

**APPENDIX E**  
**SANITATION**

## List of Tables

	<b>Page</b>
Table 4.1 Adi Keyih Water Supply and Consumption Pattern .....	E-1
Table 4.2 Domestic Water Consumption and Source of Water Supply .....	E-3
Table 4.3 Distance of Water Points from Households .....	E-3
Table 4.4 Toilet Condition and Related Behaviors .....	E-4
Table 4.5 Conditions of Waste Disposal .....	E-4
Table 4.6 Adi Keyih Schools Present Water and Latrine Facilities Condition.....	E-5
Table 4.7 Cases of Water and Poor Sanitation Related Diseases in Adi Keyih .....	E-6
Table 4.8 Conditions of Health .....	E-7
Table 4.9 Hand Washing Behavior .....	E-7
Table 4.10 Food Handling .....	E-8
Table 4.11 Households Perception of Health and Hygiene .....	E-8



**Table 4.1 Adi Keyih Water Supply and Consumption Pattern**

	Domestic water consumption by private water connection		Commercial water consumption by private connection		Gov't establishments water consumption by private water connection		Domestic water consumption by water tanker.
	m <sup>3</sup>	No. of Customers	m <sup>3</sup>	No. of Customers	m <sup>3</sup>	No. of Customers	m <sup>3</sup>
Jan-Feb/95	6054	412	1571.5	61	3773.5	56	1920
Mar.-Apr.	5796	427	1124.5	64	2549.5	56	1620
May-Jun.	6081	436	1209	62	2640.5	56	2138
July-Aug.	5332	444	1483	61	2257	56	1513.6
Sep.-Oct.	5447	455	1308	60	2927.5	53	1170
Nov.-Dec.	5874	473	1405	60	3622	51	1506.8
<b>Total</b>	<b>34,584</b> <b>50%</b>		<b>6,976</b> <b>10%</b>		<b>17,770</b> <b>26%</b>		<b>9,868</b> <b>14%</b>
Jan-Feb/96	7289.5	488	1571.5	61	2779.5	50	1695.2
Mar.-Apr.	7492.5	497	1258	61	2023.5	53	1150.4
May-Jun.	7820	507	1235.5	62	2547.5	54	797
July-Aug.	5603.5	521	1148	62	2190.5	53	1818.8
Sep.-Oct.	6982.5	534	1367.5	62	2774.5	51	2273.6
Nov.-Dec.	7096.5	545	1284.5	62	2434	51	1584
<b>Total</b>	<b>42,284</b> <b>57%</b>		<b>7,865</b> <b>10%</b>		<b>14,749</b> <b>20%</b>		<b>9,319</b> <b>13%</b>

Continue ...

**Table 4.1 Adi Keyih Water Supply and Consumption Pattern**

	Domestic water consumption by private water connection		Commercial water consumption by private connection		Gov't establishments water consumption by private water connection		Domestic water consumption by water tanker.
	m <sup>3</sup>	No. of Customers	m <sup>3</sup>	No. of Customers	m <sup>3</sup>	No. of Customers	m <sup>3</sup>
Jan-Feb/97	8359.5	537	1595.5	71	3265.5	51	1892
Mar.-Apr.	6399.6	546	1445.2	70	2133.2	51	1429.8
May-Jun.	5816.4	552	1464.8	69	1802.8	50	777
July-Aug.	6045	556	1271	69	2249	50	1126
<b>Total</b>	<b>26,620</b> <b>57%</b>		<b>5,776</b> <b>12%</b>		<b>9,450</b> <b>20%</b>		<b>5,224</b> <b>11%</b>

**Table 4.2 Domestic Water Consumption and Source of Water Supply**

Source of water supply	Household users %	Ave. volume of water consumption		Water charge Nfa/m <sup>3</sup>	Average income Nfa/mon
		m <sup>3</sup> /hld/mon	l/c/d		
Municipality supply		m <sup>3</sup> /hld/mon	l/c/d		
House connection	19.0	2	11.66	18	1345
Yard connection	40.8	1.02	5.94	9.53	730.34
Communal Water point	7.3	1.50	8.79	8.10	649
Private well	0	-	-	-	-
Public well	0	-	-	-	-
River/spring	1.1	0.80	4.66	-	561
Water tanker	41.3	0.96	5.59	9.6	724
Water vender	0	-	-	-	-
Rain water	93.3	1.07	6.24	-	894

*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			
	< 99m	100-199 m	200-399 m	>400m
Communal water point	12.3%	21.1%	22.8%	43.9%
River/spring	200-499 m 0%	500-999 m 50%	>1000 m 50%	

**Table 4.4 Toilet Condition and Related Behaviors**

Type of latrines used	Septic tank/cesspool 15.6%	Dry pit 31.3%	Community toilet 0.6%		Open field 52.5%	
Condition of septic tank/cesspool and pit latrine	Clean squatting hole 79.8%	Clean slab 67.9%	Well fitting lid 1.2%	Good ventilation 66.7%	No flies 75%	Not filled up 97.6%
Households satisfied with the existing latrines used	49.7%		Average distance of latrine from the nearest water source			-
Affordable preferences of unsatisfied households	Septic tank/cesspool 15.6%		Dry pit 44.4%	Community toilet 40%	Open field 0%	
Households favoring credit system for latrine construction	14.3%		Ave. of maximum repayment a household afford		76Nfa/mon	
Type of anal cleansing material used	Stone 12.8%	Water 14%	Paper 87.2%	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 1.1%	Open pit 14%	Covered in pit 0.6%	Burn 0%	Municipality truck 84.4%
Waste water disposal	Open field 79.9%	Pit 13.4%	Gardening 1.7%	Drainage system 5%	
Animal waste disposal	Used as fuel 50%	Used as fertilizer 37.5%	Thrown in a pit 12.5%	Open field 0%	
Infant excreta disposal	Open field 26.2%	Popo and thrown to the field 35.9%		Popo and put in the toilet 37.9%	

**Table 4.6 Adi Keyih Schools Present Water and Latrines Facilities Condition**

Name of School	Water supply facility		Latrine Facility	
	Availability	Remark	Availability	Remark
Kidus Hanna junior and elementary sch.	Yes	Continuous supply	Yes	Functional and clean.
Adi Keyih elementary school.	Yes	Continuous supply	Yes	Not functional
Fikirin Selamin elementary school	No	Never had	No	Never had
Mienmehazi elementary & junior school	Yes		Yes	Functional in clean condition
Adi Keyih junior & high school	Yes		Yes	Not functional



**Table 4.7 Cases of Water and Poor Sanitation Related Diseases in Adi Keyih**

<b>Description of Disease</b>	<b>1995</b>	<b>1996</b>	<b>1997 up to 09/97</b>
Water borne & washed diseases			
Typhoid	23	21	3
Hepatitis	15	25	2
Diarrhea	845	665	344
Amebic Dysentery	533	601	368
Shigellosis & Bacillary	106	96	57
Giardiasis	83	23	3
Bacterial skin srosis			
Scabies	467	339	255
Fungal infection (skin disease)	978	542	338
Trachoma	83	444	203
Asthma	141	188	67
Rickettsial Typhus			
Water basis			
Schistosomiasis			
<b>Total</b>	<b>3,274</b> <b>16%</b>	<b>2,944</b> <b>14%</b>	<b>1,640</b> <b>8%</b>
Water related insect vector			
Malaria	<b>547</b> <b>3%</b>	<b>433</b> <b>2%</b>	<b>139</b> <b>0.7%</b>

Source: Adi Keyih hospital

**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				
	2person/hld	Diarrhea 20 person 30.8 %	Dysentery 16 person 37.2%	Malaria 7 person 14.3%	Warms 15 person 71.4 %	Scabies 77 person 50 %
Ave. medical cost	Diarrhea 34 Nfa/case	Dysentery 25.91 Nfa/case	Malaria 10.95 Nfa/case	Warms 20.50 Nfa/case	Scabies 4.58 Nfa/case	
Type of treatment	Self-administered traditional medicine 0%	Self-administered modern medicine 1.1%	Consult traditional healer 0%	Consult physician 98.3%		
Infants health condition	Households with infant 15.6%	Infants death in the last 10 years 1.39 persons	Child immunization 97.1%			

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	39.7%	0%	0%	12.8%	0.6%	46.9%
Before cooking	4.5%	0%	0%	95%	0%	0.6%
Before eating	1.7%	0%	0%	97.8%	0.6%	0%
After disposal of children stool	68.4%	0%	0%	30.6%	0%	2%
After handling animal dung	75%	0%	0%	25%	0%	0%

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

**Table 4.10 Food handling**

Placing utensil	on shelf 39.7%	on floor 16.8%	Over the table 38.5%	Other 5%	
Storage of left over food	Covered 93.2%	Open to flies 0%	No leftover food 6.8%	Thrown away 0%	Other 0%
Washing raw food before eating	Washing vegetable 100%	Washing meat 33.3%	Washing fruit 41.9%		

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

**Table 4.11 Households Perception of Health and Hygiene**

ORS preparation knowledge 71.5%	Participation on health/hygiene education session 76.5%	Satisfaction on health/hygiene education session 98.4%		
Participation in community sanitation work 96.1%	Arcas of involvement			
	Cash contribution 17.9%	Material contribution 0%	Labor contribution 80.4%	Not willing 1.7%

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

**APPENDIX F**  
**COST ESTIMATION**

## TABLE OF CONTENTS

	<b>Page</b>
<b>3. Water Supply</b> .....	<b>F-1</b>
Table 1.1 Bill of Quantity.....	F-1
Table 1.2 (1) Project Cost (2005).....	F-2
Table 1.2 (2) Project Cost (2010).....	F-3
Table 1.2 (3) Project Cost (2015).....	F-5
Table 1.3 O&M Cost.....	F-6
<b>4. Sanitation</b> .....	<b>F-7</b>
Table 2.1 Bill of Quantity for School and Public Latrine.....	F-7
Table 2.1 (1) Bill of Quantity for School and Public Latrine.....	F-8
Table 2.1 (2) Bill of Quantity for School and Public Latrine.....	F-9
Table 2.1 (3) Bill of Quantity for School and Public Latrine.....	F-10
Table 2.1 (4) Bill of Quantity for School and Public Latrine.....	F-11
Table 2.2 Bill of Quantity for Household Flush Latrine.....	F-12
Table 2.2 (1) Bill of Quantity for Household Flush Latrine.....	F-13
Table 2.2 (2) Bill of Quantity for Household Flush Latrine.....	F-14
Table 2.2 (3) Bill of Quantity for Household Flush Latrine.....	F-15
Table 2.2 (4) Bill of Quantity for Household Flush Latrine.....	F-16
Table 2.3 Bill of Quantity for Double PIT VIP Latrine.....	F-17
Table 2.4 Cost of Estimation of Latrine.....	F-18
Table 2.5 Cost of Estimation of Public Facility.....	F-18

# 1. Water Supply

Table 1.1 Bill of Quantity

Facility	Item Description	Unit	Year		
			2005	2010	2015
Intake Facility	New borehole	sets			1
	Existing borehole	sets	2		2
	Observation borehole	sets	1		1
	Dam	sets			
	(Sub-total)	sets	3	4	2
Well Pump Facility	Submersible pump		DW-2, 0.096m <sup>3</sup> /min 101.0m, 1set	ADI-1, 0.060m <sup>3</sup> /min 37.5m, 1set	nADI-3, 0.192m <sup>3</sup> /min 39.2m, 1set
			BH-7, 0.192m <sup>3</sup> /min 13.1m, 1set	BH-5, 0.060m <sup>3</sup> /min 18.6m, 1set	nADI-2, 0.246m <sup>3</sup> /min 77.1m, 1set
			ADI-2, 0.300m <sup>3</sup> /min 102.6m, 1set	DW-2, 0.096m <sup>3</sup> /min 113.5m, 1set	
				BH-4, 0.096m <sup>3</sup> /min 108.7m, 1set	
				nADI-1, 0.114m <sup>3</sup> /min 95.1m, 1set	
				ADI-2, 0.384m <sup>3</sup> /min 111.7m, 1set	
	(Sub-total)	sets	3	6	2
Transmission Pipeline	DCIP 125mm	m		800.0	
	ditto 100mm	m	3,771.0		2,700.0
	ditto 80mm	m	1,772.0	4,800.0	2,300.0
	ditto 60mm	m	343.0	3,960.0	
	(Sub-total)	m	5,886.0	9,560.0	5,000.0
Booster Pump Facility	Centrifugal pump		BP.2, 0.288m <sup>3</sup> /min 48.2m, 1set	BP.3, 0.120m <sup>3</sup> /min 83.4m, 2set	BP.5, 0.438m <sup>3</sup> /min 123.0m, 1set
			BP.1, 0.300m <sup>3</sup> /min 112.1m, 1set	BP.4', 0.144m <sup>3</sup> /min 95.1m, 1set	BP.6, 0.582m <sup>3</sup> /min 107.7m, 1set
				BP.4, 0.144m <sup>3</sup> /min 105.5m, 1set	
				BP.1, 0.384m <sup>3</sup> /min 115.0m, 1set	
		BP.2, 0.384m <sup>3</sup> /min 52.6m, 1set			
(Sub-total)	sets	2	6	2	
Pump Pit	Made of RC		15m <sup>3</sup> , 2set	15m <sup>3</sup> , 4set	15m <sup>3</sup> 20m <sup>3</sup>
	(Sub-total)	sets	2	4	2
Reservoir	Made of RC		290m <sup>3</sup> , h=5.5m	190m <sup>3</sup> , h=5.5m	220m <sup>3</sup> , h=5.5m
	Made of FRP				
	Existing				
(Sub-total)	sets	1	1	1	
Distribution Pipeline	PVC 200mm	m	643.0		
	ditto 150mm	m	216.0		310.0
	ditto 125mm	m	1,081.0	159.0	152.0
	ditto 100mm	m	844.0	668.0	1,049.0
	ditto 75mm	m	776.0	653.0	1,979.0
	ditto 50mm	m	15,833.0	11,331.0	6,575.0
	(Sub-total)	m	19,393.0	12,811.0	10,065.0
Control House		sets	5	8	4
Communal Water Point		sets	9	7	5
Individual Connection		sets	1,730	771	984
Tempolaty Road	Width 3.0m	m	3,000	6,500	7,000

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	
<b>1. Construction Cost</b>									
Intake facility	New well	set		13,229.04	273,277.16	0	0		
	Exsiting well	set	2	9,275.43	85,317.49	18,551	170,635		
	Observation well	set	1	0.00	0.00	0	0		
	Dam	set							
	(sub total)	set	3			18,551	170,635	189,186	
Submersible pump	DW-2, 0.096m3/min 101.0m	set	1	10,505.05	146,876.10	10,505	146,876		
	BH-7, 0.192m3/min 13.1m	set	1	10,505.05	118,037.09	10,505	118,037		
	ADI-2, 0.300m3/min 102.6m	set	1	10,703.31	215,147.16	10,703	215,147		
	(sub total)		3			31,713	480,060	511,774	
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	3,771	207.31	580.60	781,751	2,189,438		
	80mm	m	1,772	204.69	499.83	362,705	885,702		
	60mm	m	343	203.85	393.40	69,921	134,935		
	(sub total)	m	5,886			1,214,377	3,210,075	4,424,452	
Booster pump	BP.2, 0.288m3/min 48.2m	set	1	1,839.48	114,255.98	1,839	114,256		
	BP.1, 0.300m3/min 112.1m	set	1	2,145.50	137,070.84	2,146	137,071		
	(sub total)		2			3,985	251,327	255,312	
Pump pit	RC 15m3	sets	2	62,765.43	38,970.28	125,531	77,941		
	(sub total)		2			125,531	77,941	203,471	
Reservoir	RC 290m3,h=5.5m	sets	1	739,160.46	197,368.12	739,160	197,368		
	FRP								
	(sub total)		1			739,160	197,368	936,529	
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	643	222.67	622.16	143,176	400,047		
	150mm	m	216	181.05	312.16	39,106	67,427		
	125mm	m	1,081	167.54	203.19	181,105	219,644		
	100mm	m	844	154.76	155.42	130,621	131,176		
	75mm	m	776	140.33	107.09	108,898	83,105		
	50mm	m	15,833	126.50	54.06	2,002,795	855,993		
	(sub total)	m	19,393			2,605,702	1,757,391	4,363,093	
Control house	Type A	sets	1	137,822.18	9,992.65	137,822	9,993		
	Type B	sets	2	195,386.85	10,232.97	390,774	20,466		
	Type C	sets	1	196,861.35	10,530.98	196,861	10,531		
	Type D	sets	1	254,523.76	10,963.56	254,524	10,964		
	(sub total)	sets	5			979,981	51,953	1,031,934	
Comunal water point		sets	9	18,019.46	6,866.40	162,175	61,798	223,973	
Individual connection		set	1,730	0.00	0.00	0	0	0	
Temporary Road	width3.0m	m	3,000	297.00	0.00	891,000	0	891,000	
Sub-Total						6,772,176	6,258,548	13,030,724	
2. Engineering Fee							1,303,072	1,303,072	
3. Administration Cost							260,614	260,614	
4. Physical Contingency							703,279	756,162	1,459,441
Total						7,736,069	8,317,783	16,053,852	
5. Price Contingency						1,477,713	1,588,830	3,066,543	
Grand Total						9,213,782	9,906,612	19,120,394	

Table 1.2 (2) Project Cost (2010)

(Nakfa)

Description		Unit	Quantity	Unit Cost		Cost		Total
Item	Dimension			Local C.	Foreign C.	Local C.	Foreign C.	
<b>1. Construction Cost</b>								
Intake facility	New well	set	1	13,229.04	273,277.16	13,229	273,277	475,692
	Exsiting well	set	2	9,275.43	85,317.49	18,551	170,635	
	Observation well	set	1	0.00	0.00	0	0	
	Dam	set						
	(sub total)	set	4			31,780	443,912	
Submersible pump	ADI-1, 0.060m <sup>3</sup> /min 37.5m	set	1	10,505.05	102,976.72	10,505	102,977	935,211
	BH-5, 0.060m <sup>3</sup> /min 18.6m	set	1	10,505.05	105,924.71	10,505	105,925	
	DW-2, 0.096m <sup>3</sup> /min 113.5m	set	1	10,505.05	146,812.01	10,505	146,812	
	BH-4, 0.096m <sup>3</sup> /min 108.7m	set	1	10,505.05	146,812.01	10,505	146,812	
	nADI-1, 0.114m <sup>3</sup> /min 95.1m	set	1	10,505.05	146,812.01	10,505	146,812	
	ADI-2, 0.384m <sup>3</sup> /min 111.7m	set	1	10,703.31	222,645.30	10,703	222,645	
	(sub total)			6			63,229	
Transmission pipeline	D C I P 200mm	m		245.85	842.83	0	0	6,444,386
	150mm	m		221.01	671.71	0	0	
	125mm	m	800	214.20	657.79	171,364	526,234	
	100mm	m		207.31	580.60	0	0	
	80mm	m	4,800	204.69	499.83	982,498	2,399,194	
	60mm	m	3,960	203.85	393.40	807,246	1,557,851	
(sub total)	m	9,560			1,961,107	4,483,279		
Booster pump	BP.3, 0.120m <sup>3</sup> /min 83.4m	set	2	1,839.48	108,886.63	3,679	217,773	708,707
	BP.4', 0.144m <sup>3</sup> /min 95.1m	set	1	1,839.48	112,924.09	1,839	112,924	
	BP.4, 0.144m <sup>3</sup> /min 105.5m	set	1	1,897.86	119,511.08	1,898	119,511	
	BP.1, 0.384m <sup>3</sup> /min 115.0m	set	1	2,145.50	138,096.22	2,146	138,096	
	BP.2, 0.384m <sup>3</sup> /min 52.6m	set	1	2,013.28	108,827.35	2,013	108,827	
	(sub total)					11,575	697,132	
Pump pit	RC 15m <sup>3</sup>	sets	4	62,765.43	38,970.28	251,062	155,881	856,015
	(sub total)		4			251,062	155,881	
Reservoir	RC 190m <sup>3</sup> ,h=5.5m	sets	1	617,230.00	238,784.63	617,230	238,785	856,015
	FRP	sets						
(sub total)			1			617,230	238,785	
Distribution pipeline	PVC 300mm	m		289.52	1,221.56	0	0	2,473,630
	250mm	m		249.89	1,000.89	0	0	
	200mm	m	0	222.67	622.16	0	0	
	150mm	m	0	181.05	312.16	0	0	
	125mm	m	159	167.54	203.19	26,638	32,307	
	100mm	m	668	154.76	155.42	103,382	103,822	
	75mm	m	653	140.33	107.09	91,637	69,932	
	50mm	m	11,331	126.50	54.06	1,433,315	612,597	
(sub total)	m	12,811			1,654,972	818,658		
Control house	Type A	sets	3	137,822.18	9,992.65	413,467	29,978	1,536,729
	Type B	sets	1	195,386.85	10,232.97	195,387	10,233	
	Type C	sets	3	196,861.35	10,530.98	590,584	31,593	
	Type D	sets	1	254,523.76	10,963.56	254,524	10,964	
(sub total)	sets	8			1,453,961	82,767		
Comunal water point		sets	7	18,019.46	6,866.40	126,136	48,065	174,201
Individual connection		set	771	0.00	0.00	0	0	0
Temporary Road	width3.0m	m	6,500	297.00	0.00	1,930,500	0	1,930,500
Sub-Total						8,101,552	7,840,462	15,942,014



(Nakfa)

Description		Unit	Quantity	Unit Cost		Cost		
Item	Dimension			Local C.	Foreign C.	Local C.	Foreign C.	Total
1. Construction Cost						8,101,552	7,840,462	15,942,014
2. Engineering Fee							1,594,201	1,594,201
3. Administration Cost						318,840		318,840
4. Physical Contingency						1,652,194	1,727,512	3,379,707
Total						18,174,139	19,002,637	37,176,777
5. Price Contingency						9,153,046	9,570,303	18,723,350
Grand Total						27,327,186	28,572,941	55,900,126

Table 1.2 (3) Project Cost (2015)

(Nakfa)

Item	Description		Unit	Quantity	Unit Cost		Cost		Total
	Dimension				Local C.	Foreign C.	Local C.	Foreign C.	
<b>1. Construction Cost</b>									
Intake facility	New well		set	2	13,229.04	273,277.16	26,458	546,554	573,012
	Exsiting well		set	0	9,275.43	85,317.49	0	0	
	Observation well		set		0.00	0.00	0	0	
	Dam		set						
(sub total)			set	2			26,458	546,554	
Submersible pump	nADI-3, 0.192m <sup>3</sup> /min 39.2m		set	1	10,505.05	141,718.51	10,505	141,719	344,844
	nADI-2, 0.246m <sup>3</sup> /min 77.1m		set	1	10,625.18	181,995.60	10,625	181,996	
	(sub total)			set	2			21,130	
Transmission pipeline	D C I P 200mm		m		245.85	842.83	0	0	3,747,737
	150mm		m		221.01	671.71	0	0	
	125mm		m		214.20	657.79	0	0	
	100mm		m	2,700	207.31	580.60	559,726	1,567,617	
	80mm		m	2,300	204.69	499.83	470,780	1,149,614	
	60mm		m		203.85	393.40	0	0	
	(sub total)			m	5,000			1,030,506	
Booster pump	BP.5, 0.438m <sup>3</sup> /min 123.0m		set	1	2,385.27	152,966.56	2,385	152,967	310,704
	BP.6, 0.582m <sup>3</sup> /min 107.7m		set	1	2,385.27	152,966.56	2,385	152,967	
	(sub total)			set	2			4,771	
Pump pit	RC 15m <sup>3</sup>		sets	1	62,765.43	38,970.28	62,765	38,970	223,980
	RC 20m <sup>3</sup>		sets	1	73,376.21	48,868.40	73,376	48,868	
	(sub total)			sets	2			136,142	
Reservoir	RC 220m <sup>3</sup> ,h=5.5m		sets	1	639,062.64	247,863.00	639,063	247,863	886,926
	FRP		sets						
	(sub total)			sets	1			639,063	
Distribution pipeline	PVC 300mm		m		289.52	1,221.56	0	0	2,211,460
	250mm		m		249.89	1,000.89	0	0	
	200mm		m		222.67	622.16	0	0	
	150mm		m	310	181.05	312.16	56,125	96,770	
	125mm		m	152	167.54	203.19	25,465	30,884	
	100mm		m	1,049	154.76	155.42	162,347	163,037	
	75mm		m	1,979	140.33	107.09	277,718	211,938	
	50mm		m	6,575	126.50	54.06	831,705	355,470	
	(sub total)			m	10,065			1,353,360	
Control house	Type A		sets	1	137,822.18	9,992.65	137,822	9,993	826,314
	Type B		sets	1	195,386.85	10,232.97	195,387	10,233	
	Type C		sets	1	196,861.35	10,530.98	196,861	10,531	
	Type D		sets	1	254,523.76	10,963.56	254,524	10,964	
	(sub total)			sets	4			784,594	
Comunal water point		sets	5	18,019.46	6,866.40	90,097	34,332	124,429	
Individual connection		set	984	0.00	0.00	0	0	0	
Temporary Road	width3.0m	m	7,000	297.00	0.00	2,079,000	0	2,079,000	
Sub-Total							6,165,121	5,163,285	11,328,406
2. Engineering Fee								1,132,841	1,132,841
3. Administration Cost							226,568		226,568
4. Physical Contingency							639,169	629,613	1,268,781
Total							7,030,858	6,925,738	13,956,596
5. Price Contingency							7,116,610	7,010,207	14,126,818
Grand Total							14,147,468	13,935,945	28,083,414

**Table 1.3 O&M Cost** (Nakfa)

Description	2005	2010	2015
1. Personnel cost	318,375	510,204	729,894
2. Electricity & fuel cost	270,053	552,616	896,253
3. Chemical cost	14,388	24,132	35,503
4. Repairing cost	75,888	172,611	238,522
5. Miscellaneous cost	67,870	125,956	190,017
<b>Total</b>	<b>746,574</b>	<b>1,385,518</b>	<b>2,090,189</b>

## 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
---------------	----------

<b>TOTAL</b>	<b>74 725,56</b>
--------------	------------------

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

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
<b>A. SUBSTRUCTURE</b>					
<b>1. EXCAVATION &amp; EARTHWORKS</b>					
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 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
					-
<b>TOTAL CARRIED TO SUMMARY .....</b>					<b>6905,00</b>
					=
<b>B. SUPERSTRUCTURE</b>					
<b>2. BRICK WORKS</b>					
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
					-
<b>TOTAL CARRIED TO SUMMARY .....</b>					<b>7060,00</b>
					=
<b>3. CARPENTRY AND JOINERY</b>					
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 roofing, to be fixed to the perlin price including lap; roof ridges and washers	m2	44	80	3520
					-
<b>TOTAL CARRIED TO SUMMARY .....</b>					<b>6140,00</b>
					=

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

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
	<b>4. METAL WORKS</b>				
4,1	Metal doors and windows constructed in accordance to detail drawing, including one coat of anti-rust and three coats of oil paint:-				
	<b>Doors</b>				
	a) Type D1 size: 60 x 170	No	10	400	4000
	b) Type D2 size: 100 x 200	No	2	600	1200
					5200,00
	<b>5. PLASTERING</b>				
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
	<b>6. PAINTING</b>				
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 emulsion paint to external wall surfaces.	m2	11	40	440
					1660,00
	<b>TOTAL CARRIED TO SUMMARY .....</b>				=
	<b>7. SANITARY INSTALLATION</b>				
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 necessary 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
					<b>14998,00</b>
	<b>8. SEPTIC TANK</b>				
	<b>Excavation &amp; earthworks</b>				
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
	<b>Concrete works</b>				
	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
	<b>Steel works</b>				
	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
	<b>Formworks</b>				
	Provide cut and fix in position sawn zigba form works :				
8,11	a) Roof slab	m2	25	65	1625
	<b>Walls</b>				
8,12	50 cm thick in trachetic or equivalent stone wall bedded in cement mortar 1:3.	m3	55	290	15950
	<b>Finishing</b>				
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
					-
	<b>TOTAL CARRIED TO SUMMARY</b>				<b>30724,56</b>
					=



**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
<b>A. SUBSTRUCTURE</b>					
<b>1. EXCAVATION &amp; EARTHWORKS</b>					
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 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
<b>TOTAL CARRIED TO SUMMARY .....</b>					<b>551,60</b>
<b>B. SUPERSTRUCTURE</b>					
<b>2. BRICK WORKS</b>					
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
<b>TOTAL CARRIED TO SUMMARY .....</b>					<b>690,20</b>
<b>3. CARPENTRY AND JOINERY</b>					
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. roofing, to be fixed to the perlin price including laps, roof ridges and washers.	m2	1,80	80	144
<b>TOTAL CARRIED TO SUMMARY .....</b>					<b>440,00</b>

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

ITEM	DESCRIPTION	UNIT	QTY.	U.PRICE Nakfa	TOTAL P. Nakfa
<b>4. METAL WORKS</b>					
4,1	Metal doors and windows constructed in accordance to detail drawing, including one coat of anti-rust and three coats of oil paint:-				
	<b>Doors</b>				
	a) Type D1 size: 60 x 170	No	1,00	400	400
					<b>400,00</b>
<b>5. PLASTERING</b>					
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
					<b>276,08</b>
<b>6. PAINTING</b>					
6,1	Apply in three coats of oil paint to internal plastered wall surfaces of the latrine units.	m2	9,86	20	197
					<b>197,20</b>
	<b>TOTAL CARRIED TO SUMMARY .....</b>				
<b>7. SANITARY INSTALLATION</b>					
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 necessary 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 (cows), 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
<b>8. SEPTIC TANK</b>					
<b><u>Excavation &amp; earthworks</u></b>					
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
	<b>Concrete works</b>				
	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
	<b>Steel works</b>				
	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
	<b>Formworks</b>				
	Provide cut and fix in position sawn zigba form works :				
8,11	a) Roof slab	m2	2,70	65	176
	<b>Walls</b>				
8,12	50 cm thick in trachetic or equivalent stone wall bedded in cement mortar 1:3.	m3	6,00	290	1740
	<b>Finishing</b>				
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
	<b>TOTAL CARRIED TO SUMMARY</b>				<b>5764,28</b>

**Table 2.3 Bill of Quantity for Double PIT VIP Latrine**

Material expenses for double pit VIP					
Item No.	Description	Unit	Quantity	Unit rate	Total mount
				Nfa	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	Corrugated iron sheet roof	pcs	1	100	100
9	Wooden post for roof support	pcs	1	70	70
				<b>Total</b>	<b>1391</b>

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

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	3	74,725.56	224,177	83,961.64	251,885
	- Year 2005 – 2010	1	74,725.56	74,726	112,359.61	112,360
	- Year 2010 – 2015	1	74,725.56	74,726	150,362.51	150,363
2	Public latrine – CFL					
	- Year 2000 – 2005	5	74,725.56	373,628	83,961.64	419,808
	- Year 2005 – 2010	1	74,725.56	74,726	112,359.61	112,360
	- Year 2010 – 2015	1	74,725.56	74,726	150,362.51	150,363
3	Household latrine					
	- CFL – Year 2005	1,285	10,500.00	13,493,500	11,728.65	15,071,315
	- CFL – Year 2010	572	10,500.00	6,006,000	15,695.58	8,977,872
	- CFL – Year 2015	731	10,500.00	7,675,500	21,004.23	15,354,092
	- PFL – Year 2005	877	10,438.46	9,154,529	11,797.80	10,346,671
	- PFL – Year 2010	1,646	10,438.46	17,181,705	15,788.12	25,987,246
	- PFL – Year 2015	1,592	10,438.46	16,618,028	21,128.06	33,635,872
	- VIP – Year 2005	673	1,671.00	1,124,583	1,877.54	1,263,584
	- VIP – Year 2010	546	1,671.00	912,366	2,512.57	1,371,863
- VIP – Year 2015	264	1,671.00	441,144	3,362.38	887,668	

**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	2	1,027,586	2,055,172	1,134,596	4,135,410
	- 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	2,067,705	4,135,410
2	Vacuum truck (3,000 lit.)					
	- Year 2000-2005	1	924,828	924,828	1,039,137	1,039,137
	- Year 2005-2010	2	924,828	1,849,656	1,390,599	2,781,198
	- Year 2010-2015	1	924,828	924,828	1,860,936	1,860,936
3	Refuse collecting bins					
	- Year 2000-2005	150	500	75,000	562	84,300
	- 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 <sup>3</sup> )					
	- Year 2000-2005	20	59,086	1,181,720	66,392	1,327,840
	- Year 2005-2010	25	59,086	1,477,150	88,848	2,221,200
	- Year 2010-2015	10	59,086	590,860	118,899	1,118,899

**APPENDIX G**  
**FINANCIAL PLAN**



## LIST OF TABLES

	<b>Page</b>
Table 1 Personnel Plan for WSA Adi Keyih .....	G-1
Table 2 (1) Financial Statements for Water Supply Facilities in Adi Keyih.....	G-2
Table 2 (2) Financial Statements for Water Supply Facilities in Adi Keyih.....	G-3
Table 2 (3) Financial Statements for Water Supply Facilities in Adi Keyih.....	G-4
Table 3 Cost Benefit Streams, Adi Keyih (Economic Analysis).....	G-5
Table 4 (1) Financial Statements for Water Supply Facilities in Adi Keyih.....	G-6
Table 4 (2) Financial Statements for Water Supply Facilities in Adi Keyih.....	G-7
Table 5 Cost Benefit Streams, Adi Keyih (Economic Analysis).....	G-8

**Table 1 Personnel Plan for WSA Adi Keyih**

Item	1997	2005	2010	2015
<b>1. Total No. of Personnel</b>				
1) Total production of water (cu. m/day)	204	707	1,186	1,746
2) Water production per worker (cu. m/day/worker)	14.5	20	25	30
3) Coefficient	1	0.9	0.9	0.9
4) No. of personnel	14	31	42	52
5) Additional personnel for sanitation	0	3	5	6
6) Final No. of personnel	14	34	47	58
<b>2. Breakdown of Personnel by Position/Function</b>				
1) Manager	1	1	1	1
2) Customer services	0	1	1	1
3) Internal audit	0	0	1	1
4) Administrative service				
(1) Head	0	1	1	1
(2) General administration section				
Secretaries/typists/clerks	0	1	1	1
Guards	2	2	3	4
Sweepers/janitors	0	0	0	0
Drivers	1	1	1	1
Sub-total	3	4	5	6
(3) Personnel section				
Recruitment/training/remuneration	0	1	1	1
(4) Storage section				
Store keepers	0	1	2	3
Purchase of materials/supplies	0	1	1	1
Sub-total	0	2	3	4
(5) Legal section	0	1	1	1
Total	3	9	11	13
5) Financial service				
(1) Head	1	1	1	1
(2) Budgeting section	0	0	1	2
(3) Accounting section				
Accountants	0	1	2	3
Cashiers/treasurers	1	1	2	2
Sub-total	1	2	4	5
(4) Financial management section				
Financial analysts	0	1	2	3
(5) Operation section				
Meter readers	1	1	1	2
Bill distributors/collectors	0	1	1	1
Water sellers	2	3(+6*)	0	0
Sub-total	3	2	2	3
Total	5	6	10	14
6) Technical service				
(1) Head	0	1	1	1
(2) Technical records section	0	1	1	1
(3) Operation and maintenance section				
Mechanics	0	1	1	2
Electricians	0	0	1	1
Motor operators	3	5	7	8
Plumbers	2	3	5	6
Sub-total	5	9	14	17
(4) Inspection section				
Water meter technicians	0	0	1	1
Leakage detectors	0	0	1	1
Water quality analysts	0	0	0	0
Sub-total	0	0	2	2
(5) Workshop	0	0	0	0
(6) Works section				
Contracting	0	0	0	0
Designing/drafting	0	0	0	1
Sub-total	0	0	0	1
Total	5	11	18	22
7) Sanitary service				
(1) Head	0	1	1	1
(2) Loan service section	0	1	1	2
(3) Maintenance section				
Technicians	0	1	2	2
Drivers	0	0	1	1
Sub-total	0	1	3	3
Total	0	3	5	6
Grand total	14	31	47	58

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 Adi Keyih**

(Unit: Nfa thousand)

No.	1	2	3	4	5	6	7	8	9	10
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Income Statement</b>										
Revenue	0	0	1173	1270	1378	1500	1705	1930	2215	2567
Operation and Maintenance	0	0	746	746	746	746	1386	1386	1386	1386
Depreciation	0	0	365	365	365	365	853	853	853	853
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	0	0	1111	1111	1111	1111	2239	2239	2239	2239
Profit before Tax	0	0	61	158	267	389	-534	-309	-24	328
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	0	0	61	158	267	389	-534	-309	-24	328
<b>Funds Statement</b>										
Profit after Tax	0	0	61	158	267	389	-534	-309	-24	328
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	1433	14621	0	0	1754	17887	0	0	0	1246
Depreciation	0	0	365	365	365	365	853	853	853	853
Sources	1433	14621	426	524	2386	18641	318	544	829	2427
Capital Works	1433	14621	0	0	1754	17887	0	0	0	1246
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	426	524	632	754	318	544	829	1181
Applications	1433	14621	426	524	2386	18641	318	544	829	2427
<b>Balance Sheet</b>										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	1433	16054	16115	16274	18294	36570	36036	35727	35704	37278
Liabilities and Capital	1433	16054	16115	16274	18294	36570	36036	35727	35704	37278
Current Assets	0	0	426	950	1582	2336	2655	3198	4027	5208
Fixed Assets	1433	16054	15689	15324	16712	34234	33382	32529	31676	32070
Assets	1433	16054	16115	16274	18294	36570	36036	35727	35704	37278

Source: JICA

**Table 2 (2) Financial Statements for Water Supply Facilities in Adi Keyih**

(Unit: Nfa thousand)

No.	11	12	13	14	15	16	17	18	19	20
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Income Statement</b>										
Revenue	3000	3203	3452	3724	4021	4346	4269	4269	4269	4269
Operation and Maintenance	1386	2091	2091	2091	2091	2091	2091	2091	2091	2091
Depreciation	853	1169	1169	1169	1169	1169	1169	1169	1169	1169
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	2239	3260	3260	3260	3260	3260	3260	3260	3260	3260
Profit before Tax	761	-58	192	463	760	1085	1008	1008	1008	1008
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	761	-58	192	463	760	1085	1008	1008	1008	1008
<b>Funds Statement</b>										
Profit after Tax	761	-58	192	463	760	1085	1008	1008	1008	1008
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	12710	0	0	0	0	0	0	0	0	0
Depreciation	853	1169	1169	1169	1169	1169	1169	1169	1169	1169
Sources	14324	1112	1361	1633	1930	2255	2178	2178	2178	2178
Capital Works	12710	0	0	0	0	0	945	0	0	0
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	1614	1112	1361	1633	1930	2255	1233	2178	2178	2178
Applications	14324	1112	1361	1633	1930	2255	2178	2178	2178	2178
<b>Balance Sheet</b>										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	50749	50691	50883	51346	52107	53192	54200	55209	56217	57226
Liabilities and Capital	50749	50691	50883	51346	52107	53192	54200	55209	56217	57226
Current Assets	6821	7933	9294	10927	12857	15111	16344	18522	20700	22877
Fixed Assets	43928	42758	41589	40420	39250	38081	37856	36687	35518	34348
Assets	50749	50691	50883	51346	52107	53192	54200	55209	56217	57226

Source: JICA

**Table 2 (3) Financial Statements for Water Supply Facilities in Adi Keyih**

(Unit: Nfa thousand)

No.	21	22	23	24	25	26	27	28	29	30
Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
<b>Income Statement</b>										
Revenue	4269	4269	4269	4269	4269	4269	4269	4269	4269	4269
Operation and Maintenance	2091	2091	2091	2091	2091	2091	2091	2091	2091	2091
Depreciation	1169	1169	1169	1169	1169	1169	1169	1169	1169	1169
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	3260	3260	3260	3260	3260	3260	3260	3260	3260	3260
Profit before Tax	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008
<b>Funds Statement</b>										
Profit after Tax	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	0	0	0	0	0	0	0	0	0	0
Depreciation	1169	1169	1169	1169	1169	1169	1169	1169	1169	1169
Sources	2178	2178	2178	2178	2178	2178	2178	2178	2178	2178
Capital Works	2025	0	0	0	0	808	0	0	0	0
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	152	2178	2178	2178	2178	1370	2178	2178	2178	2178
Applications	2178	2178	2178	2178	2178	2178	2178	2178	2178	2178
<b>Balance Sheet</b>										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	58234	59243	60251	61259	62268	63276	64285	65293	66301	67310
Liabilities and Capital	58234	59243	60251	61259	62268	63276	64285	65293	66301	67310
Current Assets	23030	25207	27385	29563	31741	33110	35288	37466	39644	41821
Fixed Assets	35204	34035	32866	31696	30527	30166	28997	27827	26658	25488
Assets	58234	59243	60251	61259	62268	63276	64285	65293	66301	67310

Source: JICA

**Table 3 Cost Benefit Streams, Adi Keyih (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	2000	1359	-41	1318	0	-1318
2	2001	13834	-41	13793	1056	-12737
3	2002	0	705	705	1464	759
4	2003	0	705	705	1952	1247
5	2004	1664	705	2370	2537	167
6	2005	16945	705	17650	3236	-14414
7	2006	0	1345	1345	3665	2320
8	2007	0	1345	1345	4144	2798
9	2008	0	1345	1345	4678	3333
10	2009	1178	1345	2523	5275	2751
11	2010	11995	1345	13340	5940	-7400
12	2011	0	2050	2050	6491	4441
13	2012	0	2050	2050	7089	5039
14	2013	0	2050	2050	7737	5687
15	2014	0	2050	2050	8439	6389
16	2015	0	2050	2050	9200	7150
17	2016	939	2050	2989	9200	6211
18	2017	0	2050	2050	9200	7150
19	2018	0	2050	2050	9200	7150
20	2019	0	2050	2050	9200	7150
21	2020	2013	2050	4063	9200	5138
22	2021	0	2050	2050	9200	7150
23	2022	0	2050	2050	9200	7150
24	2023	0	2050	2050	9200	7150
25	2024	0	2050	2050	9200	7150
26	2025	804	2050	2854	9200	6347
27	2026	0	2050	2050	9200	7150
28	2027	0	2050	2050	9200	7150
29	2028	0	2050	2050	9200	7150
30	2029	0	2050	2050	9200	7150
31	2030	0	2050	2050	9200	7150
32	2031	939	2050	2989	9200	6211

**Table 4 (1) Financial Statements for Water Supply Facilities in Adi Keyih**

(Unit: Nfa thousand)

No.	1	2	3	4	5	6	7	8	9	10
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Income Statement</b>										
Revenue	0	0	1173	1270	1378	1500	1332	1332	1332	1332
Operation and Maintenance	0	0	746	746	746	746	746	746	746	746
Depreciation	0	0	365	365	365	365	365	365	365	365
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	0	0	1111	1111	1111	1111	1111	1111	1111	1111
Profit before Tax	0	0	61	158	267	389	220	220	220	220
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	0	0	61	158	267	389	220	220	220	220
<b>Funds Statement</b>										
Profit after Tax	0	0	61	158	267	389	220	220	220	220
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	1433	14621	0	0	0	0	0	0	0	0
Depreciation	0	0	365	365	365	365	365	365	365	365
Sources	1433	14621	426	524	632	754	585	585	585	585
Capital Works	1433	14621	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	426	524	632	754	585	585	585	585
Applications	1433	14621	426	524	632	754	585	585	585	585
<b>Balance Sheet</b>										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	1433	16054	16115	16274	16541	16930	17150	17370	17591	17811
Liabilities and Capital	1433	16054	16115	16274	16541	16930	17150	17370	17591	17811
Current Assets	0	0	426	950	1582	2336	2922	3507	4093	4678
Fixed Assets	1433	16054	15689	15324	14959	14593	14228	13863	13498	13133
Assets	1433	16054	16115	16274	16541	16930	17150	17370	17591	17811

Source: JICA

**Table 4 (2) Financial Statements for Water Supply Facilities in Adi Keyih**

(Unit: Nfa thousand)

No.	11	12	13	14	15	16	17	18	19	20
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Income Statement</b>										
Revenue	1332	1332	1332	1332	1332	1332	1332	1332	1332	1332
Operation and Maintenance	746	746	746	746	746	746	746	746	746	746
Depreciation	365	365	365	365	365	365	365	365	365	365
Payment of Interest	0	0	0	0	0	0	0	0	0	0
Expenditure	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111
Profit before Tax	220	220	220	220	220	220	220	220	220	220
Tax	0	0	0	0	0	0	0	0	0	0
Profit after Tax	220	220	220	220	220	220	220	220	220	220
<b>Funds Statement</b>										
Profit after Tax	220	220	220	220	220	220	220	220	220	220
Loans	0	0	0	0	0	0	0	0	0	0
Government Budget	0	0	0	0	0	0	0	0	0	0
Depreciation	365	365	365	365	365	365	365	365	365	365
Sources	585	585	585	585	585	585	585	585	585	585
Capital Works	0	0	0	0	0	0	945	0	0	0
Payment of Principal	0	0	0	0	0	0	0	0	0	0
Working Capital	585	585	585	585	585	585	-359	585	585	585
Applications	585	585	585	585	585	585	585	585	585	585
<b>Balance Sheet</b>										
Liabilities	0	0	0	0	0	0	0	0	0	0
Capital	18031	18252	18472	18692	18912	19133	19353	19573	19794	20014
Liabilities and Capital	18031	18252	18472	18692	18912	19133	19353	19573	19794	20014
Current Assets	5264	5849	6435	7020	7606	8191	7832	8417	9003	9588
Fixed Assets	12768	12402	12037	11672	11307	10942	11521	11156	10791	10426
Assets	18031	18252	18472	18692	18912	19133	19353	19573	19794	20014

Source: JICA



**Table 5 Cost Benefit Streams, Adi Keyih (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	2000	1359	-41	1318	0	-1318
2	2001	13834	-41	13793	1056	-12737
3	2002	0	705	705	1464	759
4	2003	0	705	705	1952	1247
5	2004	0	705	705	2537	1831
6	2005	0	705	705	3236	2531
7	2006	0	705	705	3236	2531
8	2007	0	705	705	3236	2531
9	2008	0	705	705	3236	2531
10	2009	0	705	705	3236	2531
11	2010	0	705	705	3236	2531
12	2011	0	705	705	3236	2531
13	2012	0	705	705	3236	2531
14	2013	0	705	705	3236	2531
15	2014	0	705	705	3236	2531
16	2015	0	705	705	3236	2531
17	2016	939	705	1644	3236	1592
18	2017	0	705	705	3236	2531
19	2018	0	705	705	3236	2531
20	2019	0	705	705	3236	2531
21	2020	0	705	705	3236	2531
22	2021	0	705	705	3236	2531

**APPENDIX H**  
**ENVIRONMENT**

## List of Tables

	Page
Table H-1 Screening Check List(Adi Keyih).....	H-1
Table H-2 Scooping Check List(Adi Keyih).....	H-2

Table H-1 Screening Check List (Adi Keyih)

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

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

Table H-2 Scooping Check List (Adi Keyih)

Environment Item		Evaluation	Remarks
<b>Social Environment</b>			
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	Solid waste	D	No large scale construction
9	Disaster (Risk)	D	Small scale of construction in flat area
<b>Natural Environment</b>			
10	Topograpy, Geology	D	There is a possibility of depletion
11	Soil erosion	D	Not relevant
12	Groundwater	B	There is possibility of depletion
13	Lake, River regime	D	Not relevant(GW development)
14	Beach, Coast	D	Not relevant(GW development in inland)
15	Fauna, Flora	D	No large scale construction activities
16	Meteorology	D	Not relevant
17	Landscape	D	No large scale construction activities
<b>Pollution</b>			
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









JICA