6 hours	
3. Distribution Losses	10% of Daily average flow	
4. Facilities	Specifications	
(1) Intake facilities	Water source	Groundwater (Deep well)
	Daily operation hours	Maximum: 14 hours (Diesel Generator) Maximum: 16 hours (Commercial Power Supply)
	Capacity (m^3/min.)	Daily maximum flow (m^3/day)/ Daily operation hours (hour./day)
	Type of pump	Submersible pump (Centrifugal pump)
	Power source	Commercial Power or Diesel Generator
(2) Transmission Line	Design flow	Daily maximum flow (m^3/day)/ Daily operation hours (hour./day)
	Method of water supply	Pressure flow
	Material of pipes	PVC pipe
	Earth covering depth	0.9 m (minimum)
(3) Storage tank (Distribution tank)	Capacity (m^3)	Not less than Daily maximum flow (m^3/day) x 50% (50 or 90 m^3)
	Type of tank	Elevated Tank (15 m)
	Low water level	G.L. +15.50 m
	No. of tank	1 tank / scheme
	Material of tank	Reinforced concrete
(4) Distribution Line	Design flow	Hourly maximum flow
	Method of water supply	Gravity flow
	Material of pipes	PVC pipe
	Earth covering depth	0.9 m (minimum)
(5) Public water point (PWP)	Number of tap per PWP	One or Two tap(s) per PWP
	Maximum number of user	250 persons per tap
	Water head at PWP	5～25m
	Maximum distance of access	Around 400 m from household

Table 9.7 Design Conditions of the Level-1 Water Supply Schemes

1. Design Flow and Discharge Rate	0.7 m^3/hour/borehole (standard) 0.4 m^3/hour/borehole (minimum)	
2. Facilities Hand Pump	Specification	
	Water source	Deep well
	Daily operation hours	Standard: 10 hours Maximum: 16 hours
	Pump head	90 m (maximum)
	Maximum number of user	250 persons per hand pump
	Maximum distance of access	Around 400 m from household

9.3.3 FACILITY PLAN FOR THE LEVEL-2 WATER SUPPLY SCHEMES

The facility plans for the four (4) target villages where the Level-2 water supply schemes are to be constructed are shown in Figure 9.1 to Figure 9.4.

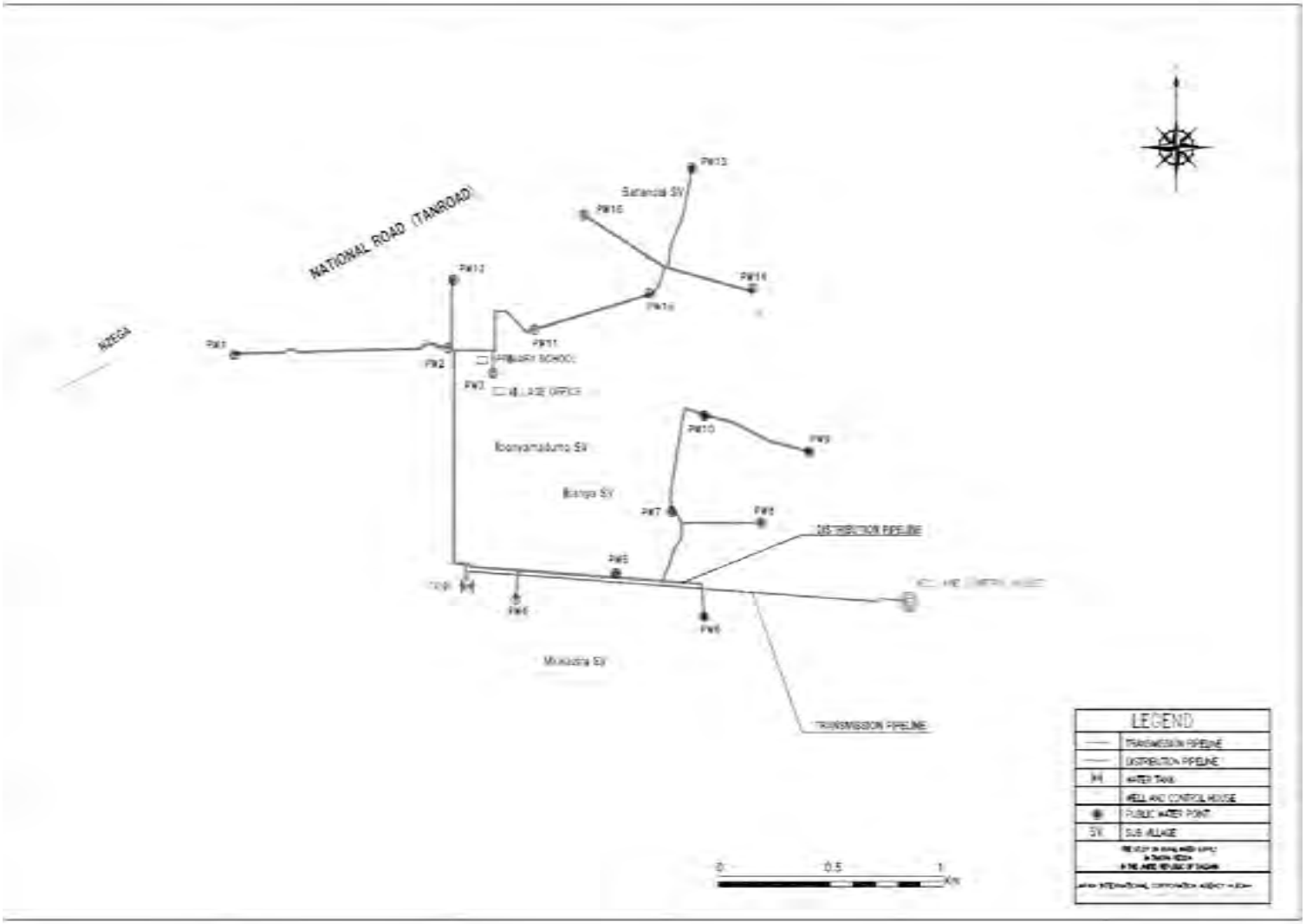


Figure 9.1 Layout Plan of Isanga Village, Nzega District

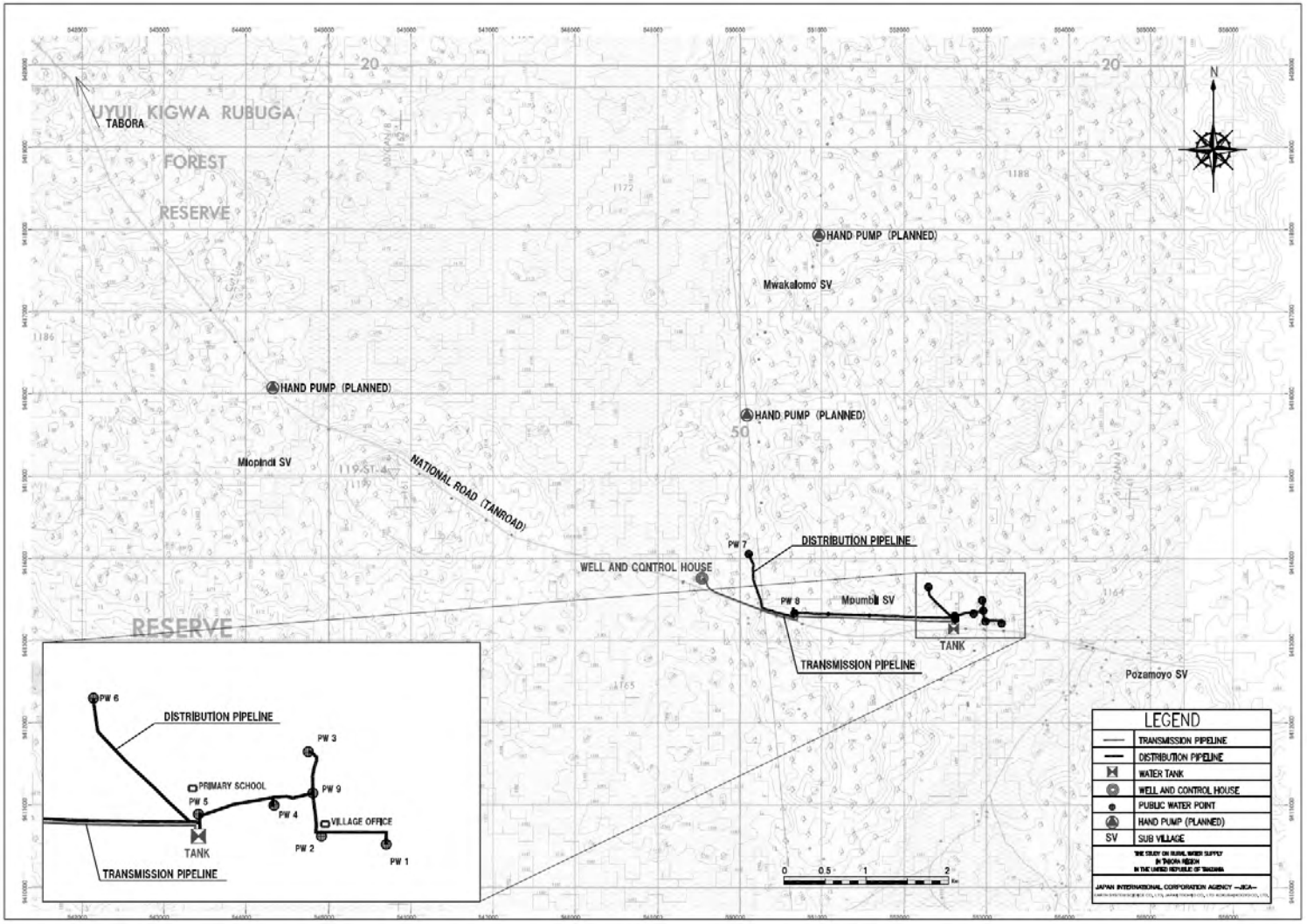


Figure 9.2 Layout Plan of Mpumbuli Village, Tabora Rural District

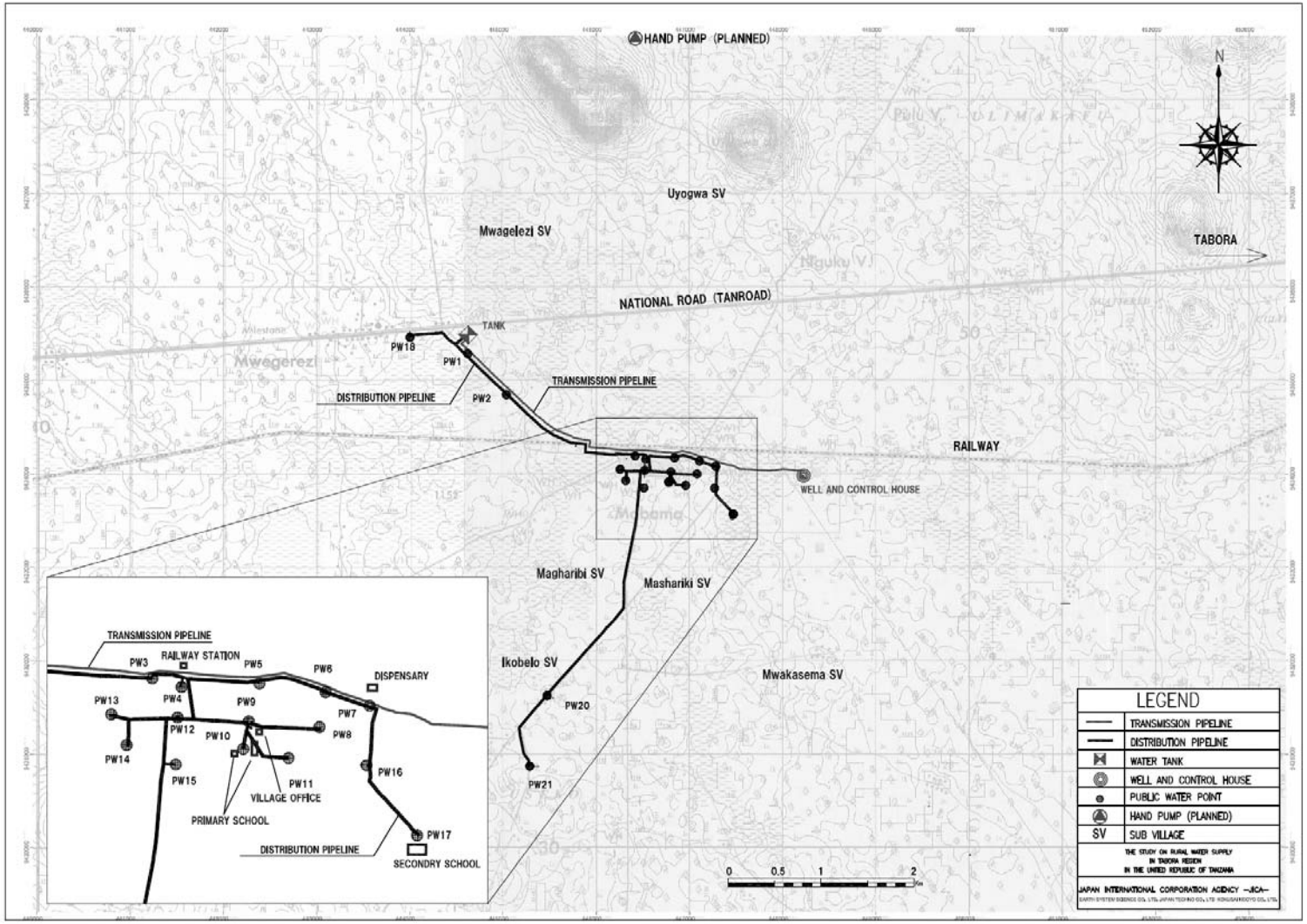


Figure 9.3 Layout Plan of Mabama Village, Tabora Rural District

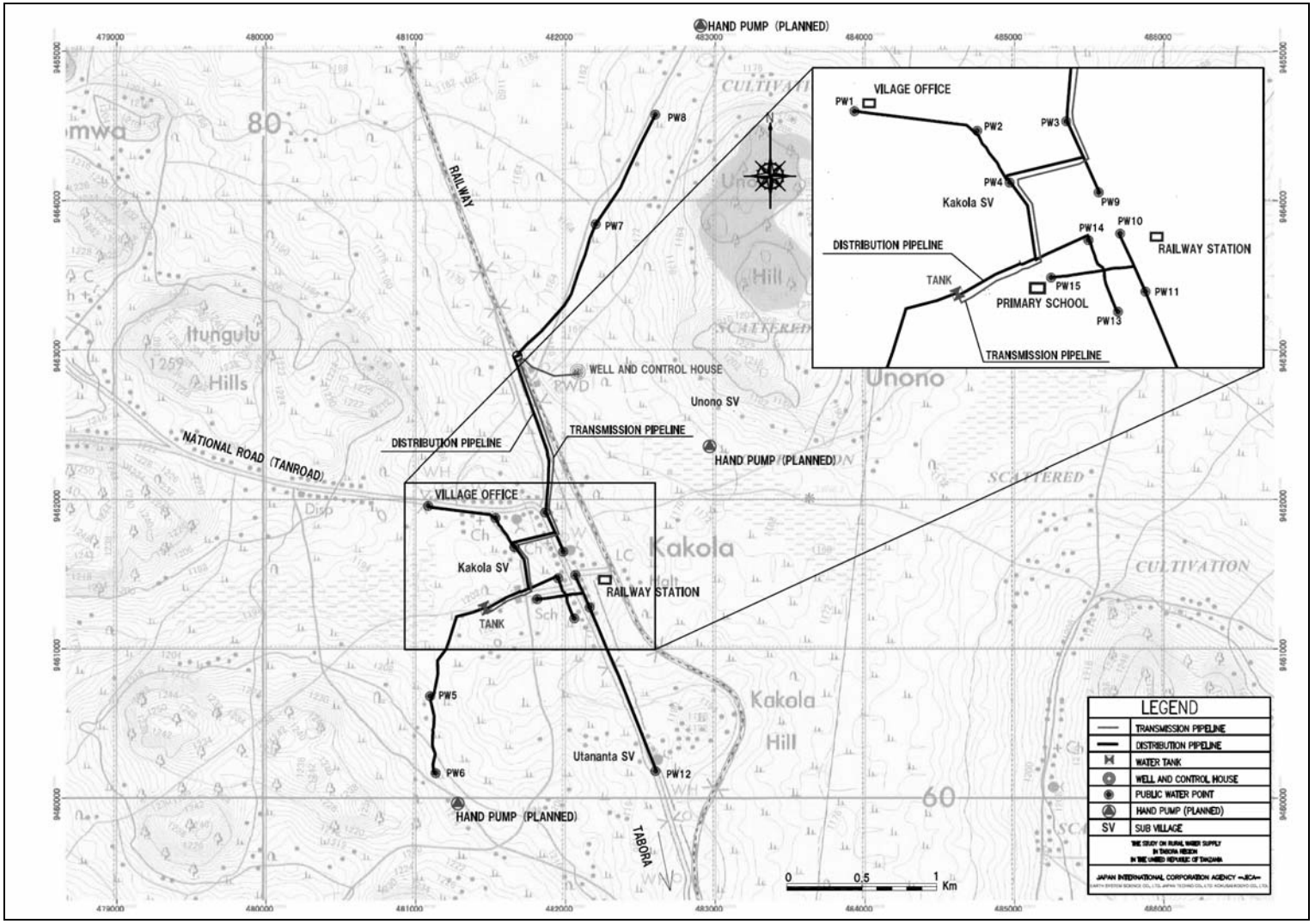


Figure 9.4 Layout Plan of Kakola Village, Tabora Municipality

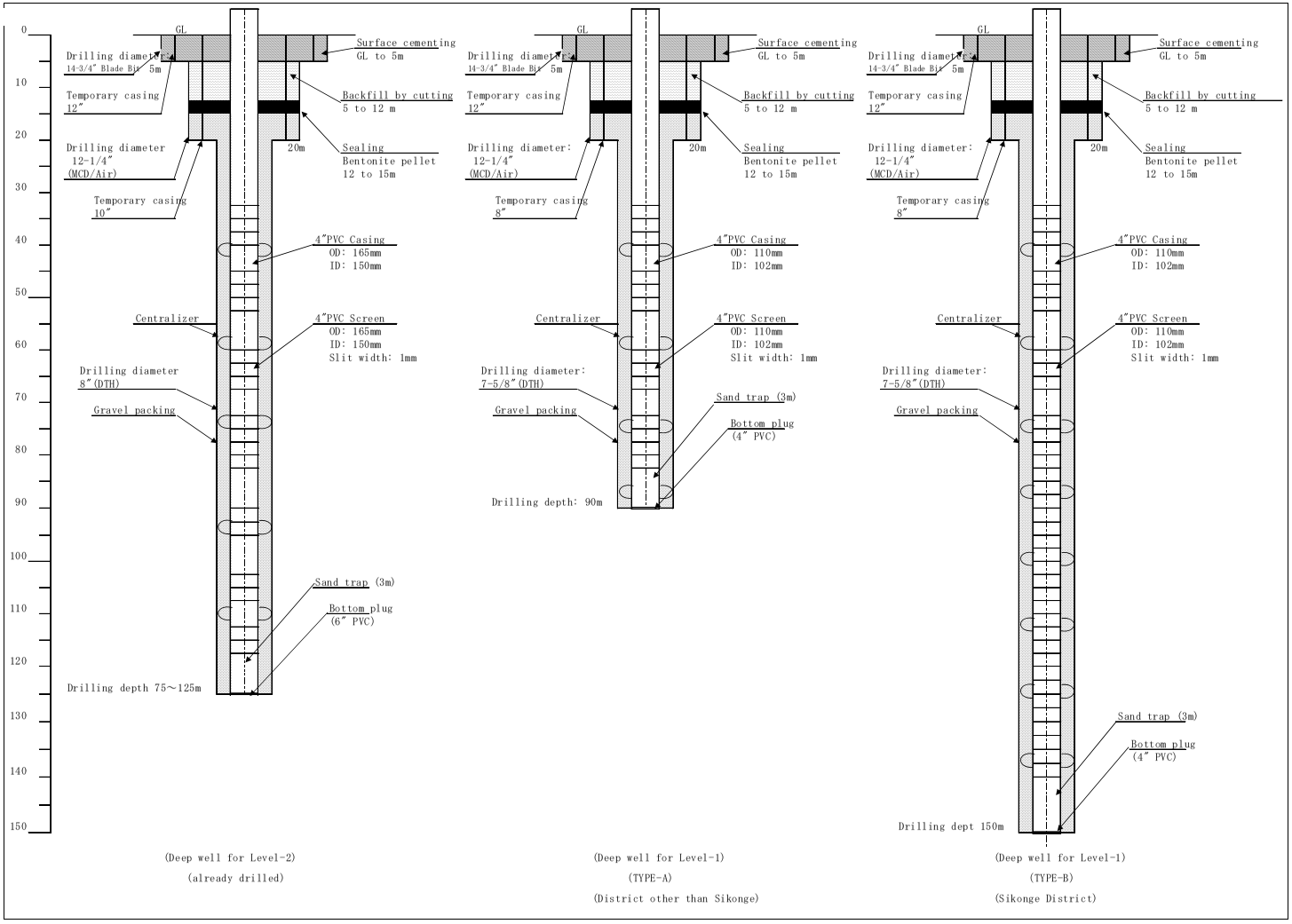


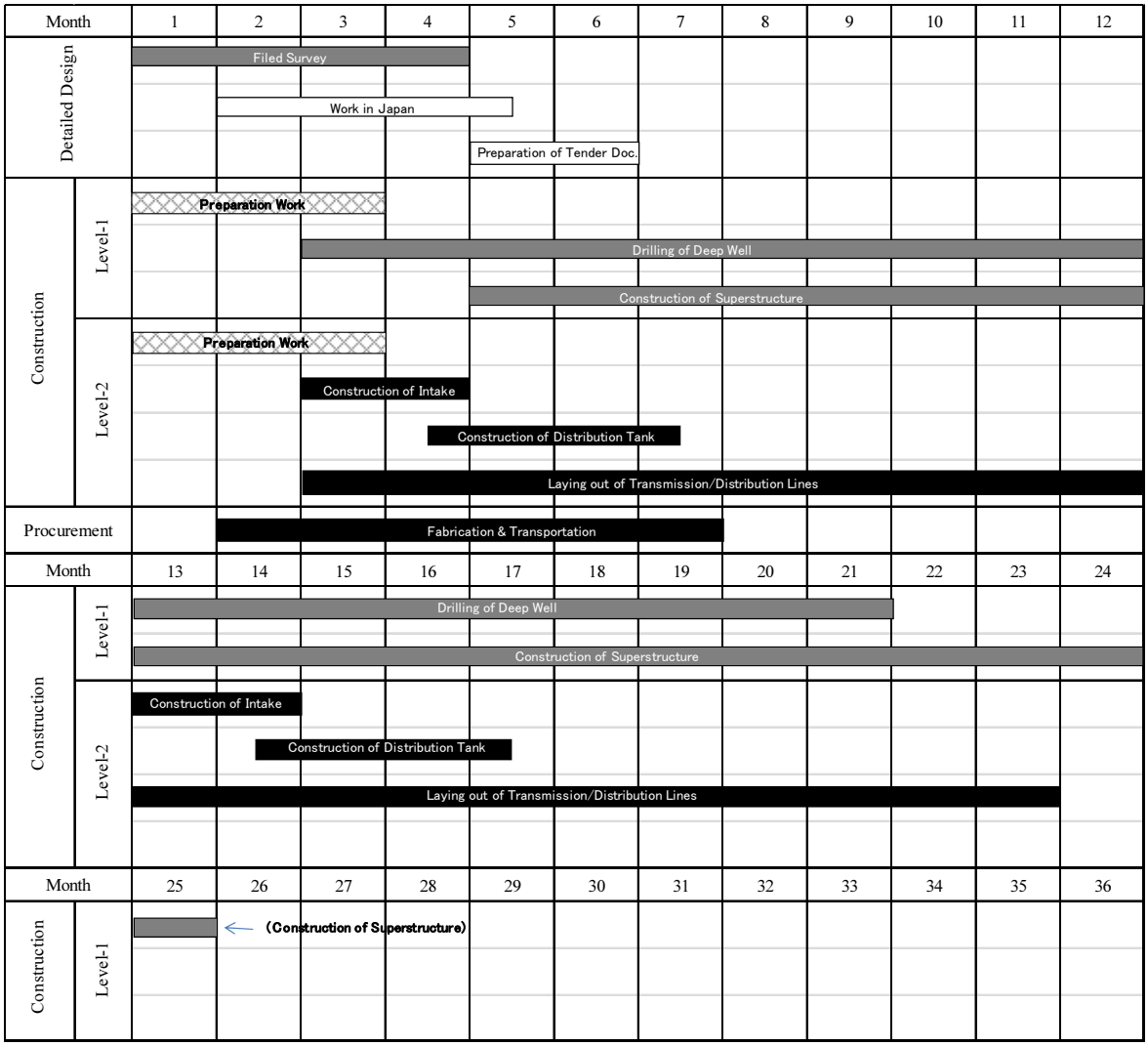
Figure 9.5 Well Structure of Deep Well for Level-2 and Level-1 Schemes

9.4 IMPLEMENTATION AND PLAN

Roads in the Tabora Region are not paved except for the section between Tabora Municipality and Nzega Town and the city area of Tabora Municipality. The width of access roads to the sites is sometimes narrow, about 3m in width, so that it is difficult for heavy vehicles to pass through the roads. Access in the dry season is not a problem, however, it becomes very bad in the rainy season (October to May) in many villages. Therefore, construction work in such villages should be done in the dry season.

The implementation schedule of the project is shown in Table 9.8. Implementation of the Project will start from the Detailed Design Study and will be end with completion of the water supply schemes. The total period is about 35 months.

Table 9.8 Implementation Schedule of the Project



9.5 PROJECT COST ESTIMATION

Operation and maintenance costs for the Level-2 and Level-1 water supply schemes were estimated as shown in Table 9.9.

Table 9.9 Operation and Maintenance Costs for Level-2 and Level-1

Type	Village	O&M Cost/Year ($x10^3$ Tsh)	O&M Cost /capita/month (Tsh)
Level-2	Isanga	21,944	935
	Mpumbuli	42,281	1,326
	Mabama	37,655	574
	Kakola	45,930	1,400
Level-1	Each scheme	841	280

CHAPTER 10 SOCIO-ECONOMY IN TARGET VILLAGES OF PRIORITY PROJECT

10.1 ECONOMICS AND INDUSTRY

The primary income source of the target villages of the priority project is agriculture (96.3%). Other income sources such as livestock raising (1.0%), waged income (1.0%), or small business (0.7%) are minor. In Nsungwa village in Urambo District, there is a gold mine and workers work for wages. 67.3% of households have secondary income sources, which are commonly livestock keeping (38.1%), retail (33.7%), and casual labour (12.4%), respectively.

10.2 HOUSEHOLD INCOME

The median household income was categorised as 150,001 - 200,000 Tsh/month, with a share of 22.6%, followed by 200,001 - 300,000 Tsh/month comprising 16.9% (Figure 10.1).

Differences among districts reveal Urambo as the wealthiest district with 200,001 - 300,000 Tsh/month, followed by Igunga, Tabora Rural and Tabora Municipality with 150,001 - 200,000 Tsh/month, and Nzega and Sikonge with 60,001 - 100,000 Tsh/month, respectively.

As mentioned in the previous section, most households depend on agriculture, which means that cash income is only available during the harvest season of May to August, as shown in Figure 10.2.

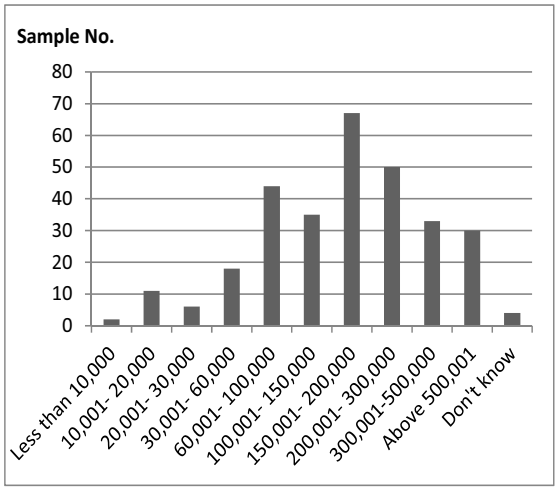


Figure 10.1 Monthly Household Income

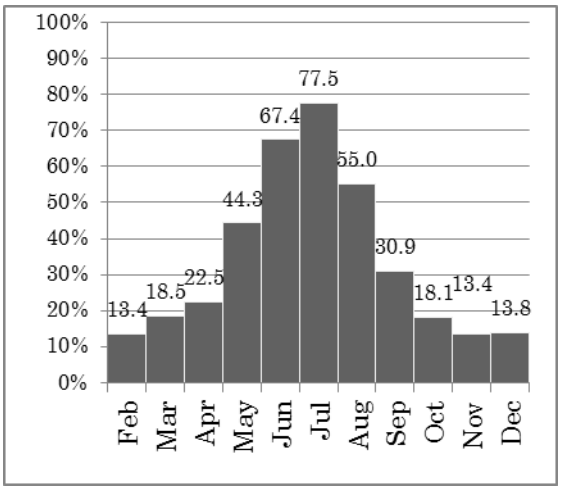


Figure 10.2 Month of Income

The median household expenditure was 120,000 Tsh/Month. Average monthly expenditure based on NBS was 8,450 Tsh/person. The equivalent figure considering inflation rate is 106,884 Tsh/household which is reasonable value.

Differences among districts reveal Urambo again as the wealthiest district with 210,000 Tsh/month, followed by Igunga and Tabora Municipality with 150,000, and Tabora Rural with 122,500 Tsh/month, and Nzega and Sikonge with 300,000 Tsh/month, respectively.

10.3 RESPONSIBILITY OF WOMEN'S ACTIVITIES

(1) Role of Fetching Water and its Means

Fetching water is primarily work for adult women (93.3%). A minority of males (3.3%) take charge of the task.

As a secondary role, girls (66.7%) and boys (16.7%) are responsible for fetching water. Water is fetched on foot by more than 60% of women, while 30% are allowed to use a bicycle.

(2) Current Water Use

According to the interview, the commonly used water source for priority villages was unprotected shallow wells (rainy season 49.5%, dry season 52.7%), followed by dam/Charcoal dam/ponds (rainy season 26.3%, dry season 23.3%), meaning more than half of households are dependent on unprotected water sources (Table 10.3). During the rainy season, rain water was also utilised in 21.5% of households, meaning an increased concentration on protected water sources capable of providing water throughout the year. Protected shallow wells with hand pumps (rainy season 11.9%, dry season 12.0%), and protected deep wells (rainy season 7.2%, dry season 9.9%) tended to be utilised more during the dry season. The total percentage of households using protected water sources was 28.0% during the rainy season and 29.8% during the dry season. Unfortunately, this figure for households using protected water sources was almost equal to the data shown in the Household Budget Survey in 2002 (28.0%), meaning that improvement of rural water supply schemes in the rural area of the Tabora Region has stagnated since 2002.

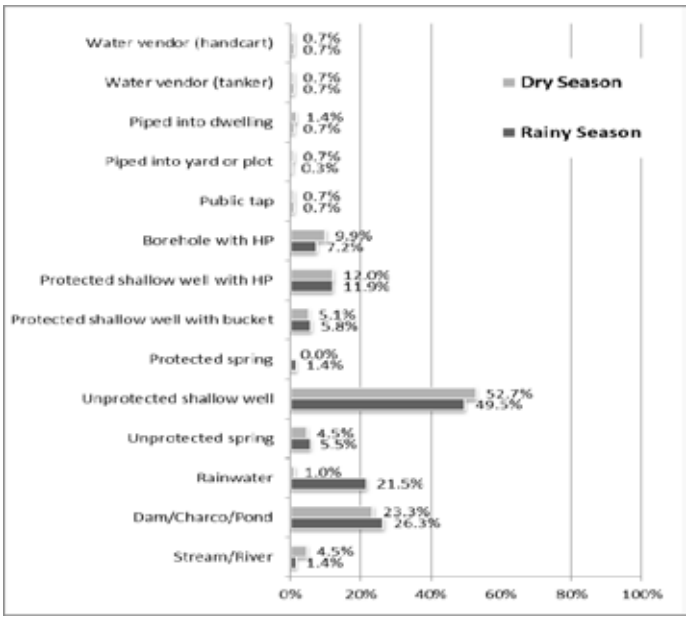


Figure 10.3 Existing Water Sources for Drinking

(3) Satisfaction with Water Service

Most households were satisfied with the water quantity in the rainy season (79%: very good, good, fair), but less so in the dry season (47%: very good, good, fair). The average water consumption per household (seven (7) people/household) was nine (9) buckets (20 litres) in the rainy season, and seven (7) buckets in the dry season. Individual consumption was 25.7 litres per day during the rainy season and 20.0 litres per day in the dry season, which is roughly consistent with the average water consumption volume recommended as the Tanzanian standard.

Perceptions of water quality indicate unique results. The majority are satisfied with the current water quality in both the dry season (69.7%: very good, good, fair) and the rainy season (66.0%: very good, good, fair). During the rainy season, mud, grass or cattle dung with rain water poured into unprotected water sources, on which the majority depends, and more people perceived the water quality as lower, meaning the satisfaction level decreases slightly during the rainy season. This tendency is considered attributable to a lack of knowledge about safe water, hygiene and sanitation, and an inability to compare safe and clean water as they have no alternatives. However, at the same time, one-third of the people are dissatisfied with the water quality ("bad" and "very bad" rainy season: 34.0%, dry season: 30.3%). Most complaints concern the water quality where livestock and human beings share the same sources.

(4) Time Taken to Fetch Water

To understand the time taken to fetch water, the time required to reach water sources and the queuing time at the water point were surveyed. As shown in Figure 10.4 below, 82.3% of households took less than 30 minutes in the rainy season, but the number of households taking longer than 91 minutes increased from 3.0 to 22.7% in the dry season. With regards to queuing time at water points, as shown in Figure 10.5, waiting time in the rainy season was less than 10 minutes (79.7%), while the proportion decreased to 29.4% in the dry season. 46% of people wait for more than 30 minutes. The increased waiting time was due to the greater concentration of people at limited water points with water available year-round, and even at such water points, the water yield was lower than the rainy season, meaning it took longer for the community people to fetch water.

The mean time required for fetching the water, including time for travelling and queuing, was 20 minutes during the rainy season and 63 minutes during the dry season respectively.

The Tanzanian government issued the National Strategy for Growth and Reduction of Poverty (NSGRP) and set the target of increasing the proportion of the rural population with access to clean and safe water from 53% in 2003 to 65% in 2009/10 within 30 minutes of time spent on water collection. The survey results showed that 56.7% of households had access to water sources of some kind in the rainy season, and 25.3% in the dry season. The results also indicate that existing level of water service is much lower than average of Tanzania.

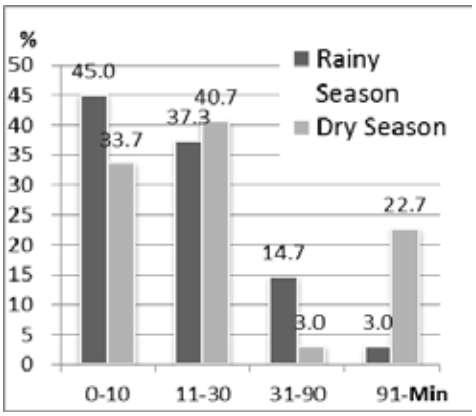


Figure 10.4 Time Taken to Fetch Water

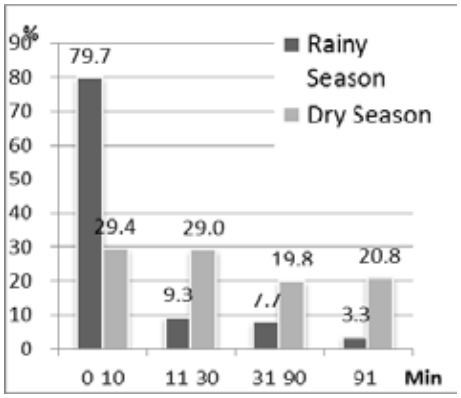


Figure 10.5 Queuing Time at Water Points

10.4 PRIORITIES FOR COMMUNITY DEVELOPMENT

Priorities for community development provide information concerning issues that are most urgent or of highest interest to the communities. Households were given seven options among electricity, health clinics and services, schools and education, water facility and services, sanitation and sewerage systems, disposal of garbage (solid waste), and access roads and roads within neighbourhoods.

67.7% of households cited water as their key concern, and 15.0% as their second priority. In total, 82.7% of households recognised it as a priority development area. The second most required service was health facilities (66.3% both primary and secondary).

Furthermore, 85.0% of the community members expressed needs for new water facilities, even if they meant additional charges. This also reflects the high demand for new water facilities in priority villages. Through the interviews, male as well as female respondents also reported on the current difficult situation of fetching water.

10.5 WILLINGNESS TO PAY AND MODE OF PAYMENT

(1) Willingness to Pay

As shown in Table 10.6, willingness to pay for water of the target villages in the Tabora Region did not reach 1 Tsh/L. However, the respondents were seen to hesitate in setting the user fee, because they had never paid before. Community awareness and training for operation and maintenance might pave the way to increase the fee. It seems to be necessary to enlighten the community people on the using of safe and clean water.

Willingness to pay of the priority village are 0.66 Tsh/L for Level-2 and 0.36 Tsh/L for Level-1.

Table 10.1 Basic Data for Examining Level-2 Introduction

	Isanga	Mpumbuli	Mabama	Kakola
Level 2 willingness to pay	0.36 Tsh/L	0.23 Tsh/L	0.84 Tsh/L	0.64 Tsh/L
Monthly household income (Mean; Tsh/month)	150,001 - 200,000	150,001 - 200,000	150,001 - 200,000	150,001 - 200,000

(2) Mode of Payment

Villagers were asked about the most convenient mode of payment. 60% preferred a flat rate per household in the form of a monthly payment, while 18% preferred a progressively increasing monthly tariff, and 17% preferred a flat rate per container. Many respondents stated that it was convenient to prepare payment once a month rather than daily or weekly in order to continue payment.

CHAPTER 11 ENVIRONMENTAL AND SOCIAL CONSIDERATION

11.1 ENVIRONMENTAL LAWS AND RELATED REGULATIONS IN TANZANIA

Among various environmental laws and regulations, the National Environmental Management Council Act (1983) is to be referred to in Environmental Impact Assessment (EIA). This environmental law enacts "the National Environmental Management Council (NEMC)". NEMC developed "Tanzania Environmental Impact Assessment Procedure and Guidelines (2002) for EIA processes.

11.2 GUIDELINE FOR ENVIRONMENTAL AND SOCIAL CONSIDERATION

Projects identified to give potentially adverse impact on surrounding environments or vicinities must be evaluated and assessed under NEMC supervision. However, in 2008, a water sector guideline was promulgated for projects under WSDP.

After 2008, projects under WSDP will have to file a check list of Environmental and Social Management Framework (ESMF) before registration. For those projects which are categorized as "C", MoW will evaluate them and will precede them to the approval process.

11.3 INITIAL ENVIRONMENTAL EXAMINATION

(1) Environmental and Social Consideration Check List

The environmental and social impact on the specific sites of the proposed Level-1 and Level-2 facilities is assessed by the Study team together with the Tanzanian counterpart. The results were summarized in IEE check list shown as Table 11.1.

Table 11.1 IEE Check List

	S/N	Impacts	Const-ruction	Opera-tion	Description
Social Environment	1.	Involuntary Resettlement	D	D	Although the distribution pipes will be laid under land for public use in most of distance, temporary use of limited agriculture land* (w=3m) is required for construction uses. However, the construction works will take place only in dry season, in which there is no cultivation, and the land is recovered to the agricultural land after the construction. Hence the impacts on income means and harvesting will not be expected or negligibly small. Land acquisition will not be necessary; however, if land acquisition would be necessary due to delay of construction works, it is confirmed by village council that substitute agricultural land (with the same size and productiveness) will be provided. It is not difficult to find substitute agricultural land almost every where around the village where grassland and bush are common. *Right of cultivation is not granted from the state government, but admitted as village customary agricultural practice.

	S/N	Impacts	Const-ruction	Opera-tion	Description
	2.	Local economy such as employment and livelihood	D	D	There would be some job opportunity provided to locals by water users' groups. They rather have positive impact on the local economy. Water venders will receive some impact, but they are not selling drinking water only. There are always demands for their water elsewhere.
	3.	Land use and utilization of local resources	D	D	No adverse impact is expected on land use and utilization of local resources, but positive impacts by installation of water supply facility such as increasing of the land value are expected.
	4.	Local communities and decision-making institutions	D	D	No negative impact is expected on local society. Because formulation of community organizations for operation and maintenance of water supply facilities are planned, and the regulations on amount of water tariff, the collection ways of collection will be determined by the villagers.
	5.	Existing infrastructures and services	D	D	Some traffic disturbances are expected when construction of burying pipes which crosses a village road; however, the impact is minimum because there is almost no paved road in the all the project sites and the works will be done in extremely short period of time.
	6.	The poor/ indigenous/ ethnic minority/ women/ children	D	D	Highly positive impact is expected for women and children by saving their time for water fetching and spending the time for other productive work.
	7.	Misdistribution of benefit and social cost	D	D	The same as above "4".
	8.	Historical/ cultural heritage	D	D	The size of water supply facilities is small; and, it is movable in the proximity area so it does not interfere with historical/ cultural heritage.
	9.	Local conflict of interests	D	D	The facility will be managed by the village water committee or water users group. According to the District officials, there were no conflict over water supply facilities and therefore no impact on local interest is expected by a new facility.
	10.	Water usage, Water rights, Communal rights	D	D	Since the water supply facility will provide water, there would be highly positive impact on water usage of the community. The facility will contribute to the respective village as a whole because the distribution is managed by village water committee or water users group.
	11.	Sanitation	D	D	Water quality is checked by 29 parameters in the test drilling phase. The facility allows the amount of water supply for sanitation use. It gives highly positive impact to community health.

	S/N	Impacts	Const-ruction	Opera-tion	Description
	12.	Health Hazards/Risk, Infectious Diseases such as HIV/AIDS	D	D	Public health and sanitation conditions will be improved by improving accessibility to clean water. HIV/AIDS problem will not occur at water facility installation work.
Natural Environment	13.	Important/ valuable geographical and geological features/ resources	D	D	There is no such place in theTabora Region. No impact is expected.
	14.	Soil erosion	D	D	No soil erosion is expected by installation and use of water supply facility.
	15.	Amount and quality of groundwater	D	D	There would be no negative impact on quality of groundwater by installation and operation of the facility. Since the facility will be built at the site only with sufficient amount of ground water, verified by analysis by water recovery tests during test drillings, depletion of water in boreholes is not expected
	16.	Amount of natural reservoir/ flow	D	D	For groundwater use, since the depth of the well is about 80 meters (150m at maximum), draw down has small relationship with surface flow if the topography of Tabora is considered. Therefore extracting deep ground water has almost no impact on the flow rate of river at the surface.
	17.	Coastal zone	D	D	There is no coastal area in theTabora Region.
	18.	Flora, Fauna, Biodiversity	D	D	Game Reserves or Forest Reserves is excluded from the project area (fringe of subject village may cross the forest reserve limit in some case). A new installation of water supply facility has a positive effect on forest reserves for preventing encroachment of villagers who might come in to a forest reserve for fetching otherwise.
	19.	Meteorology/ climate	D	D	There is no plan of large scale construction or facility as to give negative impact on the climate.
	20.	Aesthetic landscape	D	D	There will be no large scale facility that may affect the surrounding landscape.
	21.	Global warming	D	D	Diesel motor pumps emit CO_2; however, there would be no large scale generators to be installed as to give negative impact on global warming.
Pollution	22.	Air pollution	D	D	There will be some exhaust emission from trucks and machinery during the construction work, and diesel generator emits exhaust gas, which contain SOx and NOx gases, but the size is small and operation period is short. Therefore impact on air is negligible.
	23.	Water pollution	D	D	Water pollution during construction phase is avoidable with the proper supervision of work. There is no waste water discharge from the facilities during operation.

	S/N	Impacts	Const-ruction	Opera-tion	Description
	24.	Soil contamination	D	D	Falling oil some droplets from heavy machines during construction phase, which has negligible impact; and there is no soil contamination occuring during operation phase.
	25.	Solid waste amount increase	D	D	Although excavated soil becomes construction waste, it is properly disposed of in a routine manner. There is no solid waste produced by water supply facility during operation phase.
	26.	Increase of noise and vibration	D	D	Since heavy machinery will be operated during construction phase, noise and vibration will occur; however, the duration is limited. There is no complaints reported by neighbors, according to the District officers.
	27.	Ground level subsidence	D	D	The capacity of pump motors is extremely smaller, compared to causes of ground subsidence. There is no case reported from any of the districts.
	28.	Offensive odor	D	D	There would be no source of odor at the water supply facility.
	29.	Sedimentation	D	D	There is no sedimentation on river bed or reservoir bed occurred by installation of the water supply facility.
	30.	Increase of Accidents	D	D	There is no circumstances provoke accidents, by installation of the facilities according to all District officials.

Grade:
A: Serious impact(s) is (are) expected
B: Less serious impact(s) is (are) expected
C: Impact not known without further research
Note: Progress of project itself may reveal the impact (further research is not necessary, in this case)
D: Negligible impacts are expected or no impact is expected

(2) The Impact in the Constructional Phase

Although there will be some negative impact, such as heavy machinery noise and CO_2 emission, the work period lasts within a month at a site since the facility has a simple structure and the size is small. Therefore, the impact on the environment during construction is considered to be negligibly small. Obstruction of traffic may occur if a distribution pipe is to cross a village road; however, the burying works can be done within an hour. Excavated soil from the borehole could become waste material without proper disposal. The proper disposal of soil is included in the routine construction works.

(3) Impact in the Operational Phase

If deep groundwater is in the form of fracture media type, which is the common form in the Tabora Region, continuous extraction of large volume of groundwater may or may not decrease the groundwater level, depending on the characteristics of the fractures.

11.4 CATEGORIZATION

The facilities planned in the Study are likely to have minimal or little adverse impact on the environment and society, according to our environment and social impact survey with a responsible officer of the Tabora Region to all the sites with characteristics of the project site: the Project shall be classified as “Category C”.

11.5 ENVIRONMENTAL AND SOCIAL CONSIDERATION SCHEDULE ONWARD

The PEA report was submitted through the EIA division of MoW at the end of November 2010. NEMC reviewed the PEA report, and evaluated the project as "Category C". Since "Category C" projects do not require EIA process under NEMC, further evaluation of environmental impact assessment in Tanzania is waived.

CHAPTER 12 EVALUATION OF PRIORITY PROJECT

12.1 ECONOMICAL AND FINANCIAL EVALUATION

12.1.1 ECONOMIC EVALUATION

The economic feasibility of the priority project is assessed in this section, applying cost-benefit analysis based on the economic cost and benefits converted into monetary value.

(1) Preconditions of the Evaluation

The economic cost and benefits were estimated based on a comparison of the cases of "with project" and "without project". The three (3) years of construction period and 15 years of the economic life span of the water supply facilities were set for the economic evaluation period.

The estimated cost and benefit of the project were converted from market prices into economic prices using the discount rate of 12%. The foreign exchange rates of US$1 = Tsh1,435 were applied for currency conversion. Net Present Value (NPV), Benefit Cost Ratio (B/C Ratio) and Economic Internal Rate of Return (EIRR) were calculated to be used as the indicators of the economic evaluation.

(2) Economic Cost

Components considered as the economic cost were (1) Investment costs, (2) Replacement costs and (3) Operation, management and maintenance costs.

(3) Economic Benefits

As the economic benefits of the project, three factors listed below were considered. Findings from the detail socio-economic survey (This study, 2010) and village inventory survey (This study, 2009) as well as existing documents and literature were utilized in making assumptions for conversion of the project effects into monetary value. The estimated economic benefit in annual per capita amount is indicated in Table 12.1.

Table 12.1 Estimated Economic Benefit

Item (Benefit)	Annual Amount / Capita (USD)	Percentage	Assumption
Time Saved for Fetching Water from Existing Source	45.1	80.0%	1) In order to obtain water from existing source 1.0 hour/day/household and 3.5 hours/day/household is spent in rain season (6 months) and dry season (6 months) respectively. 2) 50 percent of average household income (Tsh 180,000 or USD 125 / month) is applied to convert the time saved to money value (USD 125 X 50% / 20 working days / 8 hours= USD 0.39/hour/household). 3) Average household population is 7.0 persons (Socio-Economic Survey, JICA 2010) 4) USD 1.0 is equivalent to Tsh 1435.
Increase in Water Quantity to be Used	5.3	9.4%	1) Current average amount of water consumed for domestic use is 240 litre / household, while 40 percent of community demand additional 80 litre / household (Socio-Economic Survey, JICA 2010). 2) Amount of Willingness to Pay (WTP) for improved water supply service is Tsh 0.54 / litre (Socio-Economic Survey, JICA 2010) 3) Average household population is 7.0 persons (Socio-Economic Survey, JICA 2010) 4) USD 1.0 is equivalent to Tsh 1435.
Cost Saved in Medical Expense due to Public Health Improvement	6.0	10.6%	1) Tsh 10,000 /month /household is spent for medical care. 2) Average household population is 7.0 persons (Socio-Economic Survey, JICA 2010) 3) 50 percent of medical expense will be saved. 4) Average household population is 7.0 persons (Socio Economic Survey, JICA 2010). 5) USD 1.0 is equivalent to Tsh 1435.
Total	56.4	100%	

1) Time saved from fetching water from the existing water sources

According to the detailed socio-economic survey, target communities mostly rely on traditional water sources such as unprotected shallow wells and dam/pond/stream. The survey also

revealed that, in order to obtain water from traditional sources, a household spends on average in a day one (1) hour in the rainy season and 3.5 hours for six months in the dry season and other six (6) months in the rainy season in a year. The value of time saved by a household consequent to the improved water supply facilities is estimated by applying the mean household monthly income in the target communities obtained through a detailed socio-economic survey which amounts at Tsh 150,000 to 200,000, thus approximating at Tsh 180,000 for estimation purposes.

2) Increase in water quantity to be used by the users

In case that the improved water supply schemes are constructed by the project, it is expected that the volume of water supplied from the improved scheme and consumed by the target communities will increase. The value of this benefit is estimated from the amount of willingness to pay (WTP) of communities towards water demand for domestic use that can be satisfied by improved water supply schemes. A detailed socio-economic survey]indicate that the current mean amount of water consumed per household amounts to 240 L/day and 40% of households demands additional 40 L/day/household, while the mean amount of WTP for improved supply scheme is estimated at 0.41 Tsh/L and Tsh 0.66 for Level-1 and Level-2 facilities respectively.

3) Cost saving for medical expense due to improved health status

According to the detailed socio-economic survey mean medical expenditure is 100,000 Tsh/household/month. The study assumed that 50% of the present medical expenditure will be saved, due to improved access to the safe water resulting in improved health status of households.

(4) Results of the Economic Analysis

As summarized in Table 12.2 below, NPV and B/C ratio indicate that the economic benefit will exceed the cost in case the project is implemented. Moreover, EIRR is estimated at 18%, which suggests that the implementation of the project is economically viable. *Table 12.2.6* shows flows of the economic cost and benefit during the evaluation period of the project.

Table 12.2 Summary of Results of the Economic Analysis

NPV	B/C Ratio	EIRR
USD 3,762,466	1.77	18%

12.1.2 FINANCIAL EVALUATION

In the financial analysis capital cost is excluded from the financial cost, it rather puts emphasis on the sustainability and financial feasibility of the supply scheme after implementation, assessing financial benefits (i.e. scheme income through water fee collection) and financial costs (i.e. operation and maintenance cost, replacement cost, contingency, and risk for inflation).

(1) Preconditions of the Evaluation

The financial cost and benefits were estimated based on a comparison of the cases of “with project” and “without project”. The three (3) years of the construction period and 15 years of the economic life span of the water supply facilities were set for the economic evaluation period. The foreign exchange rates of US$1 = Tsh1,435 were applied for currency conversion. Net Present Value (NPV) and Benefit Cost Ratio (B/C Ratio) were calculated as the indicators of the financial evaluation.

(2) Financial Cost

Investment costs for construction works and engineering services are excluded from the financial cost, assuming the priority project is implemented under Japanese grant aid schemes. Components considered as the financial cost were (1) Operation, management and maintenance costs, (2) Replacement cost (Replacement cost of pumps, power sources, pump house, raising main, distribution pipes, and domestic water points for Level-1 scheme, and hand pump set for Level-1 scheme).

(3) Financial Benefit

The amount of water fees collected from the user communities are only the source of income for the scheme management regarded as financial benefit. The rate of the water fee shall be set with ATP, thus, in the financial assessment in the Study, unit water price is set in the same manner at Tsh 1.0 per liter, assuming consumption of 25 L/day/capita. The analysis is also made, assuming that 80% of user communities pays water fee consuming 25 L/day/capita.

(4) Results of Financial Evaluation

The amount collected as a water fee exceeds significantly the cost of management, operation and maintenance as well as replacement of the water supply scheme with contingency, with estimated financial B/C rate at 1.26 and NPV amounting USD 236,742 on the assumption that 80% of user community consume 25 L/day/capita and made payment for water fee set at 1.0 Tsh/L. Thus, it can be concluded that the priority project could generate a financial surplus, thus financially viable, in running and management of the scheme with realistic revenue collection ratio.

12.2 INSTITUTIONAL AND ORGANIZATIONAL EVALUATION

The institutional and organizational framework, proposed in the Study was formulated considering its relevance to the set-up as envisaged by the National Water Sector Development Strategy (2006) and decentralized setup under Local Government Reform Strategy (2002).

The formation of COWSO (Community-Owned Water Supply Organization) such as Water User Group (WUG) and Water User Association (WUA), which shall be autonomous legal entity and vested with ownership of the scheme management, establishment of DWST/MWST (District/Municipal Water and Sanitation Team) that provides technical guidance to the COWSO and conducts monitoring and regulation activities of COWSO and service providers, and introduction of contracting-out setting that enhance efficiency and competence in the scheme management, are all in line with the national strategies and aimed to ensure effectiveness, efficiency, and sustainability of the water supply service.

12.3 MANAGEMENT AND MAINTENANCE EVALUATION

Effectiveness and efficiency in the scheme management would be achieved through decentralizing of functions and responsibilities in management of the scheme to the lowest appropriate institution, developing capacity of COWSO and DWST/MWST in their technical and administrative skills, and enhancing private sector participation in operation and maintenance.

In the formation of COWSO, either WUA (Water User Association) or WUG (Water User Group) is recommended in the Institutional Plan. Those COWSO management options guarantee the legal status to own and manage the water supply scheme with development of regulations and by-laws. Where it deems necessary, an education package for capacity building of COWSO on operation and maintenance is provided to enhance its competence and effectiveness in the management of the water supply scheme.

DWST/MWST, which is formed at district and municipality level among the departments involved in water development (district planning officer, water engineer, community development officer,

health and sanitation officer, etc), ensures provision of technical guidance and monitoring to COWSO.

In order to make those institutional and organizational frameworks functional in an effective and efficient manner, the Operation and Maintenance Plan also considers capacity development of each institution in their respective functions and responsibilities.

12.4 EVALUATION FROM VIEWPOINT OF POLICY

The Project will assist WSDP to attain the target by implementation of the water supply plan formulated in the Study in the same manner of WSDP' s concept although the Project is not a project by the basket fund under WSDP. Therefore, implementation of the Project will contribute to realize the policy of MoW.

12.5 ENVIRONMENTAL AND SOCIAL EVALUATION

Preliminary Environment Assessment (PEA) on each one of the facilities is conducted by the Tabora Regional Secretariat with support of the Study team in accord with Environmental and Social Management Frame Work (ESMF). The report of PEA was reviewed by National Environment Management Council (NEMC), and NEMC evaluated the project as "Category C". Since "Category C" projects do not require the EIA process under (NEMC), further evaluation of environmental impact assessment in Tanzania is waived.

12.6 TECHNICAL APPROPRIATENESS

The construction of the Priority Project is composed of drilling works, earthworks, pipe works, concrete works, mechanical/electrical works, deep well drilling and miscellaneous works. These works requires no special techniques. These will be carried out by conventional methods and machineries widely applied in Tanzania. Equipment and materials required for the Priority Project are generally procured in Tanzania, although some of them are imported from abroad such as EU countries, South Africa and Japan.

CHAPTER 13 GIS AND DATABASE

13.1 CONSTRUCTION OF THE GIS AND DATABASE

In order to formulate the rural water supply plan, the socio-economic conditions, availability of water sources and environmental aspects are essential matters. Furthermore, the socio-economic conditions, the water resources conditions and the environmental conditions of the study area are always changing. Therefore, it is necessary to have reference to the latest reliable information on the rural water supply plan, and approach it from several different angles. The database for rural water supply planning is being processed using the above considerations in the Study. Again, it is carried spatial analysis out using various data by the Geographic Information System (hereafter referred to as "GIS") as well.

13.2 GIS AND DATABASE FOR THE STUDY

Not only should the database system be accessed and deal with smoothly for the purposes of data collection, but also it is important to update the dataset periodically. Recently, most organizations have started to collect more detailed information to improve their database system since the requirement for water supply planning has shifted to a village level basis. Although the various kinds of information such as, socio-economic conditions, water resource conditions and environmental conditions are gathered and compiled into the database system, the other way around, the problem of an uncontrolled database are caused by utilizing database system under the lack of versatility software and a complicated system. Therefore, in the Study, the database was created by only MS-Excel as .xml format, based on the above concept.

The collected data of the inventory survey and the socio-economic survey are classified into two (2) categories for each MS-Excel file; "Existing Water Supply Scheme Inventory Survey" and "Socio-Economic Survey".

In the GIS data folder "Tanzania_arc1960", the data files for creating maps and results of analysis such as tables, polygons, polylines and point data are stored as shape files and dbf file. The folder of the "Map_file" stores "mxd" format data, which is possible to be opened and seen by Arc GIS software, powered by the ESRI, Inc.. Not only have base map files been saved in the folder, but also the study team prepares three (3) kinds of the resulting maps by the GIS analysis.

The design of the GIS data folder is shown in Figure 13.1.

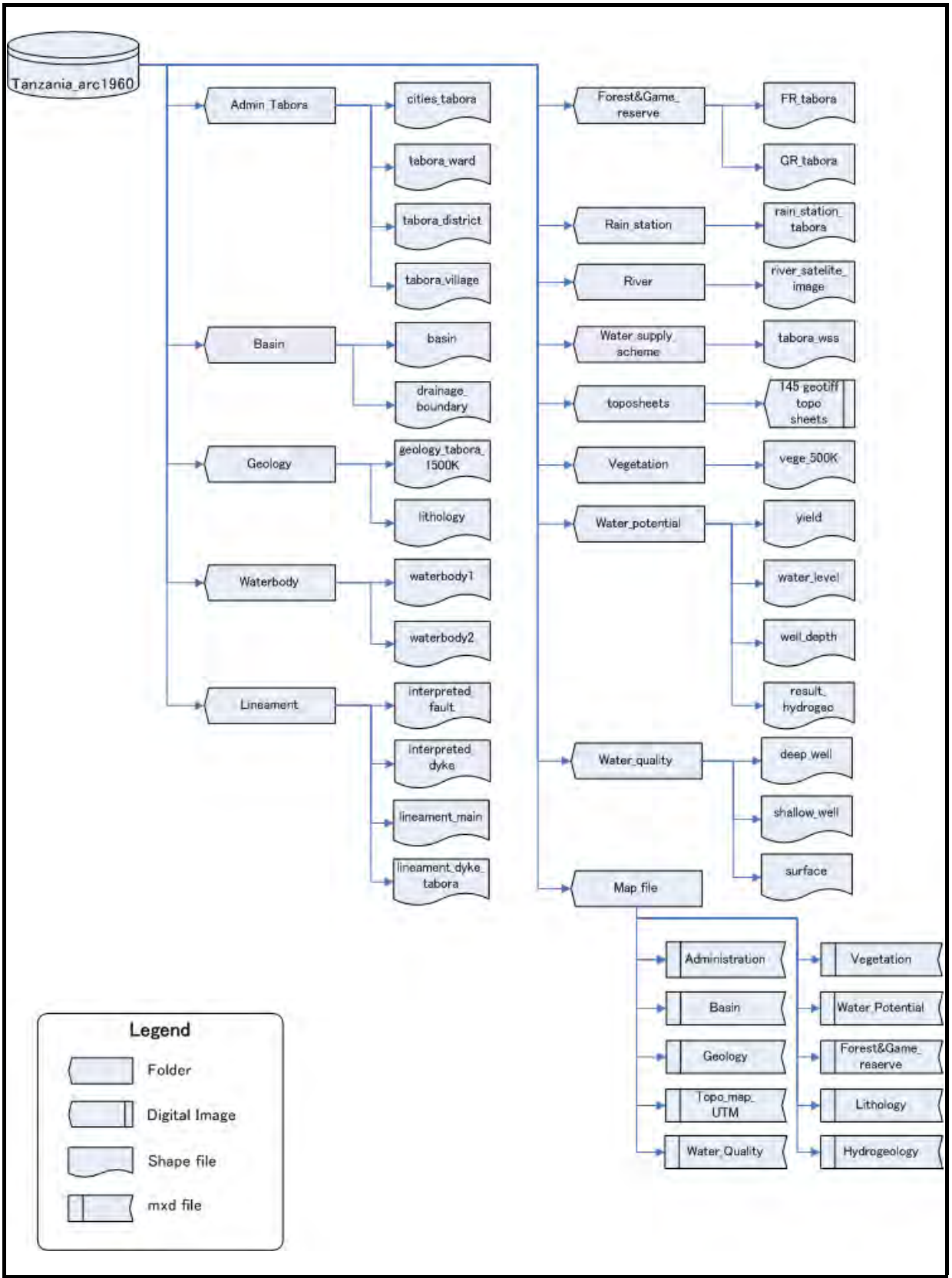


FIGURE 13. 1 DESIGN OF THE GIS DATA FOLDER

13.3 COLLECTED DATA AND ANALYZED THEMATIC MAPS

To obtain the advantages of GIS technology, preparation of maps and the spatial analysis are carried out by the latest version of the ArcGIS in the Study. The collected and created base maps and data in the study are listed in Table 13. 1.

Table 13.1 List of Base Data

Name of Data		File Name	Source
1	Region boundary	(tabora_district)	Obtained the shape file from MoW
2	District boundary	(tabora_district)	Obtained the shape file from MoW
3	Ward boundary	(tabora_ward)	Obtained the shape file from MoW
4	Cities and Small Townships in Tabora	(city_tabora)	Obtained the shape file from MoW
5	Geologic map	(geology_tabora_ 1500k)	The 1:1,500,000 scale of geologic map in "Tanzania Tabora Rural Integrated Development Project Land Use Component Land Unit Atlas".
6	Vegetation map	(vege_500k)	The 1:500,000 scale of land use and vegetation map.
7	National forest map	(FR_tabora), (GR_tabora)	The 1:500,000 scale of administration boundaries map in Tabora.
8	Waterbody in Tabora Region	(waterbody1)	lakes, dams and reservoirs extracted from the 1:50,000 scale of topographic map.

(2) Resultant Data and Data by the Existing Reports

The location data of the villages with specific village information, the locality of hand pumps and piped water supply schemes, and the distribution of fluoride, pH and electric conductivity in the Tabora Region are obtained as point data by the result of the socio-economic survey, the existing water supply scheme inventory survey, the water quality analysis in the laboratory, the result of drilling wells and the existing reports. The explanation of the exported point data is described in Table 13.2.

Table 13. 2 List of Point Data from the Result of the Surveys

Name of Data		File Name	Description
1	Village location	(tabora_village)	Location data of 547 villages and their socio-economic data.
2	Location of water supply facility	(tabora_wss)	1,587 existing water supply facilities and their detailed information.
3	Distribution of Water Quality	(deep_well) (shallow_well) (surface)	1,038 water quality data (measured or analyzed)

Thematic maps obtained by analyzation of collected data are saved in the database. List of the thematic maps are shown in Table 13.3.

Table 13.3 List of Data for Analyses

Name of Data		File Name	Contents
1	Lineament and dyke)	(lineament_dyke_tabora	lineaments and dykes
2	Main lineament	(lineament_main)	Main lineaments
3	Interpreted fault	(interpreted_fault)	Faults
4	Interpreted dyke	(interpreted_dyke)	Dykes
5	Drainage system in Tabora Region	(basin)	Drainage (shape file)
6	Drainage boundaries	(drainage_boundary)	Drainage boundary (polyline file)
7	Waterbody in Tabora Region	(waterbody2)	Water bodies
8	River system in Tabora Region	(river_satellite_image)	River systems
9	Lithology in Tabora Region	(lithology)	1:1,500,000 scales of geologic map in "Tanzania Tabora Rural Integrated Development Project Land Use Component Land Unit Atlas".
10	Well Data	(yield) (water_level) (well_depth)	Location, yield, water level, depth of existing water supply schemes inventory survey.
11	Hydrogeology	(result_hydrogeo)	Hydrogeological map

13.4 RECOMMENDATIONS

The database system is created as the results of the analysis and of the field investigations performed by the Study Team. In order to facilitate continued effective utilization of the database, the following items are absolutely recommended.

(1) Improvement of the Accuracy of Locality Information

(2) Periodical Update of the Database and Formulation of the Updating System in Tabora Region

CHAPTER 14 URBAN WATER SUPPLY PLAN

14.1 URBAN WATER SUPPLY PLAN AND SUPERIOR PLAN

In the centre of each district in Tabora Region, Urban Water Supply Authorities (UWASAs) were established for water supply and sewerage services. However, UWASA has not been established in Tabora Rural District because the District was new and there was no piped water supply scheme in the centre of the District,

The specific targets of the Urban Water Supply and Sewerage Programme (UWSSP) include raising water supply service coverage from 74% (2005) to 90% in 2010 and 95% by 2015 to meet the MDGs and 100% for Vision 2025. The target for sewerage coverage is to increase from 17% (2003) to 30% by 2010.

The strategy for achieving these goals in the urban sector is to develop the existing UWSAs into bodies that are financially autonomous and commercially viable. In essence, the focus of the strategy is the commercialisation of the urban water authorities so that they are capable of efficient and cost-effective provision of services. Commercialisation is seen as the next step forward in preparing the UWSA/WSSAs into future corporate to gain public company status. Incentives for continued reforms will be designed towards adoption of more commercial approaches in managing the UWSAs/WSSAs.

14.2 EXISTING CONDITIONS OF URBAN WATER SUPPLY AUTHORITIES

UWSAs were defined by the government of Tanzania following the categories mentioned below. In Tabora Region, only TUWASA falls into the Category A and other UWSAs are into the Category C.

- Category A: Authorities cover all the O&M costs of water supply and sewerage, including staff wages, cost of power and some contributions to investment.
- Category B: Authorities meet their O&M costs, including cost sharing of power (as per MoW with each authority) and full salaries for the permanent employees.
- Category C: Authorities meet their O&M costs but require Government support in paying for power supply and the salaries of the permanent employees.

Table 14. 1 Outline of UWSAs

Service Item	IGUWASA	NZUWASA	SUWASA	TUWASA	UUWASA
Population of town	18,000	32,075	11,411	175,557	30,104
Served population	6,900	18,000	3,800	151,000	4,800
Ratio of served population	38%	56%	33%	86%	16%
Category of UWSAs	C	C	C	A	C
Daily water consumption (m^3/day)	310	789	110	11,283	48
Type of water source and number	Dam (1)	Dam (2)	Dam (1)	Dam (2) Shallow Well (1)	Deep well (3)
Beginning year of water supply	1960's	1955	1974	1950's	1976
Water supply hours per day (hour)	13	18	1	12-18	8
Leakage ratio	40%	34-36%	27%	29%	30-40%
Per capita daily water supply	45	44	29	75	10
Minimum metered tariff (Tsh/litre)	0.6	0.75	0.8	0.54	0.7
Minimum flat rate (Tsh/month)	6,000	-	5,500	12,000	5,000
Number of permanent staff	5	5	5	72	3
Revenue (Tsh/year)	33 million (2007/2008)	137 million (2007/2008)	10 million (2007)	1,460 million (2007/2008)	8 million (2008/2009)
Number of connections	658	1,097	123	9,711	128
Ratio of metering	9%	100%	41%	80%	83%

14.3 WATER SUPPLY IMPROVEMENT PLAN

The study found that the UWASAs have received assistance from such donors as WSDP Each UWASA except for NZUWASA has been disbursed supporting funds for drastic improvement or expansion of its water supply facilities, which is shown in the following sections.

(1) SECO Project: TUWASA

The SECO Project is assisted by the Swiss Government through State Secretariat for Economic Affairs (SECO). SECO was willing to disburse this amount to TUWASA instead of transferring it to the WSDP basket fund.

(2) WSDP Project: TUWASA, SUWASA and UUWASA

Townships of Urambo and Sikonge were included under the supervision of the management of TUWASA. The activities are sub-divided into two phases whereby Phase I is for design of works (The contract was concluded with the consultant in October 2008) and Phase II is the construction of works.

(3) WSDP Project: IGUWASA

This programme is to rehabilitate the water supply system and civil works for Igunga town including three villages of Mbutu, Ibutamisuzi and Hindishi. The contract for the construction of three (3) lots was concluded in July 2008.

CHAPTER 15 REPAIRING OF EXISTING HAND PUMP

15.1 SELECTION OF TARGET HAND PUMPS

The inventory survey of existing water supply schemes carried out in the Study revealed that there exist 1,431 hand pumps in the rural area of Tabora (Study area) and 765 hand pumps of them were not functioning (November 2009). Then, the survey for repairing of hand pump was carried out to confirm the reason for not working, contents of malfunctioning and repairing cost (March 2010). According to the results of the survey there were some hand pumps which would recover the function by simple repairing. Such hand pumps were repaired in the Study. In addition, explanation of importance of collecting water tariff and training on the repairing of the hand pump.

The target hand pumps to be repaired were selected based on the result of the repairing survey. The number of hand pump was 27 Afridev pumps and 19 Tanira pumps, totaling 46 pumps. The number of village where the target hand pump exists is 41. Status of existing hand pump and the target hand pumps by District/Municipality are shown in Table 15.1.

Table 15.1 Status of Existing Hand Pumps and Number of Target Hand Pumps

District /Municipality	Existing Hand PUmp			Target Hand PUmp			Number of Village
	Total	Functioning	Unfunctioning	Afridev	Tanira	Total	
Igunga District	104	22	82	3	1	4	4
Nzega District	528	259	269	12	11	23	19
Sikonge District	127	57	70	0	5	5	5
Tabora Rural District	189	92	97	2	0	2	2
Tabora Municipality	85	56	29	1	0	1	1
Urambo District	398	180	218	9	2	11	10
Total	1,431	666	765	27	19	46	41
(%)	100	46.5	53.5	-			-

The list of target hand pump is shown in Table 15.4.1

15.2 METHOD OF REPAIRING

The repairing work was subcontracted to Community Based Resources Centre (CBRC) by the Study Team. Before repairing, CBRC called the community people in the target villages to explain and train on the following issues.

(1) To collect water tariff in order to enable to purchase spare parts in malfunctioning of the hand pump.

(2) Explanation and training on maintenance and repairing of hand pump, showing the structure of hand pump.

(3) Distribution of pamphlets prepared by CBRC for the issues above.

All the repaired hand pumps were inspected by the member of the Study Team and it was confirmed that all the repaired hand pumps were properly functioning (November, 2010).