APPENDIX E

SANITATION

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Table 4.1 Debarwa Water Supply and Consumption Pattern

	Domestic water consumption private house connection		Commercial water consumption by private connection		Domestic water consumption by public connection
	M^3	No. of customers	m^3	No. of customers	m^3
09/96	23	3	113	4	164
10/96	15	3	45	4	92
11/96	22	3	150	4	66
12/96	-	-	-	-	-
Total	**60(9%)**		**308(44%)**		**322(47%)**
01/97	63	4	80	5	157
02/97	52	4	265	5	583
03/97	48	4	239	5	163
04/97	29	4	123	5	298
05/97	40	4	260	5	150
06/97	55	5	145	5	250
07/97	29	7	185	5	236
08/97	30	9	120	8	300
09/97	35	9	124	10	141
Total	**381(9%)**		**1541(37%)**		**2278(54%)**

Source: WSS of Debarwa

Table 4.2 Domestic Water Consumption by Source of Water Supply

Source of water supply	Household users %	Ave. volume of water consumption		Ave. expenditure for Water Nfa/m^3	Average income Nfa/mon
Municipality supply		m^3/hld/mon	l/c/d		
House connection	0	-	-	-	-
Yard connection	0	-	-	-	-
Communal Water point	41.7	1.33	8.56	9.75	583.3
Private well	2.8	-	-	-	2500
Public well	27.8	1.58	10.41	6.15	396
River/spring	27.8	1.12	7.38	-	465
Water tanker	27.8	2.37	15.61	24.88	930
Water vender	11.1	2.11	13.90	22.15	518
Rain water	80.6	1.78	11.72	-	726

Source: Socio-economic survey conducted by JICA Study Team Nov. 1997

Table 4.3 Distance of water points from households

Type of water point	Average distance from household			
Communal water point	< 99m 6.7%	100-199 m 46.7%	200-399 m 40%	>400 m 6.7%
Public well	<200 m 10%	200-499 m 10%	500-999 80%	
River/spring	200-499 m 10%	500-999 m 60%	>1000 m 30%	

Table 4.4 Toilet condition and related behaviors

Type of latrines used	Septic tank/cesspool 8.3%	Dry pit 2.8%	Community toilet 0%		Open field 88.9%	
Condition of septic tank/cesspool and pit latrine	Clean squatting hole 100%	Clean slab 100%	Well fitting lid 25%	Good ventilation 100%	No flies 100%	Not filled up 100%
Households satisfied with the existing latrines used	27.8%	Average distance of latrine from the nearest water source	38m			
Affordable preferences of unsatisfied households	Septic tank/cesspool 65.4%	Dry pit 11.5%	Community toilet 19.2%	Open field 0%		
Households favoring credit system for latrine construction	63.6%	Ave. of maximum repayment a household afford	28Nfa/mon			
Type of anal cleansing material used	Stone 30.6%	Water 8.3%	Paper 94.4%	Twig 0%	Leaves 0%	Nothing 0%

Source: Socio-economic survey conducted by JICA Study Team Nov. 1997

Table 4.5 Conditions of Waste disposal

Solid waste disposal	Open field 44.4%	Open pit 50%	Covered in pit 5.6%	Burn 0%	Municipality truck 0%
Waste water disposal	Open field 100%	Pit 0%	Gardening 0%	Drainage system 0%	
Animal waste disposal	Used as fuel 80%	Used as fertilizer 0%	Thrown in a pit 0%	Open field 20%	
Infant excreta disposal	Open field 26.7%	Popo and thrown to the field 66.7%	Popo and put in the toilet 6.7%		

Table 4.6 Debarwa Schools Present Water and Latrine Facilities

Name of school	Water supply facility		Latrine facility	
	Availability	Remark	Availability	Remark
Debarwa junior and secondary school.	Yes	Since the school is not willing to pay for the consumption, supply is disconnected.	Yes, but not functional	Due to operation and management difficulties the latrines are out of order.
Debarwa elementary school.	Yes	The facility owned by the Junior and secondary school was used.	Yes, but not functional	The latrine owned by the junior and secondary school was used.
Deki Eyesus Hiyaway Guasa kindergarten sch.	Yes	Independent private drilled well	Yes, flush latrine.	Well constructed, clean condition.

Table 4.7 Cases of Water and Poor Sanitation Related Diseases in Debarwa Health Center

Description of Disease	**1996**	**1997 up to 05/97**
Typhoid	-	-
Bascillary and Shigellosis	382	150
Amoebic dysentery	-	-
Fungal infection (skin disease)	203	99
Trachoma	36	29
Asthma	67	27
Total	**717 (20%)**	**305 (8%)**

Source: Debarwa Health center

Table 4.8 Conditions of Health

Water related disease cases in the last six months	Ave. number of cases	Ave. number of cases by type of diseases				
	1person/hld	Diarrhea 3 person 6 %	Dysentery 0 person 0 %	Malaria 6 person 12.2%	Warms 0 person 0 %	Scabies 0 person 0 %
Ave. medical cost	Diarrhea 5 Nfa/case	Dysentery 0 Nfa/case	Malaria 8.50 Nfa/case	Warms 0 Nfa/case	Scabies 0 Nfa/case	
Type of treatment	Self-administered traditional medicine 5.6%	Self-administered modern medicine 0%	Consult traditional healer 0%	Consult physician 94.4%		
Infants health condition	Households with infant 13.9%	Infants death in the last 10 years 1.20 persons/hld	Child immunization 100%			

Source: Socio-economic survey conducted by JICA Study Team Nov. 1997

Table 4.9 Hand Washing Behavior

	Hand washing method					
	With water and soap	With water & ash	with water & mud	With water only	with other material	Nothing
After defecation	59.7%	0%	0%	29.9%	0%	10.4%
Before cooking	16.4%	0%	0%	80.6%	0%	3%
Before eating	13.4%	0%	0%	85.1%	0%	1.5%
After disposal of children stool	54.8%	0%	0%	7.1%	0%	0%
After handling animal dung	9.5%	0%	0%	0%	0%	0%

Source: Socio-economic survey conducted by JICA Study Team Nov. 1997

Table 4.10 Food Handling

Placing utensil	on shelf 61.1%	on floor 2.8%	over the table 36.1%	Other 0%	
Storage of left over food	Covered 94.4%	Open to flies 2.8%	No leftover food 0%	Thrown away 2.8%	Other 0%
Washing raw food before eating	Washing vegetable 100%	Washing meat 0%	Washing fruit 23.5%		

Source: Socio-economic survey conducted by JICA Study Team Nov. 1997

Table 11. Households Perception of Health and Hygiene

ORS preparation knowledge 91.7%	Participation on health/hygiene education session 47.2%		Satisfaction on health/hygiene education session 88.2%	
Participation in community sanitation work	Areas of involvement			
94.4%	Cash contribution 16.7%	Material contribution 16.7%	Labor contribution 66.7%	Not willing 0%

Source: Socio-economic survey conducted by JICA Study Team Nov. 1997

APPENDIX F

COST ESTIMATION

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1. Water Supply

Table 1.1 Bill of Quantity

Item		Unit	Year		
Facility	Description		2005	2010	2015
Intake Facility	New borehole	sets			
	Existing borehole	sets			1
	Observation borehole	sets	1		1
	Dam	sets			
	(Sub-total)	sets	1	0	2
Well Pump Facility	Submersible pump		DEB-1, 0.288m3/min 73.3m, 1set	DEB-1, 0.522m3/min 82.8m, 1set	DEB-1, 0.258m3/min 79.9m, 1set
					BH-12, 0.138m3/min 75.7m, 1set
	(Sub-total)	sets	1	1	2
Transmission Pipeline	DCIP 200mm	m			
	ditto 150mm	m			
	ditto 125mm	m			
	ditto 100mm	m	690.0		
	ditto 80mm	m			690.0
	ditto 60mm	m			480.0
	(Sub-total)	m	690.0	0.0	1,170.0
Booster Pump Facility	Centrifugal pump				
	(Sub-total)	sets	0	0	0
Pump Pit	Made of RC				
	(Sub-total)	sets	0	0	0
Reservoir	Made of RC		140m3	120m3	180m3
	Made of F R P				
	Existing				
	(Sub-total)	sets	1	1	1
Distrbution Pipeline	P V C 300mm	m			
	ditto 250mm	m			
	ditto 200mm	m			
	ditto 150mm	m			
	ditto 125mm	m	365.0		
	ditto 100mm	m			2,242.0
	ditto 75mm	m	1,513.0	174.0	2,195.0
	ditto 50mm	m	18,780.0	14,878.0	18,911.0
	(Sub-total)	m	20,658.0	15,052.0	23,348.0
Control House		sets	1	0	1
Communal Water Point		sets	12	6	6
Individual Connection		sets	409	218	334
Tempolaty Road	Width 3.0m	m	700	0	500

Table 1.2 (1) Project Cost (2005)

(Nakfa)

Description		Unit	Quantity	Unit Cost		Cost		
Item	Dimension			Local C.	Foreign C.	Local C.	Foreign C.	Total
1. Construction Cost								
Intake facility	New well	set		13,229.04	273,277.16	0	0	
	Exsiting well	set		9,275.43	85,317.49	0	0	
	Observation well	set	1	0.00	0.00	0	0	
	(sub total)	set	1			0	0	0
Submersible pump	DEB-1, 0.288m3/min 73.3m	set	1	10,625.16	193,485.86	10,625	193,486	
	(sub total)		1			10,625	193,486	204,111
Transmission pipeline	D C I P 200mm	m		245.85	842.83	0	0	
	150mm	m		221.01	671.71	0	0	
	125mm	m		214.20	657.79	0	0	
	100mm	m	690	207.31	580.60	143,041	400,613	
	80mm	m		204.69	499.83	0	0	
	60mm	m		203.85	393.40	0	0	
	(sub total)	m	690			143,041	400,613	543,654
Booster pump		set				0	0	
	(sub total)		0			0	0	0
Pump pit	Rein forced Concrete					0	0	
	(sub total)		0			0	0	0
Reservoir	RC 140m3		1	341,399.66	188,160.33	341,400	188,160	
	F R P							
	(sub total)		1			341,400	188,160	529,560
Distribution pipeline	P V C 300mm	m		289.52	1,221.56	0	0	
	250mm	m		249.89	1,000.89	0	0	
	200mm	m		222.67	622.16	0	0	
	150mm	m		181.05	312.16	0	0	
	125mm	m	365	167.54	203.19	61,150	74,163	
	100mm	m		154.76	155.42	0	0	
	75mm	m	1,513	140.33	107.09	212,323	162,032	
	50mm	m	18,780	126.50	54.06	2,375,576	1,015,319	
	(sub total)	m	20,658			2,649,049	1,251,514	3,900,564
Control house	Type A	sets	0	137,822.18	9,992.65	0	0	
	Type B	sets	1	195,386.85	10,232.97	195,387	10,233	
	Type C	sets	0	196,861.35	10,530.98	0	0	
	Type D	sets	0	254,523.76	10,963.56	0	0	
	(sub total)	sets	1			195,387	10,233	205,620
Comunal water point		sets	12	18,019.46	6,866.40	216,234	82,397	298,630
Individual connection		set	409	0.00	0.00	0	0	0
Temporary Road	width3.0m	m	700	297.00	0.00	207,900	0	207,900
Sub-Total						3,763,636	2,126,403	5,890,039
2. Engineering Fee							589,004	589,004
3. Administration Cost						117,801		117,801
4. Physical Contingency						388,144	271,541	659,684
Total						4,269,580	2,986,948	7,256,528
5. Price Contingency						527,720	369,187	896,907
Grand Total						4,797,300	3,356,135	8,153,435

Table 1.2 (2) Project Cost (2010)

(Nakfa)

Description		Unit	Quantity	Unit Cost		Cost		
Item	Dimension			Local C.	Foreign C.	Local C.	Foreign C.	Total
1. Construction Cost								
Intake facility	New well	set		13,229.04	273,277.16	0	0	
	Exsiting well	set		9,275.43	85,317.49	0	0	
	Observation well	set		0.00	0.00			
	(sub total)	set	0			0	0	0
Submersible pump	DEB-1, 0.522m3/min 82.8m	set	1	10,726.92	190,008.46	10,727	190,008	
	(sub total)		1			10,727	190,008	200,735
Transmission pipeline	DCIP 200mm	m		245.85	842.83	0	0	
	150mm	m		221.01	671.71	0	0	
	125mm	m		214.20	657.79	0	0	
	100mm	m		207.31	580.60	0	0	
	80mm	m		204.69	499.83	0	0	
	60mm	m		203.85	393.40	0	0	
	(sub total)	m	0			0	0	0
Booster pump		set						
	(sub total)		0			0	0	0
Pump pit	Rein forced Concrete	sets						
	(sub total)		0			0	0	0
Reservoir	RC 120m3	sets	1	310,072.85	180,989.65	310,073	180,990	
	FRP	sets						
	(sub total)		1			310,073	180,990	491,062
Distribution pipeline	PVC 300mm	m		289.52	1,221.56	0	0	
	250mm	m		249.89	1,000.89	0	0	
	200mm	m		222.67	622.16	0	0	
	150mm	m		181.05	312.16	0	0	
	125mm	m	0	167.54	203.19	0	0	
	100mm	m	0	154.76	155.42	0	0	
	75mm	m	174	140.33	107.09	24,418	18,634	
	50mm	m	14,878	126.50	54.06	1,881,993	804,362	
	(sub total)	m	15,052			1,906,410	822,996	2,729,407
Control house	Type A	sets		137,822.18	9,992.65			
	Type B	sets		195,386.85	10,232.97			
	Type C	sets		196,861.35	10,530.98			
	Type D	sets		254,523.76	10,963.56			
	(sub total)	sets	0			0	0	0
Comunal water point		sets	6	18,019.46	6,866.40	108,117	41,198	149,315
Individual connection		set	218	0.00	0.00	0	0	0
Temporary Road	width3.0m	m		297.00	0.00	0	0	0
TOTAL						2,335,327	1,235,193	3,570,520
2. Engineering Fee							357,052	357,052
3. Administration Cost						71,410		71,410
4. Physical Contingency						240,674	159,224	399,898
Total						2,647,411	1,751,469	4,398,880
5. Price Contingency						1,107,992	733,023	1,841,015
Grand Total						3,755,403	2,484,493	6,239,896

Table 1.2 (3) Project Cost (2015)

(Nakfa)

Description		Unit	Quantity	Unit Cost		Cost		
Item	Dimension			Local C.	Foreign C.	Local C.	Foreign C.	Total
1. Construction Cost								
Intake facility	New well	set	1	13,229.04	273,277.16	13,229	273,277	
	Exsiting well	set	1	9,275.43	85,317.49	9,275	85,317	
	Observation well	set		0.00	0.00			
	(sub total)	set	2			22,504	358,595	
Submersible pump	DEB-1, 0.258m3/min 79.9m	set	1	10,625.18	184,623.16	10,625	184,623	
	BH-12, 0.138m3/min 75.7m	set	1	10,505.05	146,812.01	10,505	146,812	
	(sub total)		2			21,130	331,435	
Transmission pipeline	DCIP 200mm	m		245.85	842.83	0	0	
	150mm	m		221.01	671.71	0	0	
	125mm	m		214.20	657.79	0	0	
	100mm	m		207.31	580.60	0	0	
	80mm	m	690	204.69	499.83	141,234	344,884	
	60mm	m	480	203.85	393.40	97,848	188,830	
	(sub total)	m	1,170	1,296.90	3,646.16	239,082	533,715	
Booster pump		set						
	(sub total)		0			0	0	
Pump pit	Rein forced Concrete	sets						
	(sub total)		0			0	0	
Reservoir	RC 180m3	sets	1	406,427.65	202,988.87	406,428	202,989	
	FRP	sets						
	(sub total)		1			406,428	202,989	
Distribution pipeline	PVC 300mm	m		289.52	1,221.56	0	0	
	250mm	m		249.89	1,000.89	0	0	
	200mm	m		222.67	622.16	0	0	
	150mm	m		181.05	312.16	0	0	
	125mm	m		167.54	203.19	0	0	
	100mm	m	2,242	154.76	155.42	346,981	348,456	
	75mm	m	2,195	140.33	107.09	308,030	235,070	
	50mm	m	18,911	126.50	54.06	2,392,147	1,022,401	
	(sub total)	m	23,348			3,047,158	1,605,927	4,653,085
Control house	Type A	sets	1	137,822.18	9,992.65	137,822	9,993	
	Type B	sets		195,386.85	10,232.97			
	Type C	sets		196,861.35	10,530.98			
	Type D	sets		254,523.76	10,963.56	0	0	
	(sub total)	sets	1			137,822	9,993	147,815
Comunal water point		set	6	18,019.46	6,866.40	108,117	41,198	149,315
Individual connection		set	334	0.00	0.00	0	0	0
Temporary Road	width3.0m	m	500	297.00	0.00	148,500	0	148,500
TOTAL						4,130,741	3,083,852	7,214,593
2. Engineering Fee							721,459	721,459
3. Administration Cost						144,292		144,292
4. Physical Contingency						427,503	380,531	808,034
Total						4,702,536	4,185,842	8,888,378
5. Price Contingency						4,224,281	3,760,136	7,984,417
Grand Total						8,926,818	7,945,978	16,872,795

Table 1.3 O&M Cost

(Nakfa)

Description	2005	2010	2015
1. Personnel cost	177,915	303,951	503,375
2. Electricity & fuel cost	55,188	136,130	218,544
3. Chemical coat	6,965	12,778	22,335
4. Repairing cost	33,518	54,260	95,879
5. Miscellaneous cost	27,359	50,712	84,013
Total	300,944	557,831	924,146

2. Sanitation

Table 2.1 Bill of Quantity for School and Public Latrine

SUMMARY

A. SUPERSTRUCTURE		
	1 EXCAVATION AND EARTHWORK	6905,00
B. SUPERSTRUCTURE		
	1 BRICKWORKS	7060,00
	2 CARPENTARY AND JOINERY	6140,00
	3 METAL WORKS	5200,00
	4 PLASTERING	2038,00
	5 PAINTING	1660,00
	6 SANITARY INSTALLATION	14998,00
	7 SEPTIC TANK	30724,56
	TOTAL	**74 725,56**

Table 2.1 (1) Bill of Quantity for School and Public Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
	A. SUBSTRUCTURE				
	1. EXCAVATION & EARTHWORKS				
1.1	Clear off site to remove top soil to an average depth of 20cm.	m2	50	4	200
1,2	Excavate for trench foundation in ordinary soil to a a depth not exceeding 75cm from the stripped ground level.	m3	39	25	975
1,3	Return fill around foundation with good, dry excavated material from site and well ram in layers every 25cm interval.	m3	26	22	572
1,4	Cartaway surplus excavated material to a distance not exceeding 5km from the compound.	m3	13	25	325
1,5	25cm thick basaltic or equivalent stone hardcore and blinded with crushed stone.	m2	179	27	4833
					-
					6905,00
	TOTAL CARRIED TO SUMMARY	.			=
	B. SUPERSTRUCTURE				
	2. BRICK WORKS				
2,1	20cm thick hollow concrete wall bedded on compo-mortar 1:2:9 mix both sides left for plastering.	m2	47	110	5170
2,2	Ditto, but 10cm thick brick wall	m2	27	70	1890
					-
					7060,00
	TOTAL CARRIED TO SUMMARY	.	.	.	=
	3. CARPENTARY AND JOINERY				
3,1	Eucalyptus post for roofing,as shown on the section of section the drawing.	m	34	25	850
3,2	5x3cm zigba wood perlin,on which the C.I.S.is going to be fixed.	m	59	30	1770
3,3	Supply and fix 0.3mm thick C.I.S roffing, to be fixed to the perlin price including lap; roof ridges and washers	m2	44	80	3520
					-
					6140,00
	TOTAL CARRIED TO SUMMARY	.	.	.	=

Table 2.1 (2) Bill of Quantity for School and Public Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
	4. METAL WORKS				
4,1	Metal doors and windows constructed in accordance to detail drawing, including one coat of anti-rust and three coats of oil paint:-				
	Doors				
	a) Type D1 size: 60 x 170	No	10	400	4000
	b) Type D2 size: 100 x 200	No	2	600	1200
					-
					5200,00
	5. PLASTERING				
5,1	Apply three coats of plaster in compo-mortar (1:2:9) mix up to fine finish to all internal walls of the latrine units.	m2	61	28	1708
5,2	Ditto but to external wall of the front faces.	m2	11	30	330
					-
					2038,00
	6. PAINTING				
6,1	Apply in three coats of oil paint to internal plastered wall surfaces of the latrine units.	m2	61	20	1220
6,2	Ditto but plastic emulusion paint to external wall surfaces.	m2	11	40	440
					-
					1660,00
	TOTAL CARRIED TO SUMMARY	.		.	=
	7. SANITARY INSTALLATION				
7,1	Supply and install Galvanized steel water supply pipes for cold water distribution from supply line, elevated tanker to all sanitary fixtures according to where shown on the drawings. Complete with the necessary connecting pieces such as bends, unions, nipples, tee, elbow, etc. shall include all the naccessry assistance to the installation works, such as chiselling of walls, slabs, floors, etc. and closing them with concrete to normal condition where required. The installation shall be tested at a pressure of 1bar at the expense of the contractor.				
	Dia. ND 15mm (1/2")	ml	13	25	325
	Dia. ND 20mm (3/4")	ml	21	28	588

Table 2.1 (3) Bill of Quantity for School and Public Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
7,2	Supply and install, on water supply lines, gate valves, made of bronze or brass parts complete with rubber gaskets, hand weels unions and other accessories.				
	Dia. ND 15mm	pcs	18	25	450
	Dia. ND 20mm	pcs	2	30	
7,3	Supply and install soil waste and vent pipes in horizontal branches and vertical stacks made of UPVC pipes and fittings. Fittings should include bends, branches, tees, clearout reducers, etc. Unit price shall include all the necessary assistance work to the installation, such as chiselling of walls, slabs, floors, etc. and closing them with concrete. All pipes entering manhole shall be trapped.				
	Dia. ND 50mm	ml	17	55	935
	Dia. ND 100mm	ml	26	95	2470
7,4	Supply and fix on terminals of ventilation pipes, vent caps (cowls), with weathering PP states, sealing gaps b/n the girth of the vent pipe and hole in the roof material.				
	Dia. ND 100mm	pcs	2	65	130
7,5	Supply and fix white vitreous Turkish type W.C. unit with trap and complete with fixing device.	pcs	10	700	7000
7,6	Construct sanitary manholes on domestic sewer lines in 200mm HCB wall plastered from the inside with cement mortar (1:3) on a base of mass concrete slab 100mm thick with proper slope for smooth flow, with reinforced concrete cover.				
	600 x 600mm	pcs	2	800	1600
7,8	Supply and install fiber-glass elevated tank of capacity 1 with vent pipe 25mm,drain pipe and gate valve of diam. 50mm and manhole 60x60cm. cover shall be provided.	pcs	1	1500	1500
					14998,00
	8. SEPTIC TANK				
	Excavation & earthworks				
8,1	Clear off site to remove top soil to an average depth of 20cm.	m2	16	4	64
8,2	Bulk excavation for under ground reservoir excavated in ordinary soil to a depth not exceeding 150cm from the stripped ground level.	m3	109	20	2180
8,3	Return fill around reservoir with good, dry excavated material from site and well ram in layers every 30cm interval.	m3	78	22	1716

Table 2.1 (4) Bill of Quantity for School and Public Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
8,5	Cartaway surplus excavated material to a distance not exceeding 5km from the compound.	m3	31	25	775
8,6	25 cm thick basaltic or equivalent stone hardcore and blinded with crushed stone.	m2	36	27	972
	Concrete works				
	Reinforced concrete in c-25,360kg cement/m3 filled in to formworks and vibrated around rod reinforcem. steel reinforcement and formworks measured separately.				
8,7	In floor slab	m3	4	65	260
8,8	In roof slab	m3	5	100	500
	Steel works				
	Steel reinforcements according to drawing. Price includes cutting ,bending ,placing in position and tying wires.				
8,9	a) Dia.8mm deformed bar	Kg	71	7	511
8,10	b) Dia.12mm deformed bar	Kg	111	7	801
	Formworks				
	Provide cut and fix in position sawn zigba form works :				
8,11	a) Roof slab	m2	25	65	1625
	Walls				
8,12	50 cm thick in trachetic or equivalent stone wall bedded in cement mortar 1:3.	m3	55	290	15950
	Finishing				
8,13	Apply three coats of plastic in cement-mortar (1:3) mix up to	m2	110	37	4070
8,14	Provide and install steel manhole cover of 10mm thick and (60x60)cm size.	pcs	2	500	1000
8,15	Provide and install inlet and outlet pipes with all necessary fittings.	Ls	1	300	300
	TOTAL CARRIED TO SUMMARY				**30724,56** =

Table 2.2 Bill of Quantity for Household Flush Latrine

SUMMARY

A. SUPERSTRUCTURE	
1 EXCAVATION AND EARTHWORK	551,60
B. SUPERSTRUCTURE	
1 BRICKWORKS	690,20
2 CARPENTARY AND JOINERY	440,00
3 METAL WORKS	400,00
4 PLASTERING	276,08
5 PAINTING	197,20
6 SANITARY INSTALLATION	1975,00
7 SEPTIC TANK	5764,28
TOTAL	**10 294,36**

Table 2.2 (1) Bill of Quantity for Household Flush Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
	A. SUBSTRUCTURE				
	1. EXCAVATION & EARTHWORKS				
1.1	Clear off site to remove top soil to an average depth of 20cm.	m2	9,60	4	38
1,2	Excavate for trench foundation in ordinary soil to a a depth not exceeding 75cm from the stripped ground level.	m3	9,60	25	240
1,3	Return fill around foundation with good, dry excavated material from site and well ram in layers every 25cm interval.	m3	6,40	22	141
1,4	Cartaway surplus excavated material to a distance not exceeding 5km from the compound.	m3	4,00	25	100
1,5	25cm thick basaltic or equivalent stone hardcore and blinded with crushed stone.	m2	1,20	27	32
					551,60
	TOTAL CARRIED TO SUMMARY	.			========
	B. SUPERSTRUCTURE				
	2. BRICK WORKS				
2,1	10cm thick hollow concrete wall bedded on compo-mortar 1:2:9 mix both sides left for plastering.	m2	9,86	70	690
					690,20
	TOTAL CARRIED TO SUMMARY	.	.....	.....	========
	3. CARPENTARY AND JOINERY				
3,1	Eucalyptus post for roofing,as shown on the section of the drawing.	m	8,00	25	200
3,2	5x3cm zigba wood perlin,on which the C.I.S.is going to be fixed.	m	8,00	30	240
3,3	Supply and fix 0.3mm thick C.I.S roffing, to be fixed to the perlin price including laps, roof ridges and washers.	m2	1,80	80	144
					440,00
	TOTAL CARRIED TO SUMMARY	.	.....	.....	========

Table 2.2 (2) Bill of Quantity for Household Flush Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
	4. METAL WORKS				
4,1	Metal doors and windows constructed in accordance to detail drawing, including one coat of anti-rust and three coats of oil paint:-				
	Doors				
	a) Type D1 size: 60 x 170	No	1,00	400	400
					400,00
	5. PLASTERING				
5,1	Apply three coats of plaster in compo-mortar (1:2:9) mix up to fine finish to all internal walls of the latrine units.	m2	9,86	28	276
					276,08
	6. PAINTING				
6,1	Apply in three coats of oil paint to internal plastered wall surfaces of the latrine units.	m2	9,86	20	197
					197,20
	TOTAL CARRIED TO SUMMARY				
	7. SANITARY INSTALLATION				
7,1	Supply and install Galvanized steel water supply pipes for cold water distribution from supply line, elevated tanker to all sanitary fixtures according to where shown on the drawings. Complete with the necessary connecting pieces such as bends, unions, nipples, tee, elbow, etc. shall include all the naccessry assistance to the installation works, such as chiselling of walls, slabs, floors, etc. and closing them with concrete to normal condition where required. The installation shall be tested at a pressure of 1bar at the expense of the contractor.				
	Dia. ND 15mm (1/2")	ml	4,00	25	100
7,2	Supply and install, on water supply lines, gate valves, made of bronze or brass parts complete with rubber gaskets, hand weels unions and other accessories.				
	Dia. ND 15mm	pcs	1,00	25	25

Table 2.2 (3) Bill of Quantity for Household Flush Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
7,3	Supply and install soil waste and vent pipes in horizontal branches and vertical stacks made of UPVC pipes and fittings. Fittings should include bends, branches, tees, clearout reducers, etc. Unit price shall include all the necessary assistance work to the installation, such as chiselling of walls, slabs, floors, etc. and closing them with concrete. All pipes entering manhole shall be trapped.				
	Dia. ND 100mm	ml	3,00	95	285
7,4	Supply and fix on terminals of ventilation pipes, vent caps (cowls), with weathering PP states, sealing gaps b/n the girth of the vent pipe and hole in the roof material.				
	Dia. ND 100mm	pcs	1,00	65	65
7,5	Supply and fix white vitreous Turkish type W.C. unit with trap and complete with fixing device.	pcs	1,00	700	700
7,6	Construct sanitary manholes on domestic sewer lines in 200mm HCB wall plastered from the inside with cement mortar (1:3) on a base of mass concrete slab 100mm thick with proper slope for smooth flow, with reinforced concrete cover.				
	600 x 600mm	pcs	1,00	800	800
					1975,00
	8. SEPTIC TANK				
	Excavation & earthworks				
8,1	Clear off site to remove top soil to an average depth of 20cm.	m2	5,33	4	21
8,2	Bulk excavation for under ground reservoir excavated in ordinary soil to a depth not exceeding 150cm from the stripped ground level.	m3	36,33	20	727
8,3	Return fill around reservoir with good, dry excavated material from site and well ram in layers every 30cm interval.	m3	26,00	22	572
8,5	Cartaway surplus excavated material to a distance not exceeding 5km from the compound.	m3	10,30	25	258
8,6	25 cm thick basaltic or equivalent stone hardcore and blinded with crushed stone.	m2	12,00	27	324

Table 2.2 (4) Bill of Quantity for Household Flush Latrine

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
	Concrete works				
	Reinforced concrete in c-25,360kg cement/m3 filled in to formworks and vibrated around rod reinforcem. steel reinforcement and formworks measured separately.				
8,7	In floor slab	m3	1,30	65	85
8,8	In roof slab	m3	1,70	100	170
	Steel works				
	Steel reinforcements according to drawing. Price includes cutting ,bending ,placing in position and tying wires.				
8,9	a) Dia.8mm deformed bar	Kg	23,70	7	171
8,10	b) Dia.12mm deformed bar	Kg	37,10	7	267
	Formworks				
	Provide cut and fix in position sawn zigba form works :				
8,11	a) Roof slab	m2	2,70	65	176
	Walls				
8,12	50 cm thick in trachetic or equivalent stone wall bedded in cement mortar 1:3.	m3	6,00	290	1740
	Finishing				
8,13	Apply three coats of plastic in cement-mortar (1:3) mix up to	m2	12,30	37	455
8,14	Provide and install steel manhole cover of 10mm thick and (60x60)cm size.	pcs	1,00	500	500
8,15	Provide and install inlet and outlet pipes with all necessary fittings.	Ls	1,00	300	300
					5764,28
	TOTAL CARRIED TO SUMMARY		.....	.....	========

Table 2.3 Bill of Quantity for Double PIT VIP Latrine

Material expenses for double pit VIP

Item No.	Description	Unit	Quantity	Unit rate Nfa	Total moun Nfa
1	Hollow block (20x20x10)	pcs	210	1,5	315
2	Stone	m3	7	20	140
3	Cement	quintel	4	70	280
4	Sand	m3	3,5	40	140
5	Reinforcement bar dia. 10mm	kg	31	6	186
6	Galvanized sheet metal vent pipe w	pcs	2	25	50
7	Door made with GSM complete with wire mesh and lock	pcs	1	110	110
8	Corrigated iron sheet roof	pcs	1	100	100
9	Wooden post for roof support	pcs	1	70	70
				Total	1391

Labour expenses for double pit VIP

Item No.	Description	Unit rate Nfa	Total mount Nfa
1	Pit cover slab	ls	60
2	Door	ls	40
3	Masonry work	ls	100
4	Digging pit-8m3	10/m3	80
	Total labour expense		280

Total labour and material cost of Double pit VIP latrine = **Nfa 1671/-**

Table 2.4 Cost Estimation of Latrine

Item No.	Description	Qty	1998 price Nfa	Total price Nfa	Inflated price Nfa	Total price Nfa
1	School Latrine – PFL					
	- Year 2000 – 2005	2	74,725.56	149,451.12	83,961.64	167,923
	- Year 2005 – 2010	1	74,725.56	74,725.56	112,359.61	112,360
	- Year 2010 – 2015	1	74,725.56	74,725.56	150,362.51	150,363
2	Public latrine – CFL					
	- Year 2000 – 2005	3	74,725.56	224,176.68	83,961.64	251,885
	- Year 2005 – 2010	1	74,725.56	74,725.56	112,359.61	112,360
	- Year 2010 – 2015	1	74,725.56	74,725.56	150,362.51	150,363
3	Household latrine					
	- CFL – Year 2005	323	10,500.00	3,391,500	11,728.65	3,788,354
	- CFL – Year 2010	172	10,500.00	1,806,000	15,695.58	2,699,640
	- CFL – Year 2015	263	10,500.00	2,761,500	21,004.23	5,524,113
	- PFL – Year 2005	292	10,438.46	3,048,030	11,797.80	3,444,958
	- PFL – Year 2010	208	10,438.46	2,171,200	15,788.12	3,283,929
	- PFL – Year 2015	244	10,438.46	2,546,984	21,128.06	5,155,247
	- VIP – Year 2005	463	1,671.00	773,210	1,877.54	869,301
	- VIP – Year 2010	412	1,671.00	688,452	2,512.57	1,035,179
	- VIP – Year 2015	530	1,671.00	885,630	3,362.38	1,782,061

Table 2.5 Cost Estimation of Public Facility

Item No.	Description	Qty	1998 price Nfa	Total price Nfa	Inflated price Nfa	Total price Nfa
1	Refuse truck (compactor)					
	- Year 2000-2005	1	1,027,586	1,027,586	1,134,596	1,134,596
	- Year 2005-2010	1	1,027,586	1,027,586	1,545,109	1,545,109
	- Year 2010-2015	2	1,027,586	2,055,172	2,067705	4,135,410
2	Vacuum truck (3,000 lit.)					
	- Year 2000-2005	-	924,828	-	1,039,137	-
	- Year 2005-2010	1	924,828	924,828	1,390,599	1,390,599
	- Year 2010-2015	1	924,828	924,828	1,860,936	1,860,936
3	Refuse collecting bins					
	- Year 2000-2005	100	500	50,000	562	56,200
	- Year 2005-2010	100	500	50,000	752	56,200
	- Year 2010-2015	100	500	50,000	1006	56,200
4	Refuse collecting container ($8m^3$)					-
	- Year 2000-2005	-	59,086	-	66,392	2,221,200
	- Year 2005-2010	25	59,086	1,477,150	88,848	2,221,200
	- Year 2010-2015	25	59,086	1,477,150	118,899	

APPENDIX G

FINANCIAL PLAN

LIST OF TABLES

Page

Table 1 Personnel Plan for WSA Debarwa

Item	1997	2005	2010	2015
1. Total No. of Personnel				
1) Total production of water (cu. m/day)	28	342	629	1,098
2) Water production per worker (cu. m/day/worker)	2.8	20	25	30
3) Coefficient	1	1	1	1
4) No. of personnel	10	17	25	36
5) Additional personnel for sanitation	0	2	3	4
6) Final No. of personnel	10	19	28	40
2. Breakdown of Personnel by Position/Function				
1) Manager	1	1	1	1
2) Customer services	0	0	0	1
3) Internal audit	0	0	0	1
4) Administrative service				
(1) Head	1	1	1	1
(2) General administration section				
Secretaries/typists/clerks	1	1	1	1
Guards	1	2	3	4
Sweepers/janitors	0	0	0	0
Drivers	0	0	1	1
Sub-total	2	3	5	6
(3) Personnel section				
Recruitment/training/remuneration	0	0	0	0
(4) Storage section				
Store keepers	0	0	1	1
Purchase of materials/supplies	0	0	0	0
Sub-total	0	0	1	1
(5) Legal section	0	0	1	1
Total	3	4	8	9
5) Financial service				
(1) Head	1	1	1	1
(2) Budgeting section	0	0	0	1
(3) Accounting section				
Accountants	0	1	1	2
Cashiers/treasurers	1	1	1	1
Sub-total	1	2	2	3
(4) Financial management section				
Financial analysts	0	0	1	1
(5) Operation section				
Meter readers	0	0	1	1
Bill distributers/collectors	0	0	0	1
Water sellers	2	3(+9*)	3(+15*)	3(+21*)
Sub-total	2	0	1	2
Total	4	3	5	8
6) Technical service				
(1) Head	0	1	1	1
(2) Technical records section	1	1	1	1
(3) Operation and maintenance section				
Mechanics	0	1	1	1
Electricians	0	0	1	1
Motor operators	1	1	1	3
Plumbers	0	2	3	5
Sub-total	1	4	6	10
(4) Inspection section				
Water meter technicians	0	0	0	0
Leakage detectors	0	0	0	0
Water quality analysts	0	0	0	0
Sub-total	0	0	0	0
(5) Workshop	0	0	0	0
(6) Works section				
Contracting	0	0	0	1
Designing/drafting	0	0	0	0
Sub-total	0	0	0	1
Total	2	6	8	13
7) Sanitary service				
(1) Head	0	1	1	1
(2) Loan service section	0	1	1	1
(3) Maintenance section				
Technicians	0	0	1	1
Drivers	0	0	0	1
Sub-total	0	0	1	2
Total	0	2	3	4
Grand total	10	16	25	37

Note: 1) Personnel in 1997 include those on temporary/contract basis. 2) *=temporary
3) As need arises, section (3) in 6) technical service may take charge of functions of sections (4) and (5).

Table 2 (1) Financial Statements for Water Supply Facilities in Debarwa

(Unit: Nfa thousand)

No.	1	2	3	4	5	6	7	8	9	10
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Income Statement										
Revenue	0	0	436	474	517	563	614	785	836	893
Operation and Maintenance	0	0	301	301	301	301	558	558	558	558
Depreciation	0	0	157	157	157	157	256	256	256	256
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	0	0	458	458	458	458	814	814	814	814
Profit before Tax	0	0	-22	16	58	105	-200	-29	22	79
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	0	0	-22	16	58	105	-200	-29	22	79
Funds Statement										
Profit after Tax	0	0	-22	16	58	105	-200	-29	22	79
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	648	6609	0	0	393	4006	0	0	0	794
Depreciation	0	0	157	157	157	157	256	256	256	256
Sources	648	6609	135	173	608	4267	57	227	279	1129
Capital Works	648	6609	0	0	393	4006	0	0	0	794
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	135	173	215	262	57	227	279	335
Applications	648	6609	135	173	608	4267	57	227	279	1129
Balance Sheet										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	648	7256	7234	7250	7702	11812	11612	11583	11605	12478
Liabilities and Capital	648	7256	7234	7250	7702	11812	11612	11583	11605	12478
Current Assets	0	0	135	308	523	785	841	1069	1347	1683
Fixed Assets	648	7256	7100	6943	7179	11027	10771	10515	10258	10795
Assets	648	7256	7234	7250	7702	11812	11612	11583	11605	12478

Source: JICA

Table 2 (2) Financial Statements for Water Supply Facilities in Debarwa

(Unit: Nfa thousand)

No.	11	12	13	14	15	16	17	18	19	20
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Income Statement										
Revenue	955	1023	1154	1299	1469	1671	1912	1886	1886	1886
Operation and Maintenance	558	924	924	924	924	924	924	924	924	924
Depreciation	256	454	454	454	454	454	454	454	454	454
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	814	1379	1379	1379	1379	1379	1379	1379	1379	1379
Profit before Tax	141	-356	-225	-80	91	293	533	507	507	507
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	141	-356	-225	-80	91	293	533	507	507	507
Funds Statement										
Profit after Tax	141	-356	-225	-80	91	293	533	507	507	507
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	8095	0	0	0	0	0	0	0	0	0
Depreciation	256	454	454	454	454	454	454	454	454	454
Sources	8492	98	230	375	545	747	987	961	961	961
Capital Works	8095	0	0	0	0	0	251	0	0	0
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	397	98	230	375	545	747	736	961	961	961
Applications	8492	98	230	375	545	747	987	961	961	961
Balance Sheet										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	20714	20358	20133	20053	20144	20437	20970	21477	21984	22490
Liabilities and Capital	20714	20358	20133	20053	20144	20437	20970	21477	21984	22490
Current Assets	2080	2178	2408	2782	3327	4074	4810	5772	6733	7694
Fixed Assets	18634	18180	17725	17271	16817	16362	16159	15705	15250	14796
Assets	20714	20358	20133	20054	20144	20437	20970	21477	21984	22490

Source: JICA

Table 2 (3) Financial Statements for Water Supply Facilities in Debarwa

(Unit: Nfa thousand)

No.	21	22	23	24	25	26	27	28	29	30
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Income Statement										
Revenue	1886	1886	1886	1886	1886	1886	1886	1886	1886	1886
Operation and Maintenance	924	924	924	924	924	924	924	924	924	924
Depreciation	454	454	454	454	454	454	454	454	454	454
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	1379	1379	1379	1379	1379	1379	1379	1379	1379	1379
Profit before Tax	507	507	507	507	507	507	507	507	507	507
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	507	507	507	507	507	507	507	507	507	507
Funds Statement										
Profit after Tax	507	507	507	507	507	507	507	507	507	507
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	0	0	0	0	0	0	0	0	0	0
Depreciation	454	454	454	454	454	454	454	454	454	454
Sources	961	961	961	961	961	961	961	961	961	961
Capital Works	248	0	0	0	0	434	0	0	0	0
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	714	961	961	961	961	528	961	961	961	961
Applications	961	961	961	961	961	961	961	961	961	961
Balance Sheet										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	22997	23504	24011	24518	25025	25532	26039	26546	27053	27560
Liabilities and Capital	22997	23504	24011	24518	25025	25532	26039	26546	27053	27560
Current Assets	8408	9369	10331	11292	12253	12781	13742	14704	15665	16626
Fixed Assets	14589	14135	13680	13226	12772	12751	12297	11842	11388	10933
Assets	22997	23504	24011	24518	25025	25532	26039	26546	27053	27560

Source: JICA

Table 3 Cost Benefit Streams, Debarwa (Economic Analysis)

CC=Capital Costs; OM=O/M Costs; CS=Costs; BF=Benefits
CF=Cash Flow (=BF - CS)

(Unit: Nfa thousand)

NO.	YEAR	CC	OM	CS	BF	CF
1	1999	606	-25	581	0	-581
2	2000	6174	-25	6149	0	-6149
3	2001	0	276	276	466	190
4	2002	0	276	276	670	394
5	2003	367	276	643	927	284
6	2004	3736	276	4013	1251	-2762
7	2005	0	533	533	1657	1125
8	2006	0	533	533	1834	1301
9	2007	0	533	533	2027	1495
10	2008	748	533	1281	2240	959
11	2009	7617	533	8149	2474	-5675
12	2010	0	899	899	3026	2127
13	2011	0	899	899	3432	2533
14	2012	0	899	899	3887	2987
15	2013	0	899	899	4397	3497
16	2014	0	899	899	4969	4069
17	2015	250	899	1149	6598	5450
18	2016	0	899	899	6598	5699
19	2017	0	899	899	6598	5699
20	2018	0	899	899	6598	5699
21	2019	246	899	1145	6598	5453
22	2020	0	899	899	6598	5699
23	2021	0	899	899	6598	5699
24	2022	0	899	899	6598	5699
25	2023	0	899	899	6598	5699
26	2024	430	899	1330	6598	5269
27	2025	0	899	899	6598	5699
28	2026	0	899	899	6598	5699
29	2027	0	899	899	6598	5699
30	2028	0	899	899	6598	5699
31	2029	0	899	899	6598	5699
32	2030	250	899	1149	6598	5450

Table 4 (1) Financial Statements for Water Supply Facilities in Debarwa

(Unit: Nfa thousand)

No.	1	2	3	4	5	6	7	8	9	10
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Income Statement										
Revenue	0	0	436	474	517	563	614	582	582	582
Operation and Maintenance	0	0	301	301	301	301	301	301	301	301
Depreciation	0	0	157	157	157	157	157	157	157	157
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	0	0	458	458	458	458	458	458	458	458
Profit before Tax	0	0	-22	16	58	105	156	124	124	124
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	0	0	-22	16	58	105	156	124	124	124
Funds Statement										
Profit after Tax	0	0	-22	16	58	105	156	124	124	124
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	648	6609	0	0	0	0	0	0	0	0
Depreciation	0	0	157	157	157	157	157	157	157	157
Sources	648	6609	135	173	215	262	313	281	281	281
Capital Works	648	6609	0	0	0	0	0	0	0	0
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	135	173	215	262	313	281	281	281
Applications	648	6609	135	173	215	262	313	281	281	281
Balance Sheet										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	648	7256	7234	7250	7309	7414	7570	7694	7818	7943
Liabilities and Capital	648	7256	7234	7250	7309	7414	7570	7694	7818	7943
Current Assets	0	0	135	308	523	785	1098	1379	1660	1941
Fixed Assets	648	7256	7100	6943	6786	6629	6472	6315	6158	6002
Assets	648	7256	7234	7250	7309	7414	7570	7694	7818	7943

Source: JICA

Table 4 (2) Financial Statements for Water Supply Facilities in Debarwa

(Unit: Nfa thousand)

No.	11	12	13	14	15	16	17	18	19	20
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
					Income Statement					
Revenue	582	582	582	582	582	582	582	582	582	582
Operation and Maintenance	301	301	301	301	301	301	301	301	301	301
Depreciation	157	157	157	157	157	157	157	157	157	157
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	458	458	458	458	458	458	458	458	458	458
Profit before Tax	124	124	124	124	124	124	124	124	124	124
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	124	124	124	124	124	124	124	124	124	124
					Funds Statement					
Profit after Tax	124	124	124	124	124	124	124	124	124	124
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	0	0	0	0	0	0	0	0	0	0
Depreciation	157	157	157	157	157	157	157	157	157	157
Sources	281	281	281	281	281	281	281	281	281	281
Capital Works	0	0	0	0	0	0	251	0	0	0
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	281	281	281	281	281	281	30	281	281	281
Applications	281	281	281	281	281	281	281	281	281	281
					Balance Sheet					
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	8067	8191	8315	8440	8564	8688	8812	8937	9061	9185
Liabilities and Capital	8067	8191	8315	8440	8564	8688	8812	8937	9061	9185
Current Assets	2222	2503	2784	3065	3347	3628	3657	3938	4220	4501
Fixed Assets	5845	5688	5531	5374	5217	5060	5155	4998	4841	4684
Assets	8067	8191	8315	8440	8564	8688	8812	8937	9061	9185

Source: JICA

Table 5 Cost Benefit Streams, Debarwa (Economic Analysis)

CC=Capital Costs; OM=O/M Costs; CS=Costs; BF=Benefits
CF=Cash Flow (=BF - CS)

(Unit: Nfa thousand)

NO.	YEAR	CC	OM	CS	BF	CF
1	1999	606	-25	581	0	-581
2	2000	6174	-25	6149	0	-6149
3	2001	0	276	276	466	190
4	2002	0	276	276	670	394
5	2003	0	276	276	927	651
6	2004	0	276	276	1251	974
7	2005	0	276	276	1657	1381
8	2006	0	276	276	1657	1381
9	2007	0	276	276	1657	1381
10	2008	0	276	276	1657	1381
11	2009	0	276	276	1657	1381
12	2010	0	276	276	1657	1381
13	2011	0	276	276	1657	1381
14	2012	0	276	276	1657	1381
15	2013	0	276	276	1657	1381
16	2014	0	276	276	1657	1381
17	2015	250	276	526	1657	1131
18	2016	0	276	276	1657	1381
19	2017	0	276	276	1657	1381
20	2018	0	276	276	1657	1381
21	2019	0	276	276	1657	1381
22	2020	0	276	276	1657	1381

APPENDIX H

ENVIRONMENT

List of Tables

Table H-1 Screening Check List (Debarwa)

	Environment Item	Contents	Evaluation	Remarks
Social Environment				
1	Resettlement	Exchange of land onwership and/or residential rights due to occupation of land	Yes (No) Not available	Small structure
2	Economic activity	Loss of productive land, change in economic structure	Yes (No) Not available	Small structure
3	Transportation, Living environment	Traffic congestion, accident and subsequent effect on school, hospital etc.	Yes (No) Not available	Small structure
4	Regional segregation	Due to transportation hindrance	Yes (No) Not available	Small structure
5	Historical ruins, cultural heritage	Damage to cultural heritage and its loss	Yes (No) Not available	Does not exist near the town
6	Water right, right of common	Effect on right of fishery, irrigation, water right	Yes (No) Not available	Use of GW of shallow layer
7	Sanitation	Deteriorated sanitation due to garbage and harmful insect outbreak	Yes (No) Not available	Not relevant
8	Industrial and Solid waste	Construction waste, waste dumps, mud, solid waste	Yes (No) Not available	No big construction
9	Disaster (Risk)	Increased hazardous land subsidence, landslides, accidents	Yes (No) Not available	Small construction in flat area
Natural Environment				
10	Topography, geology	Change in topography, geological features by digging, soil piling	Yes (No) Not available	No big construction
11	Soil erosion	Top soil erosion by rain after creating new land reclamation, cutting down trees	Yes (No) Not available	Not be a causative factor
12	Groundwater	Depletion of GW level and pollution due to excessive pumping	(Yes) No Not available	There is a possibility of depletion
13	Lake, river regime	Change in flow amount and quality due to reclamation and drainage	Yes (No) Not available	Not in the vicinity
14	Beach, coast	Shoreline erosion due to reclamation or change in tidal current	Yes (No) Not available	Activities in the inland
15	Fauna and Flora	Disturbance in breeding, extinction due to change in living condition	Yes (No) Not available	No report of Red book species
16	Meteorology	Change in temperature, rainfall, wind due to large scale construction or building	Yes (No) Not available	Not relevant
17	Landscape	Destruction of harmony due to changed topography or buildings	Yes (No) Not available	No big construction
Pollution				
18	Air pollution	Exhaust, poisonous gas from automobile, factory	Yes (No) Not available	Not relevant
19	Water pollution	Flow of muddy water, oil from boring activities	Yes (No) Not available	Boring dia is small and low depth
20	Soil contamination	Pollution due to flow of poinsonous meterial and drainage	Yes (No) Not available	Not relevant
21	Noise, vibration	Due to drilling and Water lifting	Yes (No) Not available	No house in vicinity
22	Landsubsidence	Lowering of WL due to over exstraction of water	Yes (No) Not available	W.R.Z./Quarternary aquifer are thin
23	Offensive odor	Exhaust, Odor substance	Yes (No) Not available	Not relevant
Total Evaluation:		Is EIA necessary for this project ?	Necessary (Unnecessary)	Influencial items are minimum

Note: W.R.Z. = Weathered Rock Zone

Table H-2 Scooping Check List (Debarwa)

	Environment Item	Evaluation	Remarks
Social Environment			
1	Resettlement	D	Small structure
2	Economic activity	D	Small structure
3	Transpotation, Living environment	D	Small structure
4	Regional segregation	D	Small structure
5	Historical ruins,Cultural heritage	D	Small structure
6	Water right, Right of common	D	GW development(no complaint so far)
7	Sanitation	D	The Project will improve the condition
8	Industrial and Solid waste		No large scale construction
9	Disaster (Risk)	D	Small scale of construction in flat area
Natural Environment			
10	Topography, Geology	D	No large scale construction
11	Soil erosion	D	Not relevant
12	Groundwater	B	There is a possibility of depletion
13	Lake, River regime	D	Not relevant(not in vicinity)
14	Beach, Coast	D	Not relevant(GW development in inland)
15	Fauna and Flora	D	No report of Red book species
16	Meteorology	D	Not relevant
17	Landscape	D	No large scale construction activities
Pollution			
18	Air pollution	D	Not relevant
19	Water pollution	D	Not expected due to small drilling activities
20	Soil contamination	D	Not relevant
21	Noise,Vibration	D	Negligible(no houses close to the drilling site)
22	Land subsidence	D	Not expected
23	Offensive odor	D	Not relevant

Note: Evaluation Level

A: Much impact
B: Some impact
C: Not known (Further investigation is necessary)
D: No impact

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