

## **6.5 COST ESTIMATION OF PRIORITY PROJECT**

The cost for implementation of the Priority Project is estimated at approximately 16.5 million USD including engineering cost assuming the implementation with Japan's Grant Aid.

## **6.6 FACILITY PLAN AND LAYOUT OF WATER SUPPLY SCHEME**

Layout of each water supply schemes are shown from *Figure 6.2 to 6.23*.

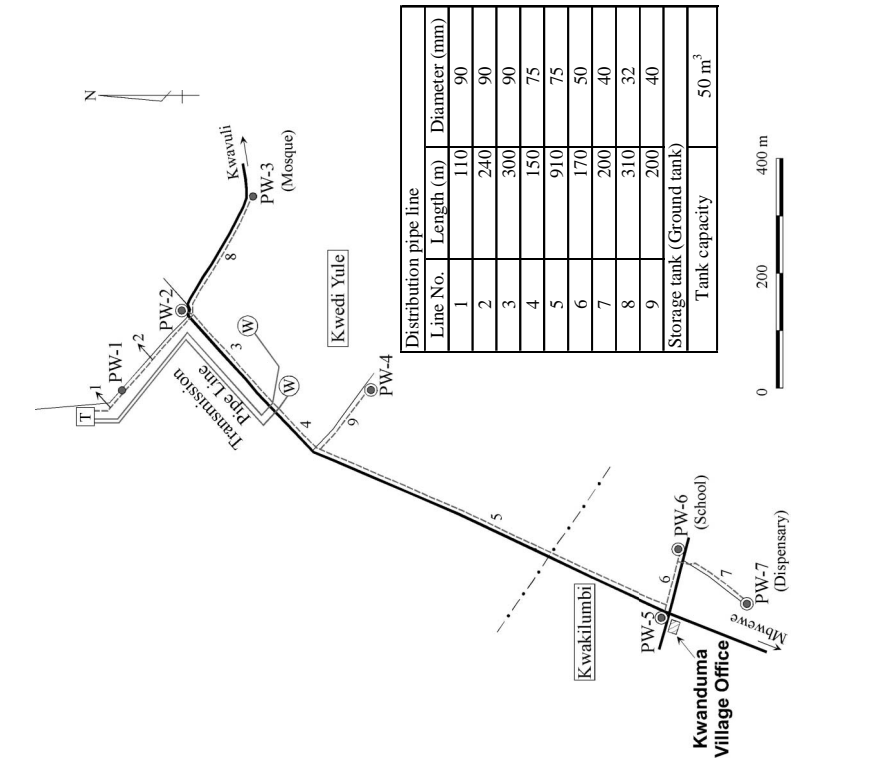


Figure 6.2 Layout of Water Supply Scheme (Kibindu: BGM-1)

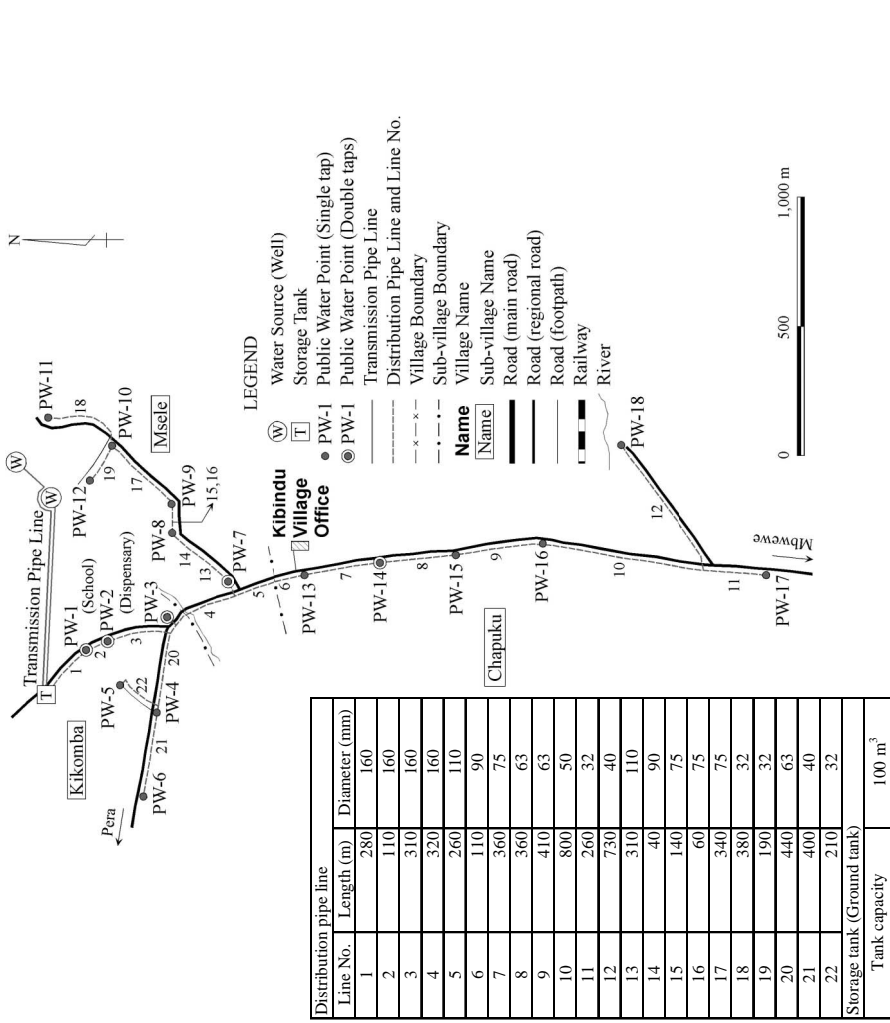
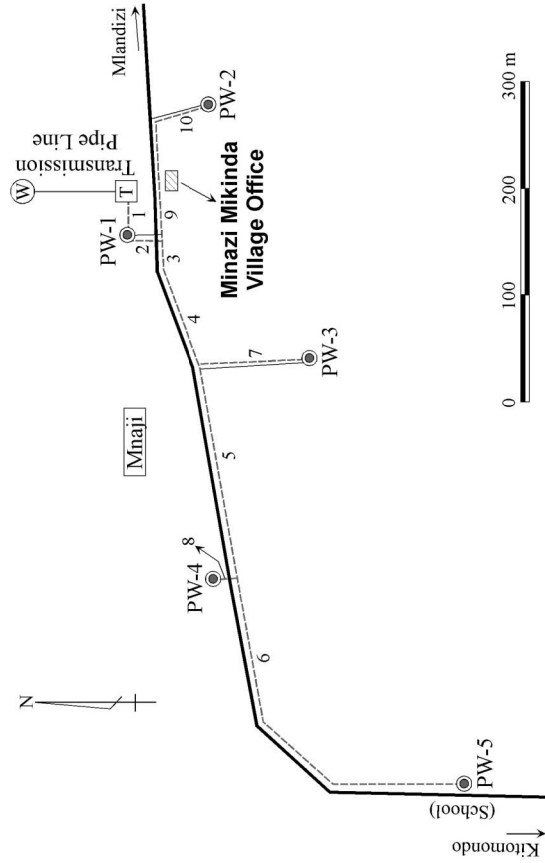
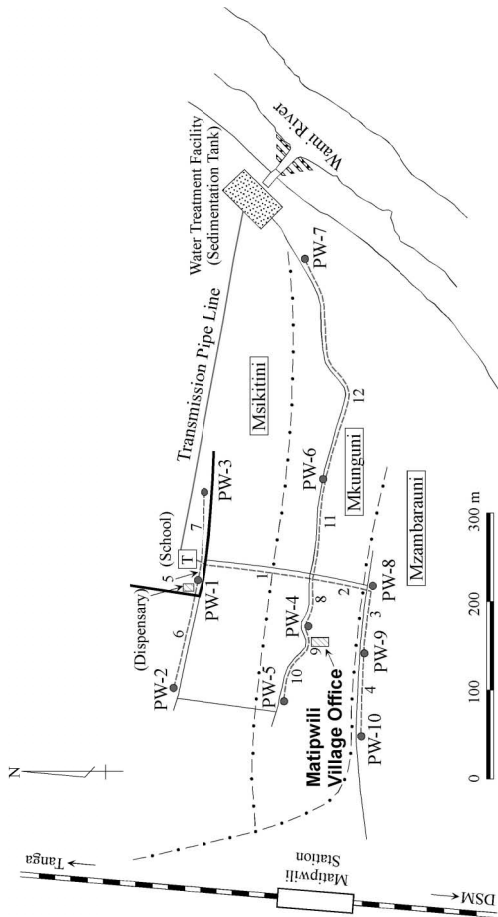


Figure 6.3 Layout of Water Supply Scheme (Kwanduma: BGM-2)



Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	100	90
2	30	75
3	30	75
4	120	63
5	240	63
6	410	50
7	120	32
8	20	32
9	140	40
10	70	40
Storage tank (Elevated tank: L.W.L.=6.05 m)		
Tank capacity		40 m <sup>3</sup>



Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	160	90
2	80	50
3	100	40
4	110	32
5	20	40
6	150	32
7	100	32
8	70	50
9	60	50
10	50	40
11	130	50
12	300	40
Storage tank (Elevated tank: L.W.L.=6.05 m)		
Tank capacity		40m <sup>3</sup>

Figure 6.5 Layout of Water Supply Scheme (Minazi Mikinda (1): KBH-1)

Figure 6.4 Layout of Water Supply Scheme (Matipwili: BGM-3)

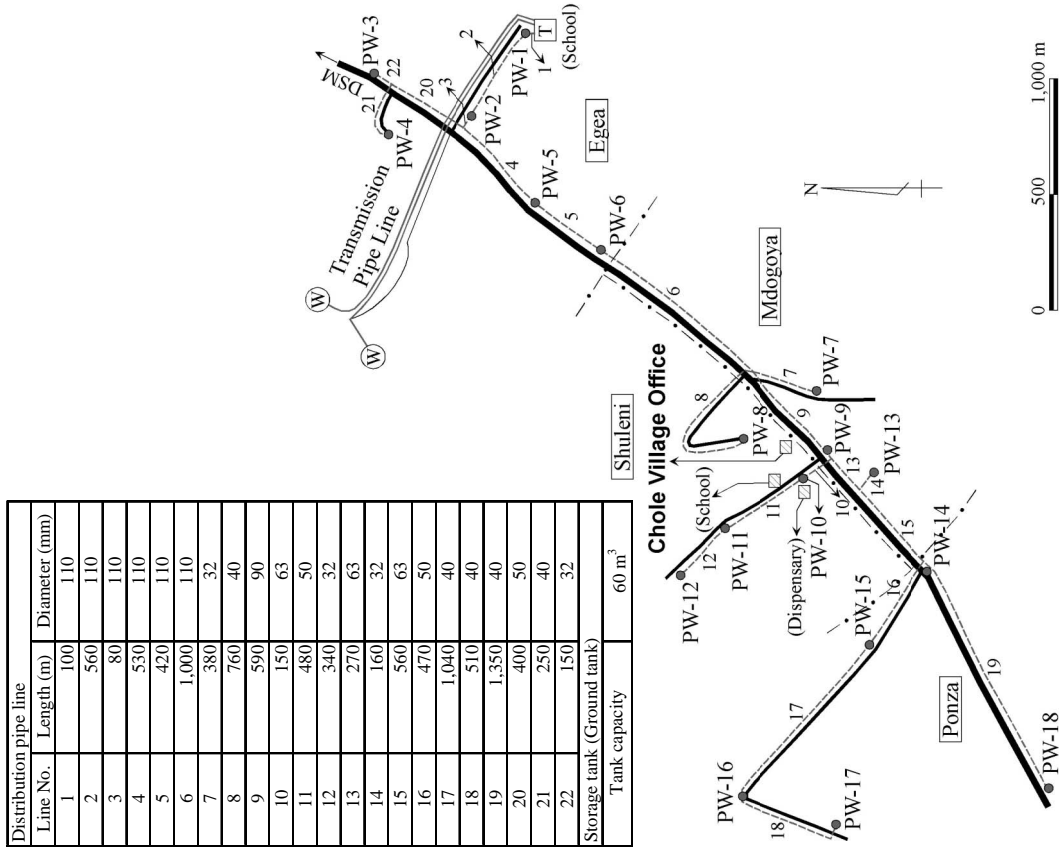


Figure 6.7 Layout of Water Supply Scheme (Chole: KSW-1)

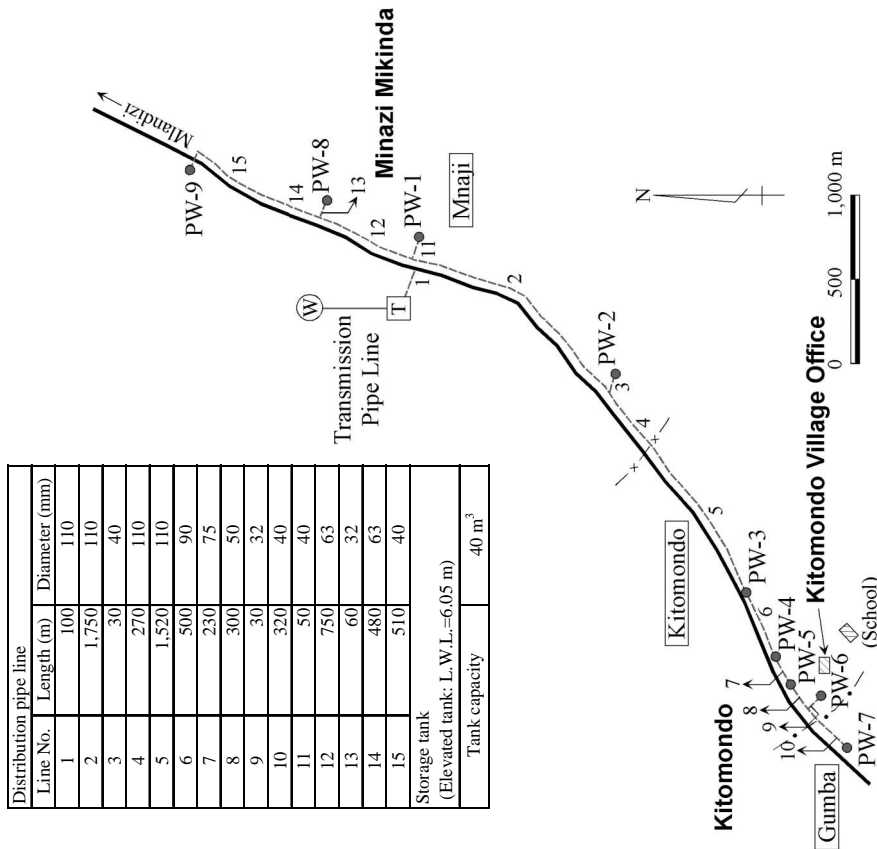


Figure 6.6 Layout of Water Supply Scheme (Minazi Mikinda (2)/Kitomondo: KBH-2)

Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	1,610	160
2	600	75
3	80	32
4	1,600	63
5	40	32
6	730	50
7	60	32
8	80	32
9	110	140
10	170	110
11	350	125
12	140	32
13	190	125
14	280	32
15	160	125
16	70	32
17	100	110
18	60	32
19	270	110
20	40	75
21	870	75
22	1,380	75
23	610	40
24	630	40
25	1,930	50
26	970	40
27	700	50
Storage tank (Ground tank)		Tank capacity
		80 m <sup>3</sup>

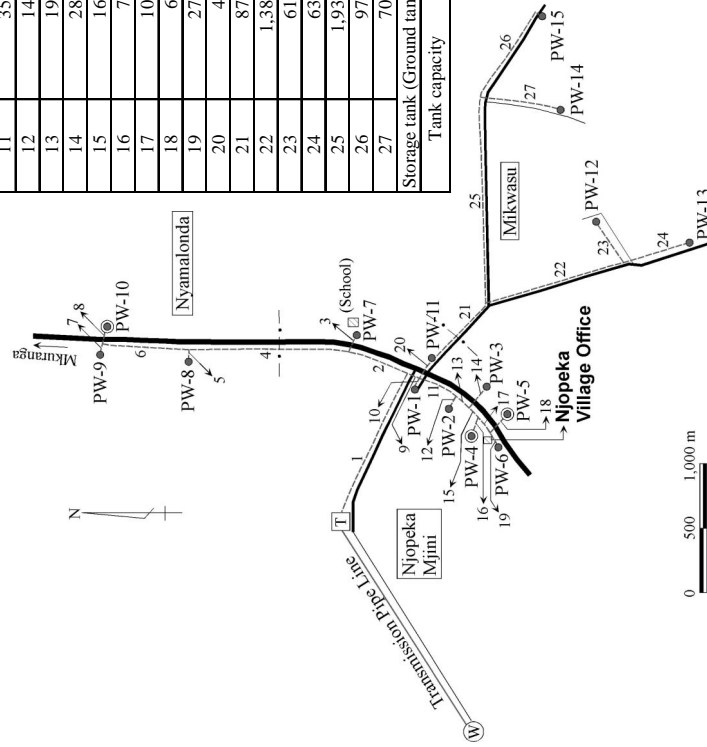


Figure 6.9 Layout of Water Supply Scheme (Njopeka: MKR-1)

Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	100	110
2	1,110	110
3	1,860	63
4	1,000	32
5	70	50
6	1,800	50
7	1,000	40
8	1,020	40
9	230	63
10	1,700	50
11	910	50
12	1,390	32
13	2,860	32
14	1,830	40
15	1,350	40
16	170	50
Storage tank (Ground tank)		Tank capacity
		50 m <sup>3</sup>

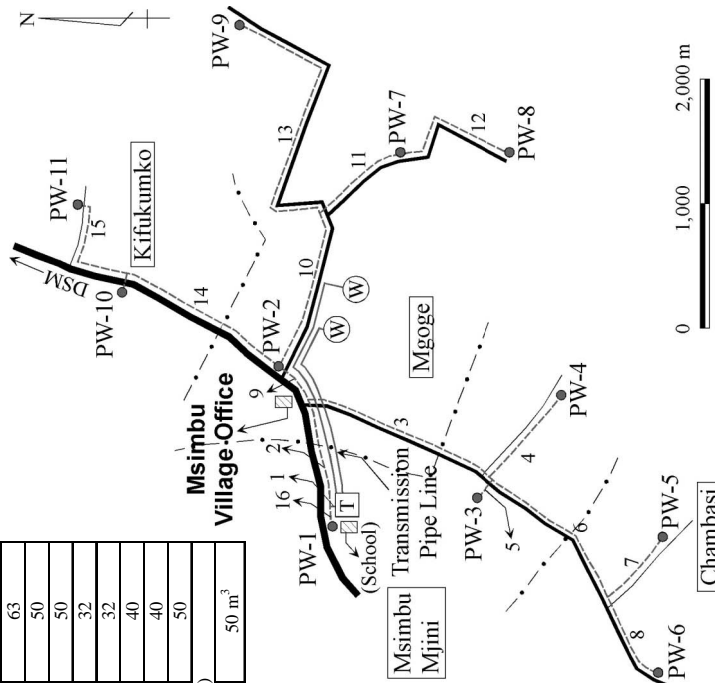


Figure 6.8 Layout of Water Supply Scheme (Msimbu: KSW-2)

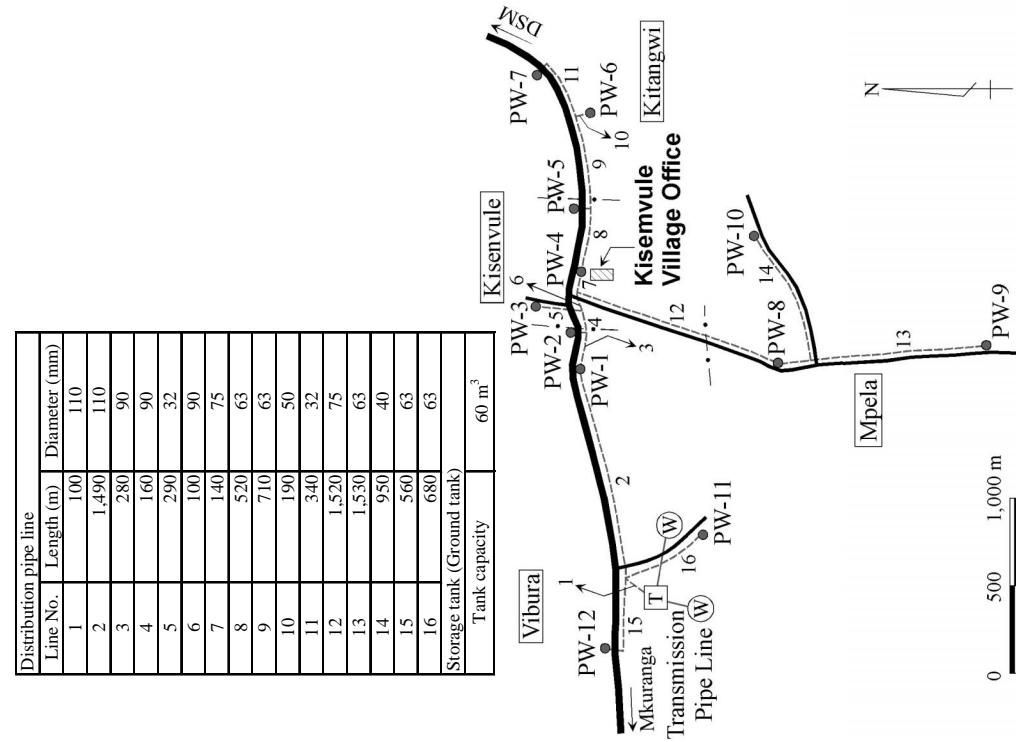


Figure 6.11 Layout of Water Supply Scheme (Kisemvule: MKR-3)

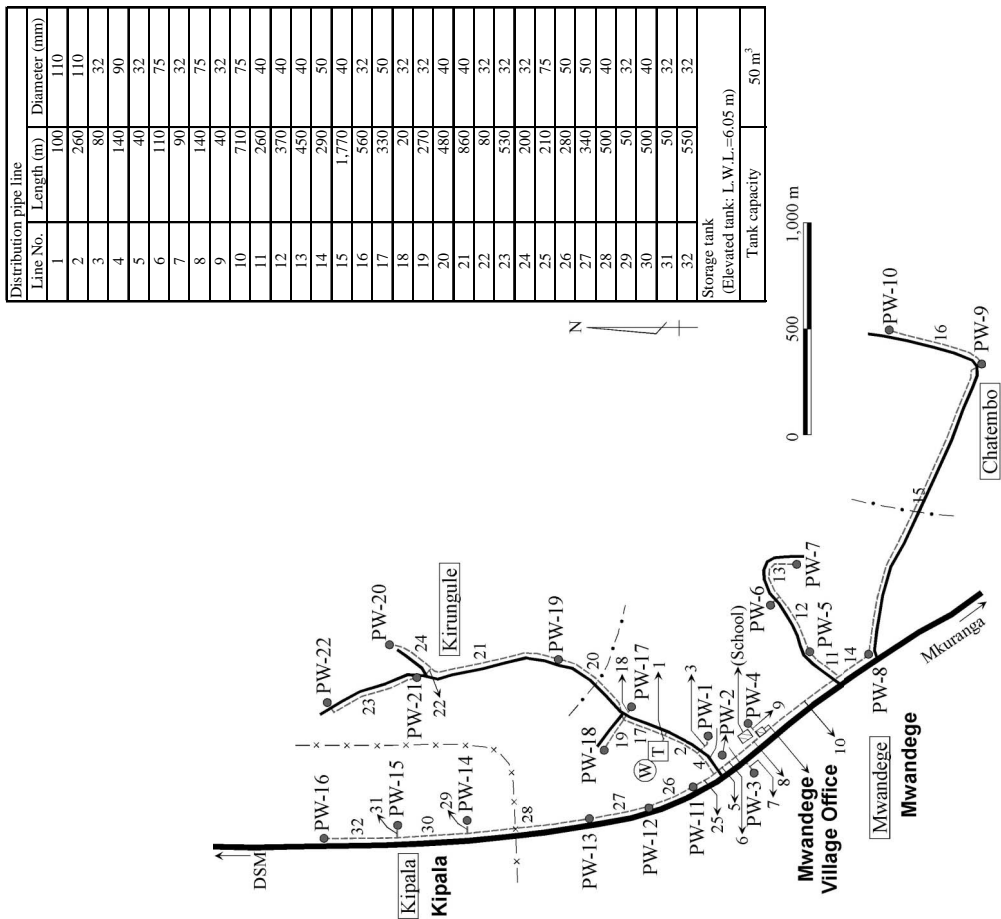


Figure 6.10 Layout of Water Supply Scheme (Mwandege/Kipala: MKR-2)

Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	100	90
2	510	75
3	600	63
4	100	50
5	350	50
6	150	32
7	280	32
8	880	32
9	80	32
10	950	32
11	40	32
12	210	32
13	610	40
14	710	32
15	310	40
16	950	32
17	590	32

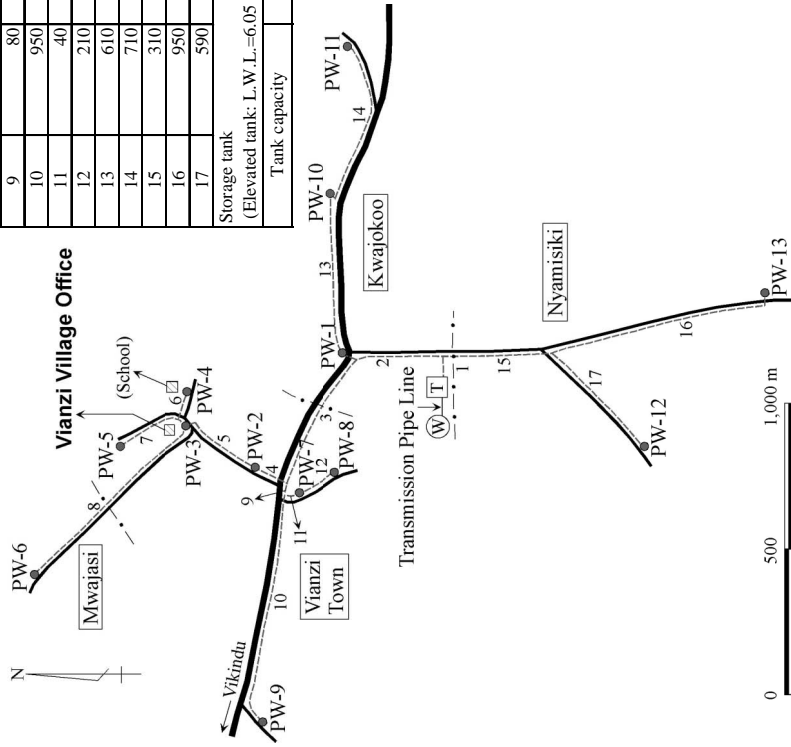


Figure 6.13 Layout of Water Supply Scheme (Vianzi: MKR-5)

Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	100	110
2	400	110
3	130	32
4	200	90
5	30	32
6	330	90
7	150	50
8	380	75
9	40	32
10	2,360	75
11	820	40
12	540	32
13	420	40
14	840	40
15	40	32
16	350	32
17	160	90
18	140	32
19	490	75
20	550	32
21	330	63
22	500	40
23	380	63
24	20	40
25	1,640	40
26	30	32

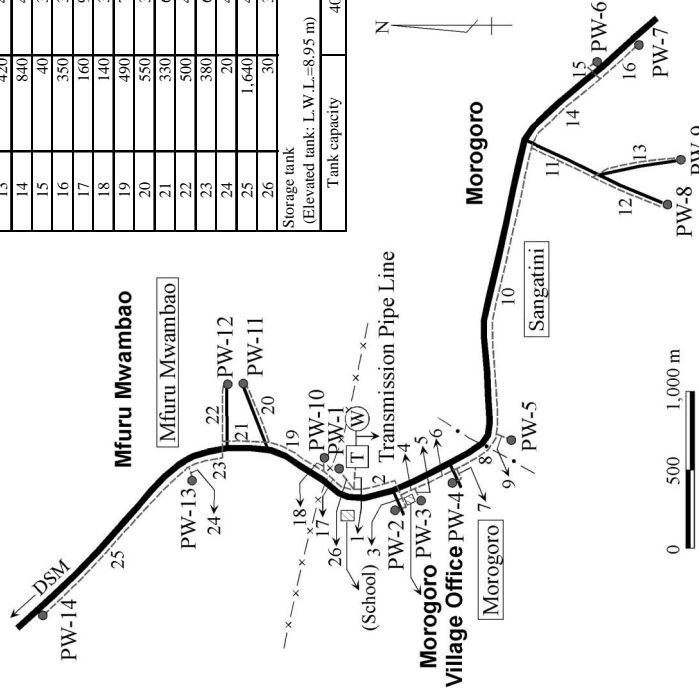


Figure 6.12 Layout of Water Supply Scheme (Morogoro/Mfuru Mwambao: MKR-4)

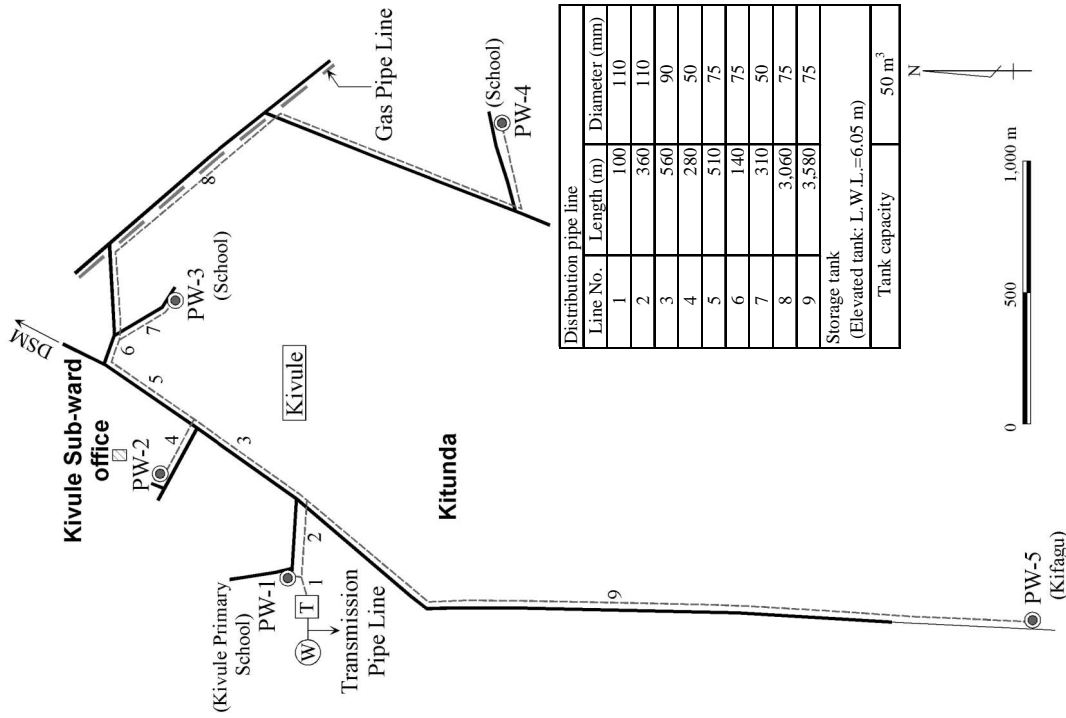


Figure 6.15 Layout of Water Supply Scheme (Kitunda-Kivule (2/2): ILL-1B)

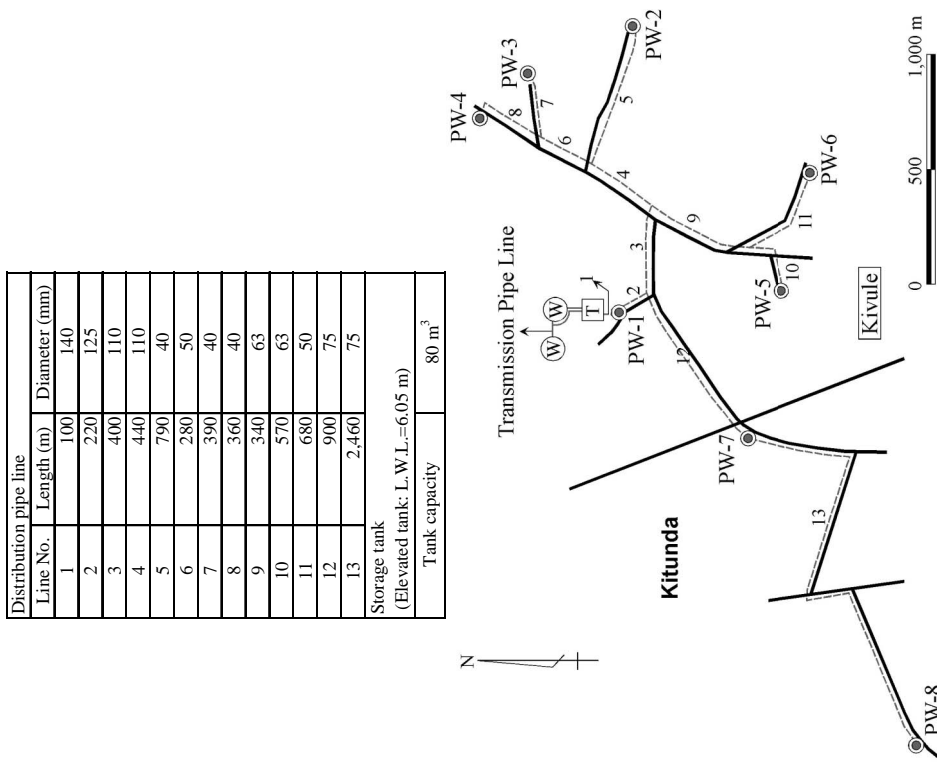


Figure 6.14 Layout of Water Supply Scheme (Kitunda-Kivule (1/2): ILL-1A)



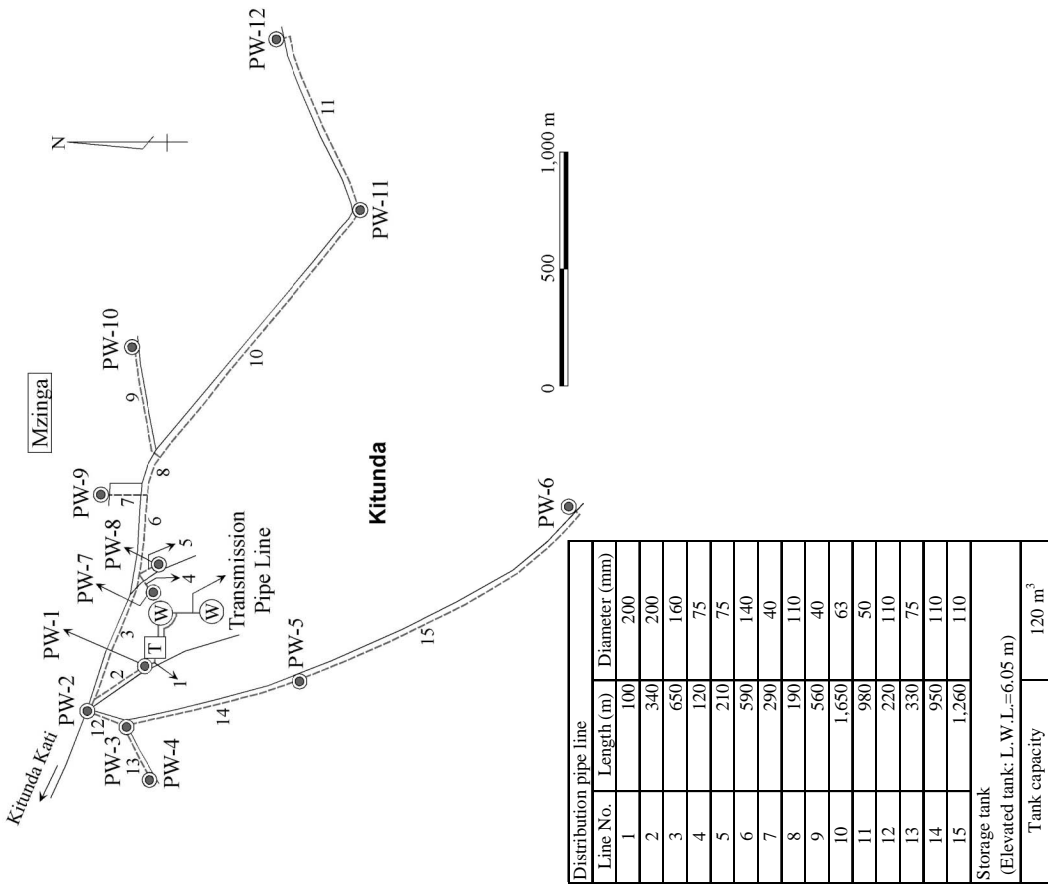


Figure 6.16 Layout of Water Supply Scheme  
(Kitunda-Mzinga: ILL-1C)

Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	100	200
2	1,220	125
3	240	40
4	220	90
5	690	63
6	130	75
7	120	75
8	340	50
9	940	40
10	870	40
11	20	110
12	850	110
13	880	125

Storage tank  
(Elevated tank: L.W.L.=6.05 m)

Tank capacity: 40 m<sup>3</sup>

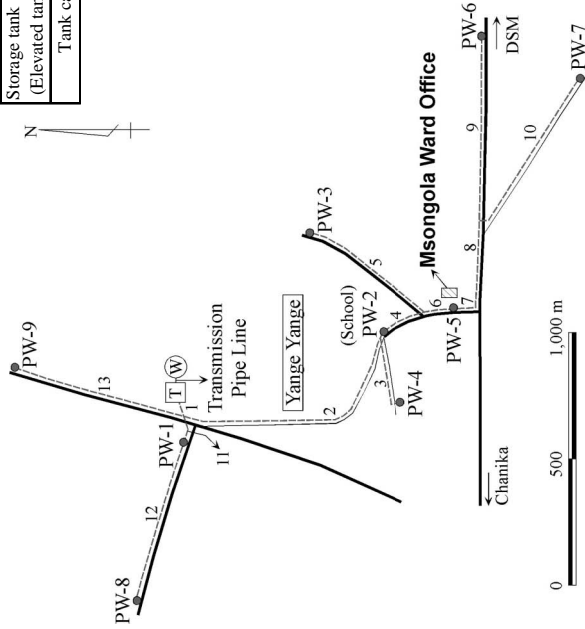


Figure 6.17 Layout of Water Supply Scheme  
(Msongora: ILL-2)

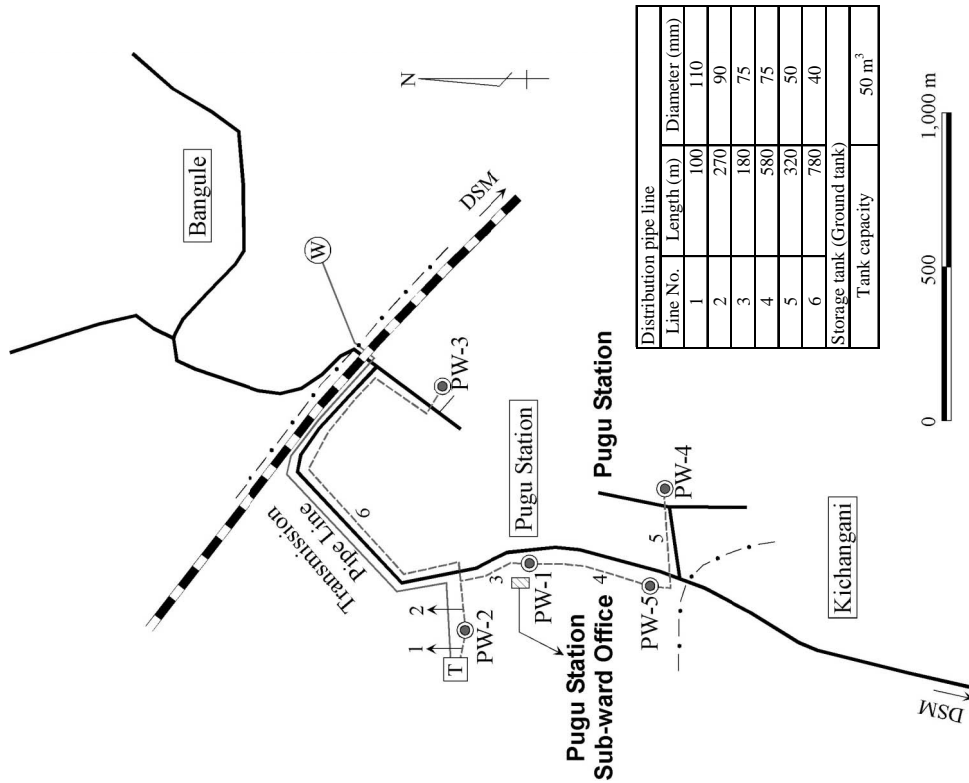


Figure 6.18 Layout of Water Supply Scheme (Pugu Station: ILL-3)

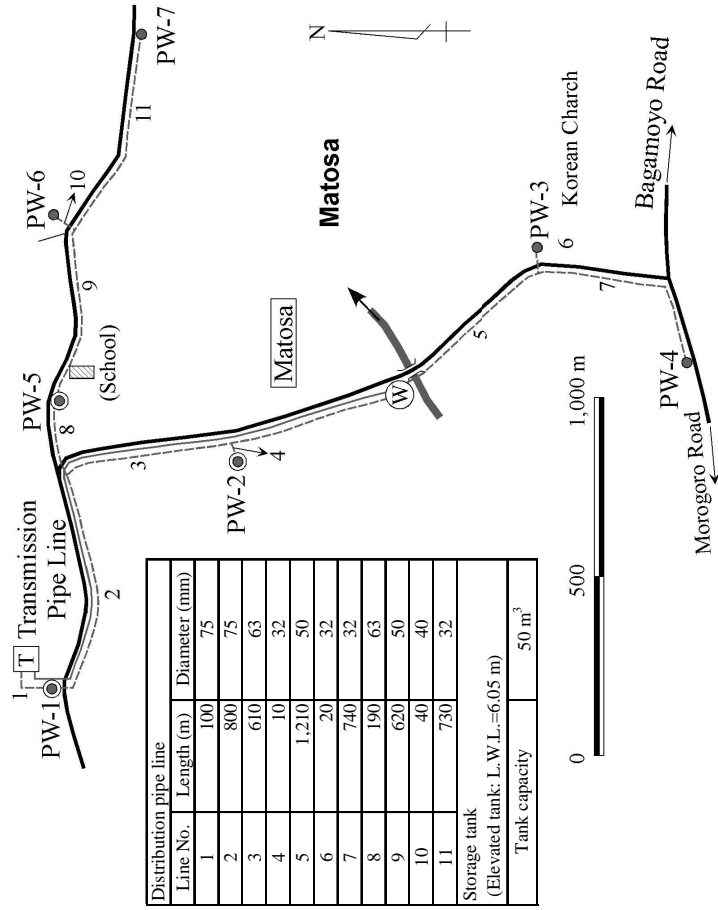


Figure 6.19 Layout of Water Supply Scheme (Matosa: KND-1)

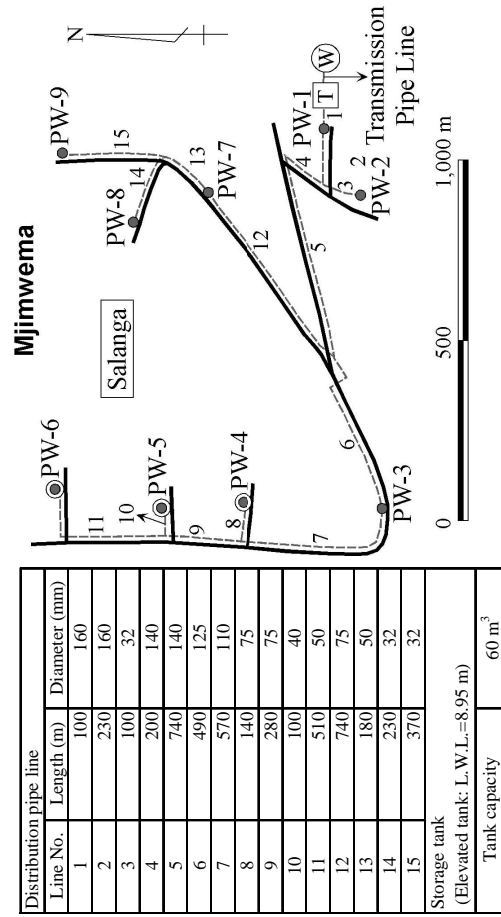


Figure 6.21 Layout of Water Supply Scheme (Mjimwema: TMK-2)

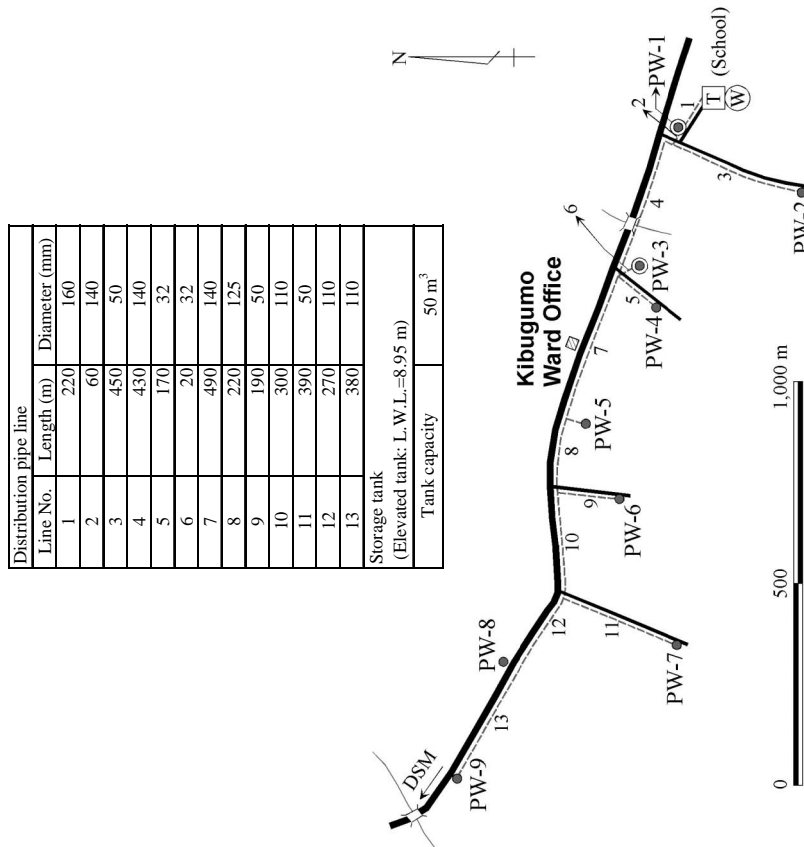


Figure 6.20 Layout of Water Supply Scheme (Kibugumo: TMK-1)

Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	100	90
2	330	50
3	390	40
4	1,380	32
5	170	90
6	70	50
7	270	32
8	100	32
9	90	40
10	250	32
11	120	40
12	210	32
13	160	40
14	50	32
15	420	40
16	140	63
17	1,250	63
18	1,060	40
19	1,060	40
20	530	32
21	1,360	32
Storage tank (Elevated tank: L. W. L.=6.05 m)		40 m <sup>3</sup>
Tank capacity		40 m <sup>3</sup>

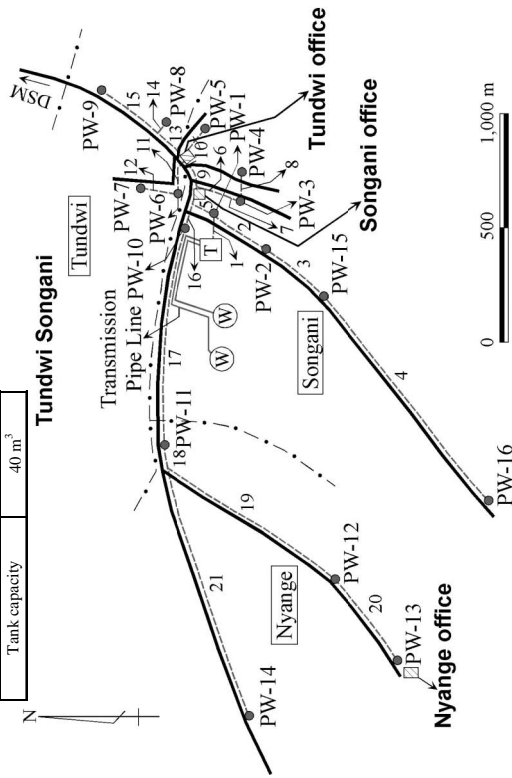


Figure 6.23 Layout of Water Supply Scheme (Tundi Songani: TMK-4)

Distribution pipe line		
Line No.	Length (m)	Diameter (mm)
1	100	140
2	620	140
3	510	110
4	600	32
5	260	90
6	680	75
7	550	63
8	20	63
9	600	63
10	370	40
11	790	40
12	1,030	40
13	160	32
14	1,110	90
15	540	32
16	1,520	75
17	530	50
Storage tank (Elevated tank: L. W. L.=6.05 m)		90 m <sup>3</sup>
Tank capacity		90 m <sup>3</sup>

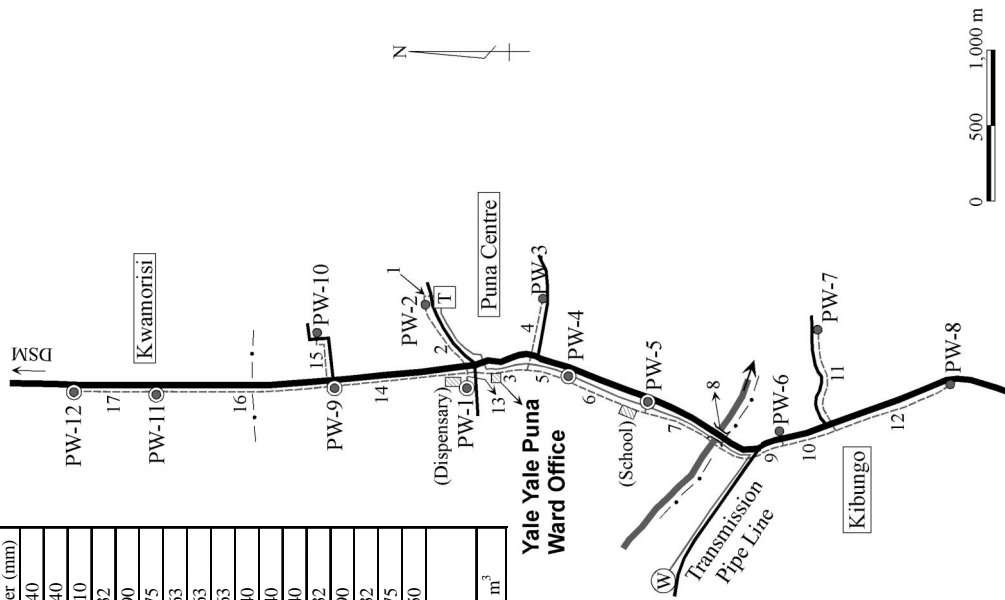


Figure 6.22 Layout of Water Supply Scheme (Yale Yale Puna: TMK-3)

Table 6.1 Evaluation Result of Villages (1/4)

Ward	Name of Village	Population (2002)	Population (2010)	Population (2015)	Water Demand (m3/day)	Form of Community	Dwelling Type	Other WSS Intervention				Scoring			Type of WSS	Evaluation of Priority (Urgency+(Water Source)x2)	Exploitable Number of Well (Level-2)	Exploitable Number of Well (Level-1)			
								None	Agency	Period	Plan	Average Time	Reliability	Consumption					Water Source	Urgency	
																				Urgency	Urgency
<b>Bagamoyo</b>																					
KIWANGWA	FUKAYOSI	3,700	4,335	4,786	96	01: Village	03: Clustered	X				4	3	2	8	C	35				
KIWANGWA	KIDOMOLE	586	687	758	19	01: Village	03: Clustered	X				4	3	2	8	C	35				
MBWEWE	PONGWEKIONA	3,135	3,673	4,055	101	01: Village	04: Scattered	X				4	3	2	8	C	35				
MIONO	KWEIKONJE	1,124	1,317	1,454	36	01: Village	03: Clustered	X				4	3	2	8	C	35				
VIGWAZA	VIGWAZA	4,039	4,732	5,225	131	01: Village	03: Clustered	X				4	3	2	8	C	35				
CHALINZE	MSOLWA	2,672	3,131	3,457	86	01: Village	03: Clustered	X				4	2	2	8	C	34				
MBWEWE	KWANG'ANDU	2,016	2,362	2,608	65	01: Village	03: Clustered	X				4	2	2	8	C	34				
TALAWANDA	MALIVUNDO	1,166	1,366	1,508	38	01: Village	03: Clustered	X				4	2	2	8	C	34				
TALAWANDA	MSIGI	1,124	1,317	1,454	36	01: Village	03: Clustered	X				4	2	2	8	C	34				
TALAWANDA	TALAWANDA	4,124	4,832	5,335	133	01: Village	03: Clustered	X				4	2	2	8	C	34				
CHALINZE	MDAULA	2,982	3,494	3,858	96	01: Village	03: Clustered	X				4	1	2	8	C	33				
KIWANGWA	MKENGE	2,050	2,402	2,652	66	01: Village	03: Clustered	X				4	1	2	8	C	33				
KIWANGWA	MSINUNE	1,927	2,258	2,493	62	01: Village	03: Clustered	X				4	3	1	8	C	33				
LUGOBA	DIOZILE	1,631	1,911	2,110	17	01: Village	03: Clustered	X				4	1	2	8	C	33				
MAGOMENI	MAKURUNGE	1,636	1,917	2,116	53	01: Village	03: Clustered	X				4	1	2	8	C	33				
MIONO	MASIMBANI	1,181	1,384	1,528	38	01: Village	02: Concentrated along the Road	X				4	1	2	8	C	33				
MIONO	MIHUGA	1,417	1,660	1,833	46	01: Village	03: Clustered	X				4	1	2	8	C	33				
MKANGE	MKANGE	2,396	2,807	3,099	77	01: Village	03: Clustered	X				4	1	2	8	C	33				
MSATA	PONGWE MSUNGURA	1,005	1,178	1,300	33	01: Village	04: Scattered	X				4	1	2	8	C	33				
TALAWANDA	KISANGA	855	1,002	1,106	28	01: Village	03: Clustered	X				4	1	2	8	C	33				
TALAWANDA	MINDUKENI	1,438	1,685	1,860	47	01: Village	03: Clustered	X				4	1	2	8	C	33				
UBENAZOMOZI	MATULI	1,977	2,316	2,557	44	01: Village	03: Clustered	X				4	1	2	8	C	33				
VIGWAZA	KIDOGOZERO	1,077	1,262	1,393	35	01: Village	03: Clustered	X				4	1	2	8	C	33	2			
VIGWAZA	VESEZI	1,281	1,501	1,657	41	01: Village	03: Clustered	X				4	1	2	8	C	33				
ZINGA	MAPINGA	195	228	252	6	01: Village	03: Clustered	X				4	1	2	8	D	33				
KIWANGWA	MASUGURU	1,768	2,071	2,287	57	01: Village	03: Clustered	X				3	2	2	8	C	31				
MBWEWE	KWARUHOMBO	2,068	2,423	2,675	32	01: Village	01: Concentrated	X				3	2	2	8	C	31				
UBENAZOMOZI	UBENAZOMOZI	2,490	2,917	3,221	81	01: Village	03: Clustered	X				4	1	1	8	C	31				
VIGWAZA	BUYUNI	1,759	2,061	2,275	57	01: Village	03: Clustered	X				4	1	1	8	C	31				
KIBINDU	KIBINDU	5,605	6,567	7,251	126	01: Village	03: Clustered	X				3	1	2	8	A	30	3 4			
KIBINDU	KWAMDUMA	3,677	4,308	4,757	119	01: Village	04: Scattered	X				4	2	2	6	A	30	2 6			
KIWANGWA	KIWANGWA	12,762	14,953	16,509	413	01: Village	03: Clustered	X				3	1	2	8	C	30				
MKANGE	MATIPWILI	2,698	3,161	3,490	87	01: Village	03: Clustered	X				3	1	2	8	A	30	4			
UBENAZOMOZI	KALOLENI	3,210	3,761	4,152	69	01: Village	03: Clustered	X				3	1	2	8	C	30				
UBENAZOMOZI	MVIDU	1,977	2,316	2,557	64	01: Village	03: Clustered	X				3	1	2	8	C	30				
UBENAZOMOZI	TUKAMISASA	3,051	3,575	3,947	63	02: Mtaa	03: Clustered	X				3	1	2	8	C	30				
MBWEWE	KIFULETA	3,523	4,128	4,557	114	01: Village	03: Clustered	X				3	2	1	8	C	29				
UBENAZOMOZI	VISAKAZI	4,893	5,733	6,330	158	01: Village	03: Clustered	X				3	1	1	8	C	28				
CHALINZE	CHAMAKWEZA	2,152	2,521	2,784	70	01: Village	03: Clustered	X				4	3	2	4	D	27				
DUNDA	KAOLE	292	342	378	9	01: Village	01: Concentrated	X				3	1	2	6	D	26				
YOMBO	YOMBO	121	142	157	4	01: Village	03: Clustered	X				4	1	2	4	D	25				
MKANGE	MANDA MAZINGARA	3,122	3,658	4,039	101	01: Village	03: Clustered	X				4	1	2	2	D	21				
MAGOMENI	MAGOMENI	645	756	834	21	01: Village	01: Concentrated	X				1	1	2	6	D	20	2			
MKANGE	SAADANI	1,344	1,575	1,739	35	01: Village	03: Clustered	X				2	1	2	4	A	19				
KIBINDU	KWAMSANJA	1,001	1,173	1,295	32	01: Village	01: Concentrated	X				3	1	2	2	D	18	6			
<b>Kibaha</b>																					
RUVU	NGETA	1,616	2,112	2,496	62	01: Village	03: Clustered	X				4	3	1	12	D	41	2			
MAGINDU	GUMBA	5,000	6,533	7,722	193	01: Village	03: Clustered	X				4	3	1	8	C	33				
RUVU	MINAZI MIKINDA	2,624	3,429	4,053	101	01: Village	02: Concentrated along the Road	X				2	1	1	12	A	33	1			
MAGINDU	GWATA	2,136	2,791	3,299	82	01: Village		X				4	2	1	8	C	32				
KIBAHA	MWENDAPOLE	854	1,116	1,319	33	01: Village	04: Scattered	X				3	4	1	8	C	31				
MAGINDU	MAGINDU	2,041	2,667	3,152	79	01: Village	01: Concentrated	X				4	1	1	8	C	31				
RUVU	LUPUNGA	1,128	1,474	1,742	44	01: Village	04: Scattered	X				4	3	2	6	D	31	2			
RUVU	KITOMONDO	627	819	968	24	01: Village	03: Clustered	X				1	1	1	12	B	30	1			
MAGINDU	LUKENGE	1,050	1,372	1,622	41	01: Village	03: Clustered	X				3	1	1	8	C	28				
RUVU	KIKONGO	710	928	1,097	27	01: Village	03: Clustered	X				3	1	2	6	D	26	2			
TUMBI	BOKOTIMIZA	623	814	962	24	02: Mtaa	04: Scattered	X				3	3	1	6	D	26	2			
SOGA	BOKOMNEMELA	2,831	3,699	4,372	109	01: Village	04: Scattered	X				4	2	2	3	D	24	4			
SOGA	MISUFINI	337	440	520	13	01: Village	01: Concentrated	X				4	1	1	4	D	23	3			
KIBAHA	VIZIWAZIWA	2,124	2,775	3,280	82	01: Village	04: Scattered	X				3	3	2	3	C	22	2			
KWALA	DUTUMI	1,300	1,699	2,008	50	01: Village	03: Clustered	X				1	1	1	8	B	22	9			
MLANDIZI	MLANDIZI 'B'	4,040	5,279	6,239	156	01: Village	04: Scattered	X				3	3	1	4	D	22				
RUVU	MWANABWITO	1,540	2,012	2,378	59	01: Village	04: Scattered	X				2	1	1	6	D	21	4			
SOGA	MPIJI	1,774	2,318	2,740	69	01: Village	04: Scattered	X				4	1	1	2	D	19	4			
SOGA	KIPANGE	347	453	536	13	01: Village	01: Concentrated	X				3	1	2	2	D	18	3			
VISIGA	ZOGOWALE	1,099	1,436	1,697	42	01: Village	04: Scattered	X				2	2	1	4	D	18	2			
KWALA	MPELAMOMBI	346	452	534	13	01: Village	03: Clustered	X				2	1	1	4	C	17	3			
KIBAHA	KONGOWE	362	473	559	14	01: Village	03: Clustered	X				1	2	2	2	D	13	3			

Table 6.1 Evaluation Result of Villages (2/4)

Ward	Name of Village	Population (2002)	Population (2010)	Population (2015)	Water Demand (2015) (m3/day)	Form of Community	Dwelling Type	Other WSS Intervention				Scoring			Type of WSS	Evaluation of Priority (Urgency+(Water Source)x2) Exploitable Number of Well (Level-2)	Exploitable Number of Well (Level-1)			
								None	Agency	Period	Plan	Average Time	Reliability	Consumption				Water Source	Urgency	
																			1	2
<b>Kisarawe</b>																				
MSIMBU	MSIMBU	2,967	3,316	3,555	89	01: Village	04: Scattered	X				3	1	2	12	A	38	2	4	
VIHINGO	MIHUGWE	310	346	371	9	01: Village	03: Clustered	X				4	3	3	8	D	37	2	2	
MZENGA	MITENGWE	408	456	489	12	01: Village	04: Scattered	X				4	4	2	8	D	36	2	2	
MZENGA	CHAKENGE	1,356	1,516	1,625	41	01: Village	04: Scattered	X				4	4	1	8	D	34	2	6	
VIHINGO	MZENGA 'B'	1,231	1,376	1,475	37	01: Village	04: Scattered	X				3	3	3	8	D	34	2	2	
KURUI	ZEGERO	738	825	884	22	01: Village	04: Scattered	X				4	3	3	6	D	33	5	5	
MZENGA	MZENGA 'A'	1,163	1,300	1,393	35	01: Village	04: Scattered	X				3	4	2	8	D	33	2	2	
VIHINGO	SANGWE	741	828	888	22	01: Village	03: Clustered	X				3	3	2	8	D	32	2	2	
CHOLE	MAFUMBI	664	742	796	20	01: Village	04: Scattered	X				4	3	2	6	D	31	4	4	
MAFIZI	MAFIZI	1,436	1,605	1,720	43	01: Village	03: Clustered	X				4	1	3	6	D	31	6	6	
MARUMBO	KIVUKONI	1,770	1,978	2,121	53	01: Village	04: Scattered	X				4	3	2	6	D	31	2	2	
MZENGA	VILABWA	197	220	236	6	01: Village	03: Clustered	X				2	4	2	8	D	30	1	1	
VIHINGO	CHIMALALE	149	167	179	4	01: Village	04: Scattered	X				3	3	1	8	D	30	1	1	
CHOLE	KWALA-CHOLE	2,245	2,509	2,690	67	01: Village	04: Scattered	X				4	3	1	8	B	33	4	4	
MARUI	KISANGIRE	300	335	359	9	01: Village	02: Concentrated along the Road					4	3	1	6	D	29	2	2	
MARUMBO	MARUMBO	1,115	1,246	1,336	33	01: Village	03: Clustered	X				4	3	1	6	D	29	6	6	
MARUMBO	PALAKA	963	1,076	1,154	29	01: Village	03: Clustered	X				4	3	1	6	D	29	2	2	
VIHINGO	KIBWEMWENDA	740	827	887	22	01: Village	03: Clustered	X				2	3	2	8	D	29	4	4	
MAFIZI	GWATA	1,956	2,186	2,343	59	01: Village	02: Concentrated along the Road					3	1	3	6	D	28	10	10	
MAFIZI	NYANI	861	962	1,032	26	01: Village	03: Clustered	X				3	1	3	6	D	28	5	5	
CHOLE	KURUI-CHOLE	1,032	1,153	1,236	31	01: Village	02: Concentrated along the Road	X				4	1	1	6	D	27	4	4	
CHOLE	YOMOBO LUKINGA	862	963	1,033	26	01: Village	04: Scattered	X				4	1	1	6	D	27	4	4	
KURUI	KIDUGALO	532	595	637	16	01: Village	02: Concentrated along the Road	X				4	3	3	3	D	27	3	3	
MARUMBO	KITONGA	734	820	879	22	01: Village	04: Scattered	X				4	1	1	6	D	27	2	2	
VIHINGO	VIHINGO	340	380	407	10	01: Village	04: Scattered	X				2	3	1	8	D	27	2	2	
KILUVYA	MLOGANZILA	1,250	1,397	1,498	37	01: Village	03: Clustered	X				4	4	1	4	D	26	2	2	
KURUI	MTAKAYO	998	1,115	1,196	30	01: Village	03: Clustered	X				3	1	2	6	D	26	5	5	
MAFIZI	KIMALA MISALE	720	805	863	22	01: Village	04: Scattered	X				3	3	1	6	D	26	4	4	
MAFIZI	VING'ANDI	780	872	935	23	01: Village	03: Clustered	X				3	1	2	6	D	26	4	4	
MANEROMANG	KIDUGALO-KANGA	857	958	1,027	26	01: Village	04: Scattered	X				3	1	2	6	D	26	2	2	
MARUMBO	MFURU KIKWETE	3,686	4,120	4,416	110	01: Village	03: Clustered	X				3	3	1	6	D	26	2	2	
MSIMBU	HOMBOZA	1,458	1,630	1,747	44	01: Village	04: Scattered	X				3	1	2	6	D	26	2	2	
MSIMBU	LUHANGAI	769	859	921	23	01: Village	03: Clustered	X				2	2	3	6	D	26	2	2	
KIBUTA	KAUZENI	1,685	1,883	2,019	50	01: Village	04: Scattered	X				4	3	1	4	D	25	4	4	
KIBUTA	KIBUTA	2,050	2,291	2,456	66	01: Village	03: Clustered	X				4	3	1	4	D	25	2	2	
KIBUTA	MASANGANYA	2,289	2,558	2,742	69	01: Village	04: Scattered	X				4	3	1	4	D	25	2	2	
MARUI	MARUI-MIPERA	1,034	1,156	1,239	31	01: Village	03: Clustered	X				4	3	2	3	D	25	2	2	
MASAKI	SUNGWU	1,573	1,758	1,885	47	01: Village	03: Clustered	X				4	3	3	2	D	25	2	2	
KIBUTA	BWAMA	1,332	1,489	1,596	40	01: Village	03: Clustered	X				3	3	2	4	D	24	6	6	
KILUVYA	KILUVYA 'A'	1,287	1,438	1,542	39	01: Village	04: Scattered	X				4	4	2	2	D	24	2	2	
KISARAWA	KISARAWA	900	1,006	1,078	27	01: Village	04: Scattered	X				3	1	3	4	D	24	4	4	
KISARAWA	KIFURU	544	608	652	16	01: Village	04: Scattered	X				4	1	3	2	D	23	2	2	
MANEROMANG	MSEGAMO	777	868	931	23	01: Village	04: Scattered	X				2	1	2	6	D	23	2	2	
MSIMBU	MAGURUWE	497	555	595	15	01: Village	04: Scattered	X				4	3	2	2	D	23	2	2	
VIKUMBURU	MTUNANI	504	563	604	15	01: Village	02: Concentrated along the Road	X				4	3	1	3	D	23	3	3	
VIKUMBURU	PANGALA MWINGERE	778	870	932	23	01: Village	02: Concentrated along the Road	X				4	3	1	3	D	23	2	2	
CHOLE	SOFU	142	159	170	4	01: Village	04: Scattered	X				1	3	2	6	D	22	1	1	
KIBUTA	MUHAGA	911	1,018	1,091	27	01: Village	03: Clustered	X				3	3	1	4	D	22	4	4	
KILUVYA	TONDORONI	4,233	4,731	5,072	127	01: Village	03: Clustered	X				3	3	1	4	D	22	4	4	
KISARAWA	VISEGESE	1,182	1,321	1,416	35	01: Village	04: Scattered	X				2	4	2	4	D	22	4	4	
MSIMBU	GUMBA	1,385	1,548	1,659	41	01: Village	03: Clustered	X				3	1	2	4	D	22	2	2	
KIBUTA	CHANG'OMBE 'B'	989	1,105	1,185	30	01: Village	02: Concentrated along the Road	X				4	3	1	2	D	21	2	2	
KIBUTA	MTAMBA	840	939	1,006	25	01: Village	03: Clustered	X				4	3	1	2	D	21	4	4	
MASAKI	KISANGA	2,125	2,375	2,546	64	01: Village	03: Clustered	X				3	4	2	2	D	21	8	8	
MSANGA	MIANZI	747	835	895	22	01: Village	02: Concentrated along the Road	X				4	3	1	2	D	21	2	2	
KISARAWA	KAZIMZUMBWI	1,678	1,875	2,010	50	01: Village	03: Clustered	X				2	4	3	2	D	20	6	6	
MANEROMANG	MENGWA	996	1,113	1,193	30	01: Village	04: Scattered	X				3	1	2	3	D	20	2	2	
MARUI	TITU	427	477	512	13	01: Village	02: Concentrated along the Road	X				3	3	1	3	D	20	3	3	
MASAKI	MASAKI	2,786	3,114	3,338	83	01: Village	03: Clustered	X				2	4	3	2	D	20	4	4	
VIKUMBURU	KORESA	689	770	825	21	01: Village	04: Scattered	X				3	3	1	3	D	20	2	2	
MSANGA	MSANGA	1,998	2,233	2,394	60	01: Village	04: Scattered	X				4	1	1	2	D	19	4	4	
MANEROMANG	NGONGERE	710	794	851	21	01: Village	04: Scattered	X				3	1	1	3	D	18	2	2	
MARUMBO	CHANG'OMBE 'A'	548	612	657	16	01: Village	04: Scattered	X				3	3	1	2	D	18	2	2	
KURUI	KURUI	584	653	700	18	01: Village	01: Concentrated	X				2	3	2	2	D	17	3	3	
MANEROMANG	BOGA	2,038	2,278	2,442	61	01: Village	04: Scattered	X				2	1	2	3	D	17	2	2	
MARUI	KIHARE	720	805	863	22	01: Village	03: Clustered	X				2	1	2	3	D	17	4	4	
MSIMBU	KITANGA	486	543	582	15	01: Village	04: Scattered	X				2	3	2	2	D	17	2	2	
VIKUMBURU	KITONGA	420	469	503	13	01: Village	04: Scattered	X				2	3	1	3	D	17	3	3	
VIKUMBURU	VIKUMBURU	1,484	1,659	1,778	48	01: Village	03: Clustered	X				2	3	1	3	D	17	6	6	
MSANGA	BEMBEZA	1,259	1,407	1,508	38	01: Village	02: Concentrated along the Road	X				2	4	1	2	D	16	6	6	
MSANGA	VISIGA	1,188	1,328	1,423	36	01: Village	02: Concentrated along the Road	X				3	1	1	2	D	16	4	4	
CHOLE	CHOLE	2,685	3,001	3,217	80	01: Village	04: Scattered	X				2	1	1	3	D	15	2	2	
MANEROMANG	CHALE	516	577	618	15	01: Village	03: Clustered	X				2	1	2	2	D	15	3	3	
MARUI	MARUI-NGWATA	1,443	1,613	1,729	43	0														

Table 6.1 Evaluation Result of Villages (3/4)

Ward	Name of Village	Population (2002)	Population (2010)	Population (2015)	Water Demand (2015) (m <sup>3</sup> /day)	Form of Community	Dwelling Type	Other WSS Intervention				Scoring				Type of WSS	Evaluation of Priority (Urgency+(Water Source)x2)	Exploitable Number of Well (Level-2)	Exploitable Number of Well (Level-1)
								None	Agency	Period	Plan	Urgency		Water Source					
												Average Time	Reliability		Consumption				
<b>Mkuranga</b>																			
VIKINDU	MKOKOZI	1,769	2,329	2,767	69	01: Village	04: Scattered	X				4	4	1	12	B	42		
VIKINDU	MWANDEGE	1,600	2,107	2,502	63	01: Village	04: Scattered	X				3	2	2	12	A	39	1	3
VIKINDU	KISEMVULE	2,260	2,976	3,535	88	01: Village	04: Scattered	X				2	3	2	12	A	37	2	2
VIKINDU	MALELA	1,250	1,646	1,955	49	01: Village	03: Clustered	X				2	3	2	12	B	37		8
VIKINDU	MOROGORO	1,500	1,975	2,346	59	01: Village	03: Clustered	X				2	3	2	12	B	37	1	2
VIKINDU	VIANZI	2,625	3,457	4,105	103	01: Village	04: Scattered	X				2	3	2	12	A	37	1	5
VIKINDU	YAVAYAVA	1,830	2,410	2,862	72	01: Village	04: Scattered	X				2	3	2	12	B	37	1	12
TAMBANI	MWANAMBAYA	2,466	3,247	3,857	96	01: Village	04: Scattered	X				2	2	2	12	A	36		4
VIKINDU	MFURU MWAMBAO	1,435	1,890	2,244	56	01: Village	03: Clustered	X				1	3	3	12	B	36		7
VIKINDU	VIKINDU	5,125	6,749	8,015	200	01: Village	04: Scattered	X				3	2	2	8	C	31	3	13
MKURANGA	DUNDANI	1,577	2,077	2,466	62	01: Village	03: Clustered	X				3	4	3	6	D	31		2
MKURANGA	SUNGUUVUNI	989	1,302	1,547	39	01: Village	03: Clustered	X				4	3	2	6	D	31		2
LUKANGA	NJOPEKA	6,611	8,705	10,339	189	01: Village	04: Scattered	X				3	1	2	8	A	30		6
MKURANGA	TENGELEA	2,845	3,746	4,449	111	01: Village	03: Clustered	X				3	3	3	6	D	30		2
NYAMATO	KILMBA	1,920	2,528	3,003	50	01: Village	04: Scattered	X				4	4	3	4	D	30		4
NYAMATO	MKIU	3,742	4,927	5,852	146	01: Village	03: Clustered	X				4	3	3	4	D	29		4
MKURANGA	KOLANGWA	500	658	782	20	01: Village	04: Scattered	X				3	3	2	6	D	28		2
KITOMONDO	MING'OMBE	992	1,306	1,551	39	01: Village	04: Scattered	X				4	4	2	4	D	28		2
LUKANGA	MISASA	2,196	2,892	3,434	86	01: Village	03: Clustered	X				4	4	2	4	D	28		2
LUKANGA	MKOLA	1,107	1,458	1,731	43	01: Village	04: Scattered	X				4	4	2	4	D	28		2
MAGAWA	NYAMIHIMBO	889	1,171	1,390	35	01: Village	03: Clustered	X				4	4	2	4	D	28		2
MAGAWA	SANGASANGA	1,006	1,325	1,573	39	01: Village	04: Scattered	X				4	4	2	4	D	28		2
NYAMATO	KILIMAHEWA KUSINI	1,280	1,686	2,002	75	01: Village	03: Clustered	x				4	4	2	4	D	28		2
NYAMATO	NYANDUTURU	1,668	2,196	2,609	65	01: Village	03: Clustered	X				4	4	2	4	D	28		2
MKURANGA	MKWALIA/KITUMBO	1,072	1,412	1,677	42	01: Village	04: Scattered	X				3	2	2	6	D	27		2
TAMBANI	KIBAMBA	1,095	1,442	1,713	43	01: Village	04: Scattered	X				3	2	2	6	D	27		2
KIMANZICHANA	KILIMAHEWA KASKAN	3,256	4,288	5,092	127	01: Village	03: Clustered	x				4	3	2	4	D	27		2
KIMANZICHANA	KIMANZICHANA KUSIN	13,700	18,040	21,426	535	01: Village	01: Concentrated	x				4	3	2	4	D	27		2
KITOMONDO	KIKOO	2,395	3,154	3,746	94	01: Village	03: Clustered	X				4	3	2	4	D	27		2
KITOMONDO	NJIA NNE MIKERE	6,788	8,938	10,616	265	01: Village	03: Clustered	X				4	3	2	4	D	27		4
LUKANGA	SANGALANI	1,678	2,210	2,624	66	01: Village	04: Scattered	X				4	3	2	4	D	27		2
MAGAWA	MDINI	1,648	2,170	2,577	64	01: Village	03: Clustered	X				4	3	2	4	D	27		2
NYAMATO	MVULENI	1,886	2,484	2,950	74	01: Village	03: Clustered	X				4	3	2	4	D	27		2
BUPU	MAMNDI KONGO	1,421	1,871	2,222	56	01: Village	04: Scattered	X				3	3	3	4	D	26		4
KITOMONDO	KITOMONDO	1,799	2,369	2,814	70	01: Village	04: Scattered	X				4	2	2	4	D	26		2
KITOMONDO	MITEZA	1,819	2,395	2,845	71	01: Village	03: Clustered	X				3	3	3	4	D	26		2
LUKANGA	LUKANGA	1,983	2,611	3,101	78	01: Village	03: Clustered	X				4	2	2	4	D	26		4
MKURANGA	KIPARANG'ANDA'A'	4,321	5,690	6,758	169	01: Village	04: Scattered	X				4	2	2	4	D	26		2
MAGAWA	MAGAWA	4,524	5,957	7,075	177	01: Village	04: Scattered	X				3	4	2	4	D	25		4
MKURANGA	KIBULULU	1,005	1,323	1,572	39	01: Village	01: Concentrated	X				3	2	3	4	D	25		2
BUPU	BUPU	1,435	1,890	2,244	56	01: Village	04: Scattered	X				4	1	3	3	D	25		4
VIKINDU	KIPALA	2,029	2,672	3,173	79	01: Village	04: Scattered	X				1	3	1	8	C	24		
BUPU	TUNDU	1,416	1,865	2,215	55	01: Village	03: Clustered	X				3	3	2	4	D	24		8
KISIJU	BINGA	1,832	2,412	2,865	72	01: Village	03: Clustered	X				3	3	2	4	D	24		2
KITOMONDO	KIWAAMBO	1,969	2,593	3,079	77	01: Village	03: Clustered	X				3	3	2	4	D	24		2
MAGAWA	KIFUMANGAO	681	897	1,065	27	01: Village	03: Clustered	X				3	3	2	4	D	24		4
MAGAWA	NASIBUGANI	97	128	152	38	01: Village	03: Clustered	X				3	3	2	4	D	24		1
TAMBANI	DONDWE	1,951	2,569	3,051	76	01: Village		X				4	2	1	4	D	24		2
TAMBANI	MWANADILATU	1,560	2,054	2,440	61	01: Village	04: Scattered	X				3	3	2	4	D	24		4
KISIJU	KALOLE	1,198	1,578	1,874	47	01: Village	03: Clustered	X				2	3	3	4	D	23		2
KISIJU	MPAFU	665	876	1,040	26	01: Village	03: Clustered	X				3	2	2	4	D	23		4
KISIJU	SOTELE	1,917	2,524	2,998	75	01: Village	03: Clustered	X				2	3	3	4	D	23		2
MKURANGA	KIPARANG'ANDA'B'	2,065	2,719	3,230	81	01: Village	04: Scattered	X				3	4	1	4	D	23		2
MWALUSEMBE	MWALUSEMBE	5,886	7,751	9,205	230	01: Village	03: Clustered	x				3	2	2	4	D	23		2
TAMBANI	TAMBANI	1,538	2,025	2,405	60	01: Village	04: Scattered	X				3	2	2	4	D	23		2
MAGAWA	MSONGA	1,197	1,576	1,872	47	01: Village	04: Scattered	X				2	4	2	4	D	22		2
MKURANGA	MKURANGA	2,823	3,717	4,415	110	01: Village	04: Scattered	X				3	3	1	4	D	22		4
NYAMATO	TIPO	1,997	2,630	3,123	78	01: Village	01: Concentrated	X				2	2	3	4	D	22		8
TAMBANI	MLAMLENI	2,318	3,052	3,625	91	01: Village	04: Scattered	X				2	1	1	6	D	21		2
BUPU	MANDI MPELA	1,820	2,397	2,846	71	01: Village	04: Scattered	X				2	3	2	4	D	21		2
KIMANZICHANA	KIMANZICHANA KASKAZ	1,006	1,325	1,573	39	01: Village	04: Scattered	x				2	3	2	4	D	21		2
KIMANZICHANA	MKENGE	2,393	3,151	3,743	94	01: Village	04: Scattered	x				2	3	2	4	D	21		2
KISIJU	KEREKESE	2,800	3,687	4,379	109	01: Village	04: Scattered	X				2	3	2	4	D	21		2
KITOMONDO	MITARANDA	1,552	2,044	2,427	61	01: Village	04: Scattered	X				2	3	2	4	D	21		2
MAGAWA	MTONGANI	591	778	924	23	01: Village	02: Concentrated along the Road	X				2	3	2	4	D	21		2
MKURANGA	MAGOZA	2,220	2,923	3,472	87	01: Village	03: Clustered	X				2	3	2	4	D	21		2
MWALUSEMBE	BIGWA	2,098	2,763	3,281	82	01: Village	02: Concentrated along the Road	x				2	3	2	4	D	21		2
MWALUSEMBE	KITONGA TOWN	1,500	1,975	2,346	59	01: Village	04: Scattered	x				2	3	2	4	D	21		2
MWALUSEMBE	KIZIKO	1,286	1,693	2,011	50	01: Village	01: Concentrated	x				2	3	2	4	D	21		4
TAMBANI	MPEKO	1,418	1,867	2,218	55	01: Village	04: Scattered	X				3	2	1	4	D	21		2
MKURANGA	HOYOYO	3,320	4,372	5,192	130	01: Village	03: Clustered	X				3	2	2	3	D	21		2
KISIJU	DONDO	1,189	1,566	1,860	47	01: Village	03: Clustered	X				2	2	2	4	D	20		4
KIMANZICHANA	KIMBWININDI	3,250	4,280	5,083	127	01: Village	04: Scattered	X				1	2	2	4	D	17		

Table 6.1 Evaluation Result of Villages (4/4)

Ward	Name of Village	Population (2002)	Population (2010)	Population (2015)	Water Demand (2015) (m <sup>3</sup> /day)	Form of Community	Dwelling Type	Other WSS Intervention				Scoring				Type of WSS	Evaluation of Priority (Urgency+(Water Source)x2)	Exploitable Number of Well (Level-2)	Exploitable Number of Well (Level-1)
								None	Agency	Period	Plan	Urgency							
												Average Time	Reliability	Consumption	Water Source				
<b>Ilala</b>																			
KITUNDA	KITUNDA	23,424	33,567	42,031	1,051	01: Village	04: Scattered												
TABATA	MATUMBI	4,304	6,168	7,723	193	02: Mtaa	01: Concentrated	X											
UKONGA	GONGO LA MBOTO	20,470	29,334	36,731	918	02: Mtaa	01: Concentrated			Plan Int'l									
MSONGOLA	MSONGOLA	3,668	5,256	6,582	165	01: Village	04: Scattered	X											
SEGEREA	AMANI	4,238	6,073	7,605	190	02: Mtaa	01: Concentrated	X											
CHANIKA	BUYUNI	6,544	9,378	11,742	294	01: Village	04: Scattered	X											
SEGEREA	KISUKULU	4,151	5,948	7,448	186	02: Mtaa	01: Concentrated			Municipal	Cor	4	3	2	4	D	27		
KIPAWA	KIPUNGUNI	19,275	27,622	34,586	865	02: Mtaa	01: Concentrated			Municipal	Exp	2	2	1	8	A	26		
PUGU	PUGU STATION	1,998	2,863	3,585	90	01: Village	04: Scattered	X											
ILALA	SHARIF SHAMBA	6,708	9,613	12,037	301	02: Mtaa	01: Concentrated	X											
KINYEREZI	KINYEREZI	5,811	8,327	10,427	261	01: Village	04: Scattered	X											
SEGEREA	TEMBOMGWAZA	6,239	8,941	11,195	280	02: Mtaa	01: Concentrated	X											
CHANIKA	CHANIKA	13,906	19,928	24,953	624	01: Village	04: Scattered	X											
CHANIKA	MAJOHE	3,122	4,474	5,602	140	01: Village	04: Scattered	X											
UKONGA	GULUKA KWALALA	12,978	18,598	23,287	582	02: Mtaa	01: Concentrated			Plan Int'l	Cor	4	1	1	4	D	23		
UKONGA	ULONGONI	3,680	5,274	6,603	165	02: Mtaa	01: Concentrated			Plan Int'l	Cor	3	1	2	4	D	22		
PUGU	PUGU KAJIUNGUNI	3,850	5,517	6,908	173	01: Village	04: Scattered			Ilala Munic	Exp	2	3	2	4	D	21		
UKONGA	MWEMBEMADAFU	27,648	39,620	49,611	1,240	02: Mtaa	01: Concentrated	X											
SEGEREA	KIMANGA DARAJANI	19,270	27,614	34,578	864	02: Mtaa	01: Concentrated	X											
TABATA	TENGE	4,750	6,807	8,523	213	02: Mtaa	01: Concentrated			World Bank	WB	3	1	1	4	D	20		
UKONGA	MARKAZ	4,279	6,132	7,678	192	02: Mtaa	01: Concentrated	X											
UKONGA	MONGO LA NDEGE	3,698	5,299	6,636	166	02: Mtaa	04: Scattered			Plan Int'l	Cor	2	1	1	4	D	17		
TABATA	TABATA	9,239	13,240	16,578	414	02: Mtaa	01: Concentrated	X											
MSONGOLA	MVUTI	4,108	5,887	7,371	184	01: Village	04: Scattered	X											
<b>Kinondoni</b>																			
KIBAMBA	KWEMBE	7,600	10,481	12,814		Mtaa	04: Scattered			GOT&Japa	Cor	4	3	2	8	A	35		
GOBA	MATOSA	25,144	34,677	42,393	1,060	Mtaa	04: Scattered	X											
MBEZI	MBEZI-LUIS	20,079	27,692	33,853	846	Mtaa	01: Concentrated	X											
MBEZI	MPIJI MAGOHE	2,723	3,755	4,591	115	Mtaa	04: Scattered	X											
MBEZI	MSAKUZI	2,797	3,857	4,716	118	Mtaa	04: Scattered	X											
GOBA	KULANGWA	1,220	1,683	2,057	51	Mtaa	04: Scattered	X											
KIBAMBA	KIBWEGERE	3,000	4,137	5,058	126	Mtaa	04: Scattered	X											
MBEZI	MSUMI	1,330	1,834	2,242	56	Mtaa	04: Scattered	X											
KUNDUCHI	MADALA	8,932	12,318	15,059	376	Mtaa	04: Scattered	X											
BUNJU	MBOPO	1,868	2,576	3,149	79	Mtaa	03: Clustered	X											
KAWE	CHANGANYIKENI	17,000	23,445	28,662	717	Mtaa	01: Concentrated	X											
KIMARA	KIMARA BARUTI	14,584	20,113	24,589	615	Mtaa	01: Concentrated	X											
BUNJU	MABWEPANDE	3,100	4,275	5,227	131	Mtaa	04: Scattered	X											
KIMARA	MAVURUNZA	3,974	5,481	6,700	168	Mtaa	01: Concentrated	X											
<b>Temeke</b>																			
CHAMAZI	MSUFINI	6,427	9,210	11,532	288	02: Mtaa	03: Clustered	X											
CHARAMBE	KIBANGULILE	12,500	17,913	22,430	561	02: Mtaa	03: Clustered	X											
KIMBIJI	KIZITO HUONJWA	1,096	1,571	1,967	49	02: Mtaa	02: Concentrated along the Road	X											
PEMBA MNAZI	YALEYALE PUNA	3,321	4,759	5,959	149	01: Village	03: Clustered	X											
PEMBAMNAZI	TUNDWI SONGANI	2,204	3,158	3,955	44	01: Village	03: Clustered	X											
VIJIBWENI	VIJIBWENI	1,800	2,579	3,230	81	02: Mtaa	03: Clustered	X											
VIJIBWENI	KIBENE	751	1,076	1,348	34	02: Mtaa	03: Clustered	X											
MAKANGARAW	MAKANGARAWE	10,400	14,903	18,661	467	02: Mtaa	03: Clustered	X											
MBAGALA	KINGUGI	4,663	6,682	8,367	209	02: Mtaa	03: Clustered	X											
MBAGALA KUU	MGENI NANI	7,020	10,060	12,596	315	02: Mtaa	04: Scattered	X											
VIJIBWENI	KISIWANI	1,060	1,519	1,902	48	02: Mtaa	03: Clustered	X											
VIJIBWENI	MKWAJUNI	997	1,429	1,789	45	02: Mtaa	01: Concentrated	X											
YOMBO VITUKA	MACHIMBO	15,421	22,099	27,671	692	02: Mtaa	03: Clustered	X											
YOMBO VITUKA	SIGARA	8,024	11,499	14,398	360	02: Mtaa	01: Concentrated	X											
TANDIKA	NYAMWELA	4,402	6,308	7,899	197	02: Mtaa	03: Clustered	X											
MJIMWEMA	MJIMWEMA	5,670	8,125	10,174	254	02: Mtaa	03: Clustered	X											
YOMBO VITUKA	VITUKA	11,499	16,478	20,633	516	02: Mtaa	04: Scattered			WaterAid		4	1	1	4	D	23		
MAKANGARAW	YOMBO DOVYA	15,881	22,758	28,496	712	02: Mtaa	03: Clustered	X											
MBAGALA KUU	MBAGALA KUU	11,540	16,537	20,707	518	02: Mtaa	01: Concentrated	X											
MJIMWEMA	KIBUGUMO	1,883	2,698	3,379	84	02: Mtaa	01: Concentrated	X											
TANDIKA	MACURUWE	6,599	9,457	11,841	296	02: Mtaa	03: Clustered	X											
TANDIKA	TAMLA	5,814	8,332	10,432	261	02: Mtaa	03: Clustered	X											
TUANGOMA	KONGOWE	3,165	4,536	5,679	142	02: Mtaa	03: Clustered	X											



## CHAPTER 7 CONSTRUCTION AND IMPLEMENTATION PLAN

### 7.1 GENERAL

The Construction Plan and the Implementation Plan for the Priority Project are discussed in this Chapter, considering the natural and social conditions in the Study area, and the financial status of MoWLD.

### 7.2 CONSTRUCTION PLAN

#### 7.2.1 NATURAL CONDITIONS

The Study area has two wet seasons from March to May and October to December. In planning the construction schedule, the bad road conditions should be taken into consideration. Attention should be paid to the difficult conditions of target aquifers: Fissure groundwater in hard rock aquifers and frequent changing in water quality with locations in the Neogene aquifers. Potential contamination by Fluoride (F) and salinity should be verified before the construction of water supply schemes.

#### 7.2.2 SOCIAL CONDITIONS

Involvement of community in the construction of schemes is important to effectively use their experience in managing in developing of infrastructures in the village and for sharing those with adjacent villages. Although activity of water vendors are in the informal sector, necessary measure to mitigate the adverse impact on them should be considered.

#### 7.2.3 CONSTRUCTION ASPECTS

Most of the construction works will be carried out by conventional methods and machineries. Local and foreign construction contractors in Tanzania are all registered with Contractor Registration Board (CRB). They are ranked from Class 1 to Class 7 in descending order. A total of 31 construction contractors are registered as Class 1 and 2 (Web Site of CRB, as of July 2005). These contractors have enough ability to construct water supply facilities planned in the Study. Most required equipment and material are available in Tanzania though some should be imported from abroad.

### 7.3 IMPLEMENTATION PLAN

Priority Project is planned to be implemented in three years from 2006 to 2008 as shown in *Table 7.1*.

**Table 7.1 Implementation Schedule of Priority Project**

District/Municipality	2006	2007	2008	2009	2010
Bagamoyo	←→				
Kibaha	←→				
Kisarawe	←→				
Mkuranga		←→			
Ilala			←→		
Kinondoni		←→			
Temeke			←→		

### 7.4 FINANCIAL PLAN OF THE PRIORITY PROJECT

Implementation cost of the Priority Project is estimated at 16.5 million USD. The available budget of MoWLD for independent implementation is insufficient to the Priority Project as noted in Chapter 5. Therefore, the Project is assumed to be implemented by with Japan's Grant Aid.

Disbursement schedule for the implementation of the Priority Project is planned as shown in *Table 7.2*.

**Table 7.2 Annual Disbursement Schedule for Priority Project**

Unit: Thousand USD

District/Municipality	2006	2007	2008	2009	2010	Total
Bagamoyo	2,213.2					
Kibaha	780.1					
Kisarawe	1,872.5					
Mkuranga		3,126.6				
Ilala			2,950.6			
Kinondoni		509.1				
Temeke			2,527.2			
Sub Total	4,865.8	3,635.7	5,477.8			13,979.3
Engineering	875.9	654.4	986.0			2,516.3
Total	5,741.7	4,290.1	6,463.8			16,495.6

## CHAPTER 8 INSTITUTIONAL DEVELOPMENT PLAN

### 8.1 GENERAL

Current and future institutional framework for Community-Owned Water Supply Organizations (COWSS), proposed in the National Water Sector Development Strategy (Draft) is reviewed in Chapter 3, defining the functional responsibilities of each organization involved in management, and operation and maintenance of COWSS.

Current management options also analyzed in terms of organizational and contractual settings. The analysis assessed the efficiency, competency, and guarantee for management, and operation and maintenance for each options.

The Study for institutional development is carried out with the following major objectives:

- To comprehend and analyze problems, causes, and effects in current institutional framework for the provision of rural and peri-urban water supply services, and management options of COWSOs.
- To identify the efficient and effective institutional framework and COWSO management options, and assess their applicability and feasibility in the Study area.
- To optimize and finalize institutional development plan through the above process.

It shall be noted that the institutional development plan is prepared, taking into consideration the requirements both in technical operation and maintenance, and institutional management, socio-economic conditions, awareness of communities, and so forth.

### 8.2 PERFORMANCE ANALYSIS ON COWSO

The comparative analysis on current COWSO options with respect to their performance, efficiency, competency, and guarantee in management of the water supply schemes was made to identify the recommendable COWSO option.

The analysis results indicated that the most traditional and conventional COWSO management option of Village Water Committee (VWC) is less efficient and competence in the scheme management, while Water User Group (WUG) has relatively improved efficiency and competency if capacity building and legal registration is provided. Water Users Association (WUA) and Water Trust/Co-operative have fair steadiness in management, while further elaborated COWSO management options such as Water Company by guarantee and by share would ensure higher effectiveness and competency.

### 8.3 SUGGESTED INSTITUTIONAL FRAMEWORK

Taking into consideration the current and future institutional frameworks and problems/challenges in COWSS, its management options and models are identified, with further examination on their varying strengths in efficiency, competency, and guarantee for the management and services provision. The identified models vary in their organizational and contractual settings, namely, 1) Community-Owned Water Supply Organization (COWSO) management model, 2) Service Contractors Model, and 3) Community Water Supply Management Entity Model.

The *Figure 8.1* presents the entire overview of Community-Owned Water Supply Organization (COWSOs) management options proposed in the Study. As can be seen, COWSOs are placed in the pivot of the structure, taking major roles and responsibilities in the scheme management in the rural and peri-urban water supply service delivery. Institutional arrangements of COWSOs are proposed either in the form of Water Users Associations (WUAs) or Water Trust/Co-operatives, vested with autonomous and legal status through widely recognized process of registration and regulation/by-law development in a participatory manner. Relationship between COWSO and

Village Council becomes rather interactive in decision making process with roles and responsibilities of Village Council being supervisory.

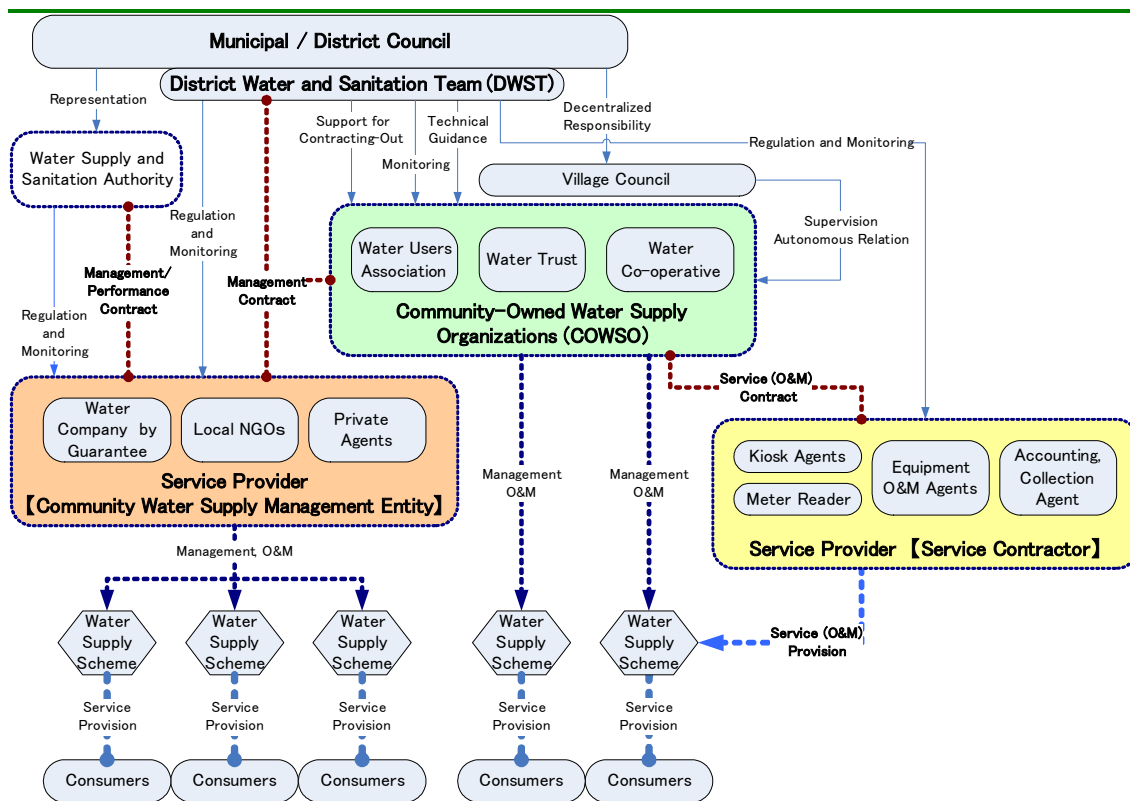


Figure 8.1 Overview of Suggested Management Options

Municipal and District Council shall provide technical and managerial guidance and monitoring services for COWSOs in their management, and operation and maintenance of the water supply scheme by establishing District Water and Sanitation Team (DWST). DWST shall be composed of; 1) District Executive Officer as chairperson, 2) District Water Engineer as Secretary, 3) District Planning Officer, 4) District Health Officer, and 5) District Community Development Officer. This composition and membership can allow for the integrated and sector-wide approaches in planning, activities, and monitoring. DWST is expected to take the following roles and responsibilities in the implementation of water and sanitation project: 1) coordination of the day-to-day project activities in the district, 2) coordination, appraisal of community sub-project proposal, and selection of communities for assistance for presentation to the full council for approval, 3) coordination and provident linkage between partner organizations and the communities, 4) providing support for training and capacity building of the private sector, NGOs, CBOs (community-based organizations), and communities, and 5) assessing the capability of communities in letting and managing contract, and 6) providing technical support to communities.

Contractual arrangements, such as service contracts and management contracts, are highly advocated in this option frames to enhance the efficiency, competency, and guarantee in scheme management, and operation and maintenance, in particular, for the technologies requiring relatively elaborated expertise, such as piped water supply schemes (Level-2). In this arrangement, District and Municipal Council, through DWST, shall be responsible for regulation and monitoring of contractors, and for support and supervision in contracting-out for COWSOs.

## CHAPTER 9 MANAGEMENT, OPERATION AND MAINTENANCE PLAN

### 9.1 GENERAL

Operation and Maintenance Study is carried out to achieve the following objectives; 1) to comprehend the pros and cons pertaining to the current institutional framework concerning management, operation and maintenance of community-owned water supply (and sanitation) schemes (COWSS), and 2) to identify and examine the feasibility and applicability of COWSS management options with respect to institutional, political, and economic aspects.

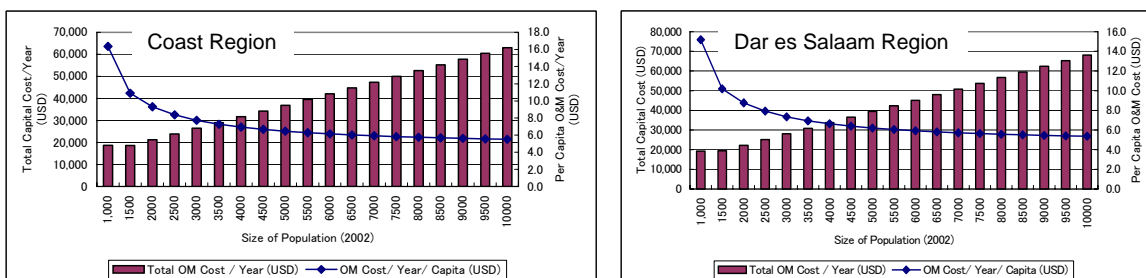
Current and future institutional framework for COWSS, proposed in the National Water Sector Development Strategy (Draft) is reviewed. Analysis is also given to the current management options in terms of organizational and contractual settings. The analysis assess the efficiency, competency, and guarantee for management, and operation and maintenance in each options.

### 9.2 MANAGEMENT, OPERATION AND MAINTENANCE PLAN

#### 9.2.1 OPERATION AND MAINTENANCE COST

Operation and maintenance cost includes fuel, minimum wages for operation agents, commission for community-owned water supply organizations, cost for management/service contracts, supplies, tools, spare parts, regular pump maintenance cost as well as replacement cost. Capital cost is used for estimation of approximate operation and maintenance cost for piped water supply schemes of Level-2. O&M cost for Level-1 hand pump scheme is estimated by using experiences from similar projects.

The period for depreciation is set at 10 years (2010-2020), therefore, full cost for replacement is accumulated over 10 years. *Figure 9.1* shows the correlation between annualized total O&M cost and per capita O&M cost by the size of communities in the Study area (Coast Region and Dar es Salaam Region). Trend can be observed in both Regions that the annualized per capita O&M cost declines as the size of population increases, even increasing in total annualized O&M cost.



**Figure 9.1 Annualized Total and Per Capita O&M Cost**

Annualized per capita O&M cost for Level-1 hand pump scheme is estimated based on the estimated annualized total O&M cost of USD 736.5 divided by the maximum served population of 250, which amounts to approximately USD 2.9/capita/year.

#### 9.2.2 TARIFF SETTING WITH AFFORDABILITY- AND WILLINGNESS-TO-PAY ANALYSIS

Median per capita monthly income is Tsh. 8,172 in Coast Region and 16,349 per month in Dar es Salaam Region (Household Budget Survey 2000/01 and National Bureau of Statistics Tanzania). On the assumption that water tariff is set at Tsh. 1 per liter and 80% of population in the community consume 25 liter/day/capita, percentage of annualized per capita O&M cost for Level-2 scheme is compared with median per capita income. It is observed that percentages with respect to income is

more than 5 % in Coast Region even for village population size exceeding 10,000. In case of Dar es Salaam Region it is below 5 % for the village population size of just 2,000 and more. The application of the piped water scheme (level-2) in Coast Region requires further consideration and examination concerned to affordability. The same estimation is made for Level-1 scheme as well. The percentage in Coast Region amounts to 3.1 percent, while the one in Dar es Salaam becomes merely 1.5 percent

Communities in the Study area are purchasing water, in most cases, at Tsh. 10 - 20 per 20 liter bucket, whatever the water sources are, except in some cases where water vendors charge considerably higher prices. This prevailing local customs seems to be affecting the willingness to pay of the communities. The Study revealed that quite a majority of sample households would pay around Tsh. 10 and 20 per 20 liter as the maximum amount that (willingness to pay) for water from the improved water supply scheme.

### **9.2.3 TARIFF COLLECTION MECHANISM**

There are two types of tariffs which communities can choose: flat rate per litre and flat rate per household per month. Flat rate per liter or container system ensures fairness and equity for the users than that of the monthly flat rate system.

According to the Socio-Economic Survey (JICA 2005), 60% of the sampled households responded that they would like to pay use fee at domestic water points. Accordingly, tariff collection at the domestic water points shall be introduced, employing attendants, in order to ensure both controlled water consumption and proper tariff collection.

### **9.2.4 CONSIDERATION ON THE POOR AND INTRODUCTION OF INCREASING BLOCK TARIFF**

The 2000/01 Household Budget Survey reported that 46 percent and 18 percent of population live below the basic need poverty line in Coast and Dar es Salaam Regions, respectively. Therefore, pro-poor tariff structure shall be introduced. The Study suggests introduction of two correlated measures; 1) Increasing block tariff structure and 2) Lifeline minimum tariff with social aid for the poor identified by the community.

Increasing block tariffs are to charge successive block of consumption at increasing volumetric rates per unit consumption. The lowest block of consumption is termed a "lifeline" block. Lifeline block tariff shall be set at base minimum level to ensure access to safe water for the poor, ideally at 50 percent of the estimated flat tariff (0.5 Tsh/liter/capita) up to 10 liter consumption per capita per day. It is also suggested that medium block is set at 1.0 Tsh. per liter up to 20 liter consumption per capita per day, while higher block shall be set at 1.5 Tsh. per liter for more than 20 liter consumption per capita per day. It is assumed that relatively better-off and business owner consume larger amount of water than the poor, paying for larger amount of water at higher block rate and acting as cross subsidy for the minimum consumption by the poor. Introduction of increasing block tariff structure to subsidize the poor is feasible and applicable for tariff setting, if proper collection mechanism is introduced in. Introduction of card system is an applicable alternative.

As for the affirmative countermeasure for the poorest of the poor, who are socially vulnerable such as disadvantaged and aged widows, mutual aid within the community shall be considered. The communities will define the poorest of the poor by developing their own indicators. Those poorest identified by the community will receive social aid for the provision of safe water in a community-determined manner.

## **9.3 CAPACITY DEVELOPMENT PLAN**

In the proposed institutional framework and contractual set-up in management of the water supply schemes, community and relevant organizations are required to build their capacity and skills. Particular focuses and concerns on capacity building are given in *Table 9.1*.

**Table 9.1 Capacity Building of Organization Focused in the Plan**

Organization	Capacity Building focused in the Plan
Communities	-Capacity to form and manage COWSOs, with preparation of regulation and by-laws in a participatory manner with stakeholders to define the functional roles of each organization, and legal registration -Capacity to manage contractual process and monitor the performance of Service Provider
District/Municipality	-Capability to form and manage District Water and Sanitation Team (DWST) -Competency to regulate contractual process between the communities and Service Providers
Service Providers	Ability to provide particular services contracted-out with community
COWSO	Capacity to manage, and operate and maintain the water supply scheme, where the Service Providers are unavailable or contracting-out is not feasible

The Capacity Building Plan shall be coherent with National Water Policy (2002), Draft National Water Sector Development Strategy (2004), and other national sector program. Moreover, the plan will be prepared utilizing participatory tools such as Participatory Rapid Appraisal (PRA) and Participatory Health and Sanitation Transformation (PHAST).

The following approaches shall be dully considered and applied during the later stages of implementation, and monitoring and evaluation of the actual project intervention plans.

### **(1) Advocacy and Consensus Building**

Consensus shall be made among stakeholders on newly introduced institutional framework and contractual set-up prior to their implementation. Advantages and disadvantages in each options shall be fully analyzed and understood.

### **(2) Enhanced Private Sector Participation and Contracting-Out**

In the introduction of proposed institutional framework for management, and operation and maintenance of the water supply scheme, contractual arrangements shall be made between Community-Owned Water Supply Organizations (COWSOs) and Service Providers. The service provider shall preferably be selected through open bidding and tender procedure. Necessary guidelines for contracting-out to the Service Providers including standard performance targets and setting of performance indicators on the quality and quantity in the service provision shall be developed.

### **(3) Capacity Building of District Water and Sanitation Team (DWST)**

One of the major roles of DWST is facilitation of capacity building to the communities. Several manuals on this aspect has been developed by MoWLD, which shall be utilized as field implementation manuals. Capacity building package for DWST would cover the following, 1) community mobilization and communication, 2) group dynamics, community leadership, and organizational management, 3) technical operation and maintenance, 4) tariff setting and collection, 5) accounting and financial management, 6) hygiene and sanitation education, and 7) community monitoring and evaluation.

### **(4) Capacity Building of Community-Owned Water Supply Organizations**

COWSOs will be bodies legally constituted by a community to own, manage, operate and maintain the water supply systems on behalf of community. COWSOs would require the following capacity building packages; 1) preparation of regulations/by-laws and registration, 2) group dynamics, communication, and leadership, 3) organizational management, 4) preventive maintenance, 5) tariff setting and collection, 6) financial aspects, 7) hygiene and sanitation education, 8) community monitoring and evaluation, 9) negotiation and interactive communication, 10) contract development and management, 11) performance target setting, and 12) performance indicator development and monitoring.

### **(5) Promotion of Personal Hygiene and Sanitation Practices**

It is an important component to enhance community awareness on health and sanitation along with the use of safe water. Community Owned Resource Persons (CORPs) will be selected in the community and provided with training in PHAST (Participatory Health and Sanitation Transformation) skills, who will provide hygiene and sanitation education for their community.

### **9.3.1 ACTIVITIES AND EXPECTED OUTPUT**

Facilitation and capacity building packages varies with the COWSOs' institutional and contractual arrangement. Therefore, proposed activities and expected output under Facilitation and Capacity Building Plan is described for COWSO with contractual arrangement, which is applicable for piped water supply scheme of Level-2. Facilitation and Capacity Building Packages are summarized in *Table 9.2*.

### **9.3.2 CONSIDERATION ON COMMUNITY CONTRIBUTION**

In the implementation of water supply and sanitation project in the country, it becomes rather common strategy that the community contribute five percent of the construction cost of the supply scheme in cash. It is believed that this practice increases the awareness of the community in ownership and participation. However, it can be said that capital cost sharing with community is not only the way to increase community participation and awareness in community ownership. There are several other approaches to increase sense of ownership through encouraging community contribution, which may applicable for Japan's Grant Aid Project, such as; 1) labour contribution in the construction stage, 2) contribution in procurement of construction material, and 3) accumulation of maintenance fund prior to the construction. Therefore, further consideration is necessary in the introduction of community contribution.

Among those options in community contribution, accumulation of maintenance fund prior to the construction should be best practice under Japanese Grant Aid Scheme both in modality and increasing sense of ownership/participation. Utilization of this maintenance fund is limited for future expansion and major rehabilitation of the scheme, not allowed for daily operation and maintenance. Accumulation of the fund is not prerequisite for the construction, but one for transition of legal ownership of the scheme to COWSOs. In this manner, the sense of ownership/participation is enhanced, coping with modality in Japan's Grant Aid Project.



Table 9.2 Facilitation and Capacity Building Package for Level-2 and Output

Activity	Output
<b>Stage 1: Pre-Planning</b>	
Preparation of Guideline for Contracting-Out	<ul style="list-style-type: none"> <li>– Guideline for contractual process, such as identification of Service Provider, bidding, bid evaluation, standard contract formats, are developed.</li> <li>– Standard performance targets and indicators are developed.</li> <li>– Regulation for Service Providers are developed with effective monitoring mechanism.</li> </ul>
Adoption of the Guideline for Contracting-Out in the Local Government Framework	<ul style="list-style-type: none"> <li>– Guideline for contracting-out is adopted by District/Municipal Council and Ministry of Water and Livestock Development.</li> </ul>
Preparation of Field Implementation Manual	<ul style="list-style-type: none"> <li>– Field Implementation Manual to be utilized by DWST in the implementation of activities under the Plan is developed.</li> </ul>
Formation of District Water and Sanitation Team (DWST)	<ul style="list-style-type: none"> <li>– DWST, which composes of District/Municipal Council staff involved in the development of the sector, is formed and integrated approaches are introduced.</li> </ul>
Provision of Training of Trainers (TOT) for DWST, and preparation of DWST Action Plan	<ul style="list-style-type: none"> <li>– Utilizing Field Implementation Manual, facilitation skills of DWST are improved, and DWST Action Plan for the implementation of Facilitation and Capacity Development Plan is prepared.</li> <li>– Utilizing the Guideline for Contracting-Out, capacity of DWST in managing contractual process is developed.</li> </ul>
Initial Advocacy Seminar with Stakeholders	<ul style="list-style-type: none"> <li>– Stakeholders fully understand concepts in National Water Policy (2002) and National Water Sector Development Strategy (2004).</li> <li>– Concensus is made among stakeholders in the introduction of proposed institutional and contractual arrangements for improvement of scheme management.</li> </ul>
<b>Stage 2: Participatory Planning</b>	
Community Consultative Meeting	<ul style="list-style-type: none"> <li>– Target communities understand project purpose, expected output, and activities and participation are enhanced.</li> <li>– In particular, user-pay-principle is understood.</li> </ul>
Participatory Community Assessment, and preparation of Community Action Plan (CAP)	<ul style="list-style-type: none"> <li>– Risks and problems in management, operation and maintenance of the improved water supply scheme are identified, and Community Action Plan (CAP), which identify community task and means of implementation, is developed in a participatory manner.</li> </ul>
Community Consultation on COWSO Management Option and Contractual Arrangement	<ul style="list-style-type: none"> <li>– Most suitable, effective and efficient COWSO management option to manage the improved supply scheme is identified and adopted.</li> <li>– Contractual arrangement is determined, identifying the part or all of operation and maintenance to be contracted-out.</li> </ul>
Development of COWSO Regulations and Registration	<ul style="list-style-type: none"> <li>– COWSO regulations are prepared and adopted.</li> <li>– COWSO is legally registered.</li> </ul>
<b>Stage 3: Construction/Implementation</b>	
Capacity Building of COWSO in Operation and Maintenance, and Hygiene and Sanitation Education	<ul style="list-style-type: none"> <li>– Capacity of COWSO in management, operation and maintenance is enhanced particularly in; 1) group dynamics, communication, and leadership, 2) organizational management, 3) preventive maintenance, 4) tariff setting and collection, 5) financial aspects and 6) community monitoring and evaluation.</li> <li>– CORPs (Community Resource Persons) are trained in PHAST (Participatory Health and Sanitation Transformation).</li> </ul>
Community Contracting-Out	<ul style="list-style-type: none"> <li>– Service Providers are identified.</li> <li>– Bidding is conducted, and Service Providers are selected.</li> <li>– Contract for operation and maintenance of the entire water supply scheme or selected part of the scheme is concluded among the Provider, COWSO, and the District/Municipal Council.</li> </ul>
<b>Stage 4: Operation and Maintenance</b>	
Performance Monitoring for Service Providers	<ul style="list-style-type: none"> <li>– Performance of Service Provider is monitored with indicators.</li> </ul>
Follow-up Training for COWSO	<ul style="list-style-type: none"> <li>– Through the actual operation and maintenance of improved water supply scheme, weakness in management and additional training needs are identified.</li> <li>– Additional training package is provided and management is strengthened.</li> </ul>
<b>Stage 5: Monitoring and Follow-up</b>	
Regular Follow-Up by DWST	<ul style="list-style-type: none"> <li>– Performance of Service Provider is monitored and sustained</li> <li>– COWSO management is monitored and sustained.</li> </ul>

## CHAPTER 10 EVALUATION OF PRIORITY PROJECT

### 10.1 GENERAL

The Priority Project is evaluated from the view points of (1) socio-economic, (2) financial, (3) institutional and organizational, (4) management and maintenance, (5) social and environmental aspects and (6) technical appropriateness

### 10.2 ECONOMICAL AND FINANCIAL EVALUATION

#### 10.2.1 ECONOMIC EVALUATION

Feasibility of the Priority Project is analyzed and evaluated from the aspects of economic cost and benefit. The cost-benefit analysis was applied for the evaluation of the project based on the calculation of economic cost and benefit converted into the monetary value.

##### (1) Precondition of the Evaluation

The economic cost and benefit were estimated based on comparison between the cases of “With Project “ and “Without Project”. The project life (evaluation period) is set at 22 years considering two years for the project implementation and 20 years of economic life span of the water supply facilities. 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 = Tsh1,050 and US\$1= JY112.47 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 are (1) Investment costs, (2) Replacement costs and (3) Operation, management and maintenance costs. Cost for acquisition of land is not included in the investment cost. Replacement cost for intake facility and water tank are not included in the economic cost. Taxes, interest and inflation rates are not considered.

##### (3) Economic Benefit

Factors listed below were considered as the economic benefit of the project.

###### 1) Time saving of water fetching from the existing water sources

Frequency of water fetching is 3.8 times/day in Coast Region and 3.3 times/day in Dar es Salaam. Average time spent by a household per day is estimated at 5.3 hours in Coast Region and 3.1 hours in Dar es Salaam, the per capita time of which is computed at 1.05 hours (Coast) and 0.5 hours (Dar es Salaam) considering average number of household members. The amount saved by this effect is calculated by applying the minimum rural wage in Tanzania which is equivalent to 30 USD/month. 40 percent of this minimum wage is applied to convert the time saved into monetary value.

###### 2) Cost saving for obtaining domestic water from alternative source

Amount of the cost to be saved for obtaining water from existing water source is estimated from present situation on financing for water by the households in the study area, except for users of existing piped water scheme. The household daily expenditure to obtain domestic water is Tsh104.35 on average in Coast Region and Tsh386.5 in Dar es Salaam. These costs that can be saved by the implementation of the project are considered as a part of the benefit of the project. Since percentage of households spending money to obtain domestic water in Dar es Salaam Region is higher than the one in Coast Region, per household and per capita amount of the benefit becomes higher in Dar es Salaam.

### 3) Increase in water quantity to be used by the users

The project will lead the increase in water supply while its costs will be reduced. This incremental benefit is estimated from the amount of Willingness to Pay (WTP) of the communities toward additional water for domestic use. Additional water demand is estimated at approximately 35 liter/household/day in Coast and 63 liter/household/day in Dar es Salaam.

### 4) Cost saving for medical expense due to improved health status

Mean monthly medical expenditure is about 3,000 Tsh/household in Coast and 7,300 Tsh / household in Dar es Salaam. It is assumed that approximately 40 percent thus medical cost will be saved by the project. This effect can be firmly realized when hygiene behaviour and sanitation of the residents are improved.

## (4) Results of the Economic Analysis

Results of the economic analysis is summarized in *Table 10.1*. NPV and B/C ratio indicate that the economic benefit will exceed the cost. EIRR is calculated at 13% in Coast and 16% in Dar es Salaam. The results indicate that the project is economically viable.

**Table 10.1 Summary of Results of the Economic Analysis**

Region	NPV	B/C Ratio	EIRR
Coast	722	1.07	13%
Dar es Salaam	2,123	1.27	16%

## (5) Conclusion

The expected economic benefit for each region is different due to their district socio-economic condition. The realized cost saving in Dar es Salaam Region is higher due to high volume of water use along with its higher cost which is three times that of Coast Region. Major benefit for Coast Region is realized due to time saved for fetching water. In addition to these project effects, other secondary benefit in social aspect is expected such as reduction of distance to the water points and opportunities for women to allocate saved time to other household chores, communal activities or other income generating activities.

### 10.2.2 FINANCIAL EVALUATION

Full cost recovery for operation and maintenance is very important to ensure sustained functioning of water supply scheme. Water tariff is set at 1 Tsh/litre, which is same as the amount of Willingness to Pay (WTP) examined in the Study. The 80 % of revenue collection would ensure the recovery of full operation, and maintenance cost over 10 years for the Priority Project including replacement cost. Amount of water tariff to be collected would largely exceed the cost necessary for management, operation and maintenance of the Priority Project. The profit-loss break-even point of revenue collection rate is 74 % for Coast Region and 51 % in average for Dar es Salaam Region. Accordingly, it is concluded that all the priority projects could gain surplus, thus financially viable.

### 10.3 INSTITUTIONAL AND ORGANIZATIONAL EVALUATION

Key issues concerned to the relevance, efficiency and sustainability of the Institutional Plan are (1) current and future institutional setup, (2) decentralized functional responsibilities of each stakeholders in the water supply service delivery, (3) transition of the role of MoWLD, (4) strategy to enhance COWSOs and (5) current approach to increase private sector participation and contracting-out in the service delivery. Among these issues, COWSO management options with contracting-out with Service Providers for part or all of management, operation and maintenance, is assessed as most suited to enhance competency and efficiency in the scheme management. Formation of COWSO and establishment of DWST (District Water and Sanitation Team) are all in line with the national strategies and aimed at assuring effectiveness, efficiency, and sustainability of the supply service. From

those points of views, the plan is assessed as feasible and efficient in institutional and organizational aspects.

#### **10.4 MANAGEMENT AND MAINTENANCE EVALUATION**

Proposed COWSO management option ensures its legal status. It can allow contracting-out with private agencies on management, operation and maintenance of the water supply schemes thereby enhancing scheme management. DWST ensures provision of technical guidance to COWSO, and monitoring and regulation to the Service Providers. In order to make these functions effective, capacity building plan was developed. Main packages are (1) advocacy and consensus building, (2) enhanced private sector participation and contracting-out, (3) capacity building of DWST, (4) capacity building of COWSO, and (5) promotion of personal hygiene and sanitation practices. Providing facilitation package for capacity development of COWSO and DWST will enhance effectiveness, while contracting-out would enhance competency and expertise in operation and maintenance of the water supply schemes.

#### **10.5 SOCIAL AND ENVIRONMENTAL EVALUATION**

The water supply plan has definite positive impacts when accompanied with appropriate consideration on mitigation measures. As the results of IEE, all the screened issues fall into Category C as per the JICA Guidelines. However it does not automatically mean that adverse impact will never occur in future *unless* continuous environmental and social monitoring is duly carried out in a long-term basis. For this reason, initiatives on monitoring the Priority Projects is very important. Accordingly, establishment of monitoring system by related institutions on environmental and social considerations in Tanzania is very important.

#### **10.6 TECHNICAL APPROPRIATENESS**

Construction works of the Priority Project 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, though some would be imported from abroad. Thus, techniques, machineries and materials necessary for the implementation of Priority Project are evaluated as technically appropriate.

## CHAPTER 11 CONCLUSION AND RECOMMENDATION

### 11.1 CONCLUSION

- (1) Water resources were evaluated and the “Water Resources Evaluation Maps” were constructed for future development.
- (2) Groundwater is considered as the main water source for the water supply schemes proposed in the Study. In case of surface water, only the Wami River was evaluated to have development potential.
- (3) The Water Supply Plan was formulated for 278 villages considering the availability of water sources and population of villages. The plan is composed of piped water supply scheme (Level-2), Hand pump scheme (Level-1: deep tube well), rehabilitation of existing water supply scheme, and extension of Chalinze Water Supply Scheme and DAWASA.
- (4) A total of 22 Level-2 schemes were planned in 22 villages. The service population is 78,352 in 2015. Areas evaluated as not suitable for piped water supply were excluded from the service area of Level-2. Such areas were planned to be supplied by Level-1 schemes.
- (5) Number of proposed Level-1 schemes (deep tube well) was 607 with a total service population of 145,850 in 2015.
- (6) The Revised Poverty Reduction Strategy of Tanzania sets out to raise the water supply service level from 53 % in 2003 to 65 % by the year 2009. If the proposed Water Supply Plan is implemented, it will improve the water supply rate up to 66.9 % in 2009 which meets the target of nation strategy.
- (7) Among the Water Supply Plan, 22 Level-2 schemes were selected as the Priority Project, which is supposed to be implemented with the Japan’s Grant Aid. The estimated cost is 16.5 million USD.
- (8) Allocation of budget by MoWLD for rural water supply sector is inadequate to implement the proposed Water Supply Plan, therefore, foreign assistance is necessary to call. Especially, implementation of Level-1 project except for Mkuranga needs foreign assistance in order to attain the target of the Revised Poverty Reduction Strategy.
- (9) As the most prospective management option, COWSO management option with contracting-out with Service Providers (i.e. private sector participation) for a part or all of management, operation and maintenance, was proposed in the Study.
- (10) Water tariff is set at 1 Tsh/liter, which is same as Willingness to Pay (WTP) surveyed in the Study area. Under this condition, the Priority Project was evaluated as economically feasible. NPV and B/C exceed the project cost. EIRR is 13 % in Coast Region and 16 % in Dar es Salaam.
- (11) Applying the tariff, 1 Tsh/liter, amount of water tariff to be collected exceeds the cost for management operation and maintenance of Level-2 scheme. More than 80 % of recovery rate would assure the recovery of full operation and maintenance cost over 10 years including replacement cost. Therefore, the Priority Project was evaluated as financially feasible.
- (12) As the results of the Initial Environmental Evaluation (IEE), all the Categories, including categories evacuated as “B” in the Preliminary Study, fall under Category “C”. Therefore, Environmental Impact Assessment (EIA) is not required for the implementation of the Priority Project. However, it is indispensable to continue the environmental and social monitoring in order to mitigate the occurrence of adverse impact.

## 11.2 RECOMMENDATION

### (1) Water Resources Development

Groundwater quality, especially salinity, frequently changes in the Neogene aquifers from place to place due to the frequent changes of lithology. In the selection of drilling site of deep tube well, detailed geophysical exploration should be carried out under the supervision of a Hydrogeologist.

In the hard rock area (Precambrian to Cretaceous aquifers), groundwater is occurred in the linear structures like fissures or faults. In order to detect these structures effectively, hydrogeological field reconnaissance and geophysical survey are indispensable.

It is desirous to drill test wells in the area where hydrogeological conditions are considered to be critical for groundwater development such as Kibaha, Kisarawe and Kinondoni Districts. As for Bagamoyo District, the deep wells suitable for Level-2 scheme were in Kibindu and new well was constructed in Kwanduma, therefore, drilling of test well is not required in Bagamoyo District.

### (2) Water Quality

Prior to the construction of water supply schemes, water quality of water sources (deep wells, the Wami River and Njopeka Spring) should be carefully analyzed for the following items: Microbial aspects and Chemicals that are of health significance (refer to *Table 3.7*).

Turbidity and Colour of water of the Wami River is high, therefore, sedimentation tank was planned in Matipwili for their reduction. Sedimentation velocity was obtained by applying the Stokes Law. Prior to the detailed design of sedimentation tank, effectiveness of the sedimentation tank should be experimentally confirmed by using the river water. Should turbidity and colour cannot be reduced to less than the value of the Tanzanian Standard by the treatment facility (sedimentation pond), further consideration on treatment method will be required.

### (3) Designing of Water Supply Facilities

Water supply facilities were designed based on the elevation data obtained by GPS in the field and distance measured on the map. Locations of storage tanks were also decided based on these data. Therefore, topographic survey should be carried out prior to the detailed design of those facilities.

### (4) Implementation of Project

Priority Projects composed of Level-2 water supply scheme were proposed in the Study. Though Level-1 project is not included in the Priority Projects, still Level-1 is an important component of Water Supply Plan formulated by the Study. In order to attain the target defined in the Revised Poverty Reduction Strategy, to raise the 53% of water supply level in 2003 to 65% up to 2009, the implementation of Level-1 project is indispensable.

Therefore, MoWLD is advised to allocate the necessary budget if necessary with foreign assistance to implement the Level-1 schemes.

- (5) Consideration on villages where some sub-villages were excluded from the service area of the Priority Projects

Some sub-villages were excluded from the service area of Priority Projects (Level-2) due to various reasons. Such sub-villages were still recommended to be provided with Level-1 schemes in the Water Supply Plan, though none of the Level-1 scheme implementation is not included in the Priority Project.

Implementation of Level-1 schemes is planned only in Mkuranga District from the year 2006 but no plan in other Districts and Municipality. These situations may cause a kind of conflict on the water supply situation in the villages, and between Districts/Municipalities. Considering these situations, it is desirable to implement the Level-1 schemes also in these villages as soon as possible in order to facilitate equality in the water supply service level in the villages and Districts/Municipalities.

In the implementation of Level-1 project, the highest priority is given to the villages where some sub-villages were excluded from the service area of Level-2 scheme. Priority for the other villages will be assigned based on the priority ranking presented in Table 6.4.

- (6) Water Right

Both surface water and groundwater are exploited at many places in the Study area. However, water right for these uses is not properly organized. This situation will cause improper management of water resources. The Ruvu River was evaluated no potential for further development. In Dar es Salaam city area, sea water intrusion is observed caused by overexploiting of groundwater. It is recommended that water right should be properly registered following the "Water Utilization (Control and Regulation) Act in Tanzania (1974)".

The implementation of the Priority Project needs the organization of water right. The water right should be properly organized prior to the commencement of the project, considering the water demand estimated in the Water Supply Plan.

- (7) Environmental and Social Consideration

All the categories to be evaluated in IEE fall in Category "C", which means EIA is not required. However, adverse impacts will not be automatically avoided without continuous environmental and social monitoring. Such monitoring should be properly planned and conducted.

- (8) Implementation Arrangements for Capacity Development Plan

For the introduction of Capacity Development Plan suggested in Chapter 9, various options in institutional and implementation arrangement are considered. Activities in Stage 1 of Pre-Planning up to Stage 3 of Construction/Implementation could be efficiently implemented by the scheme consolidated in the construction and supervision works, if external assistance is applied. This implementation arrangement would assure effective and timely execution of activities as far as communication and funding mechanism are concerned. There is also other option in implementation arrangement for execution of the said stages. In particular, activities requiring relatively dedicated expertise, such as preparation of guideline for private sector participation (i.e. contract-out) and its introduction, could be more effectively carried out by the technical cooperation hiring consultants apart from the construction and supervision scheme. In this implementation arrangement, coordination with the construction and supervision scheme shall be enhanced.

On the other hand, activities in Stage 4 of Operation and Maintenance and Stage 5 of Monitoring and Follow-up would be carried out by the local government, namely DWSTs, since their functional roles and responsibilities are provision of technical guidance and follow-up/monitoring for COWSOs and Service Providers.

(9) In-House Study and Training for Introduction of Improved COWSO Management Options

As explained in Chapter 8, there are various successful cases of COWSO (Community-Owned Water Supply Organization) management options in the country. Examples are Water User Group formed in each domestic water points in Sinyaga Region, Water User Association established in Hanan, Singida Rural, Igunga, and Manyoni Districts, and Water Company by Guarantee actively evolved in Morogoro Region. Although there are several studies on those successful institutional arrangements, those studies reflect only on a particular COWSO management option. Thus, MoWLD shall facilitate comparative and comprehensive study on those successful cases in COWSO management, reviewing advantages and disadvantages of each management option, and applicability and feasibility of those options in particular settings. The study results shall be widely disseminated in the country, followed with the provision of in-house training for the ministry and local government staff for effective introduction of those identified management options. The training shall include on-site investigation at the successful scheme and provision of lecture by management staff of the schemes.

(10) Utilization of local contractors in implementation of projects

Construction and drilling contractors in Tanzania are all registered with the Contractor Registration Board (CRB). Registration is made separating local and foreign contractors. They are ranked from Class 1 to Class 7 in descending order in each type of construction work.

Both construction contractors and drilling contractors ranked as Class 1 and 2 have adequate experience and capability to construct water supply facilities planned in the Study. It is desirable to employ such registered contractors in the construction of water supply facilities.