6. Cost Estimate

Supporting Report
6. Cost Estimate

Contents

Table 6.1 Macro Basis Unit Costs for Rural Water Supply (1/2)

Unit : 1000
US$ 1.0 = DH 8.6 = Y 100

No.	Work Items		Unit	Unit Construction Cost Total (DH)	F.C (US$)	L.C (DH)	Equivalent total (US$)	Equivalent total (Y)
	< Construction Costs >							
1	Well development and pumping test, 10 " <1		8-hour	4.8	0.4	1	0.6	56
2	Well recharge <1		8-hour	3.2	0.3	1	0.4	37
3	well logging, 10 " <1		unit	112	9.8	28	13.0	1299
4	Reservoir cost (semi-buried)							
	Capacity	100 m3	place	302	26	76	35	3,503
		200 m3	place	524	46	131	61	6,078
		500 m3	place	1,016	89	254	118	11,786
		1000 m3	place	1,732	151	433	201	20,091
		2000 m3	place	3,166	276	792	368	36,726
		3000 m3	place	4,481	391	1,120	521	51,980
		4000 m3	place	5,735	500	1,434	667	66,526
		5000 m3	place	7,049	615	1,762	820	81,768
5	Pumping station							
	(Cost ratio : 75 % for electro-mechanical works and remaining 25 % for civil works)			0.507				
	Equipment cost	C = 162.549 * P (kw)						
	Civil works	pump house	m2	6.5	0.6	2	0.8	75
		transformer house	m2	6.1	0.5	2	0.7	71
		guard house	m2	7.5	0.7	2	0.9	87
		technician's apartment	m2	5.2	0.5	1	0.6	60
6	Treatment plant (including primary sedimentation / tank settling)							
	Capacity	50 l/s (4320 m3/day)	lot	36,700	3,200.6	9,175	4,267.4	425,720
		100 l/s (8640 m3/day)	lot	49,800	4,343.0	12,450	5,790.7	577,680
		150 l/s (12960 m3/day)	lot	59,550	5,193.3	14,888	6,924.4	690,780
		200 l/s (17280 m3/day)	lot	67,600	5,895.3	16,900	7,860.5	784,160
		250 l/s (21600 m3/day)	lot	74,500	6,497.1	18,625	8,662.8	864,200
		300 l/s (25920 m3/day)	lot	80,700	7,037.8	20,175	9,383.7	936,120
7	Power line	22 kV/380 A	km	240	20.9	60	27.9	2784
8	Access road	W=4.0 m, asphalt pavement	km	625	54.5	156	72.7	7250
	< Procument costs >							
1	Deepwell pump, 2.0 l/s, H=100 m, CIF site <2		set	30	3	3	3	348
2	Deepwell pump, 5.0 l/s, H=70 m, CIF site <2		set	40	4	4	5	464
3	Diesel generator, 10 kVA, CIF site <2		set	55	6	6	6	638
4	Diesel generator, 30 kVA, CIF site<2		set	154	16	15	18	1,786
5	Deepwell pump & motor for 100 mm well, 50 mm delivery dia,18-stage, 5.5 kw, 50 Hz, 0.16 m3/min. (2.7 l/s), Head 99 m		set	120	13	12	14	1,392
6	Deepwell pump & motor for 150 mm well, 65 mm delivery dia,11-stage, 11 kw, 50 Hz, 0.233 m3/min. (3.9 l/s), Head 103 m		set	139	14.5	14	16.2	1,612
7	Deepwell pump & motor for 200 mm well, 100 mm delivery dia,10-stage, 30 kw, 50 Hz, 0.833 m3/min. (13.9 l/s), Head 118 m		set	218	22.8	22	25.3	2,529
8	Deepwell pump & motor for 250 mm well, 125 mm delivery dia, 6-stage, 37 kw, 50 Hz, 1.0 m3/min. (16.7 l/s), Head 100 m		set	253	26.5	25	29.4	2,935
9	Deepwell pump & motor for 300 mm well, 150 mm delivery dia, 4-stage, 75 kw, 50 Hz, 2.0 m3/min. (33.3 l/s), Head 105 m		set	544	56.9	54	63.3	6,310

Table 6.1 Macro Basis Unit Costs for Rural Water Supply (2/2)

No.	Work Items	Unit	Unit Construction Cost Total (DH)	F.C (US$)	L.C (DH)	Equivalent total (US$)	Equivalent total (Y)
	< Operation and maintenance costs >						
1	Operation costs of pumping station						
	staff expenditures for water treatment plant	year	650	56.7	163	75.6	7540
	(small to medium scale of plant)						
	pumping station (small to medium scale)	year	180	15.7	45	20.9	2088

2 Energy cost

C={0.02725 * (TDH*V*B/Ef)}+Pf

Pf=(3188.5*Q*TDH)/Ef

Where, C=energy cost in 1000 DH
Pf=Initial cost (273 DH/kVA)
TDH=Total Dynamic Head in meter
V=annual pumped volume in 1000 m3
Ef=pump and motor efficiency (0.64)
Q=pumping rate, m3/s
B=unit price of kwh (0.868 DH/kwh)

4 Annual maintenance cost

(structure)	(year/life)	(annual rate for maintenance cost)
Dam	50	0.5 % of Investment cost
Drilled well	40	2.5 % of Investment cost
Dughole	40	1.0 % of investment cost
Equipment of well or dughole	13	3.0 % of Investment cost
Civil works of well or dughole	40	0.5 % of investment cost
Electro-mech. equipment for pumping station	13	3.0 % of investment cost
Civil works for pumping station	40	0.5 % of investment cost
Electro-mech. equipment for water treatment plant	13	3.0 % of investment cost
Civil works for water treatment plant	40	0.5 % of investment cost
Water reservoirs	40	0.5 % of investment cost
Pipes	40	0.5 % of investment cost
Fittings and valves	20	1.0 % of Investment cost
Electric and telephone lines	20	1.0 % of Investment cost
Access road	40	3.0 % of investment cost

Note <1 quotation from local contractor, <2 information from local supplier
Source : ONEP

Table 6.2 Unit Construction Costs (1/3)

US$ 1.0 = DH 8.6 = Y 100

No.	Work Items	Unt	Unit construction cost			Equivalent total	Equivalent total
			Total	F.C	L.C		
			(DH)	(US$)	(DH)	(US$)	(Y)
	Civil Works						
1	bulk excavation, common	m3	30	2.6	8	3.5	348
2	trench excavation, up to 2 m depth	m3	34	3.0	9	4.0	394
3	trench excavation, depth exceeding 2 m	m3	40	3.5	10	4.7	464
4	- d -, rock	m3	100	8.7	25	11.6	1160
5	backfill of trench	m3	28	2.4	7	3.3	325
6	sand for pipe bedding	m3	100	8.7	25	11.6	1160
7	blinding concrete	m3	477	41.6	119	55.5	5533
8	cyclopean concrete	m3	575	50.1	144	66.9	6670
	concrete for reinforced concrete (supply and placing including formwork, re-bar and all necessary works)						
9	plain concrete, 150 kg/m3 for thrust blocks and anchors including blinding concrete	m3	650	56.7	163	75.6	7540
10	foundation concrete, 250 kg/m3	m3	1000	87.2	250	116.3	11600
11	non reinfrcing concrete 300 kg.m3 for small manholes	m3	1300	113.4	325	151.2	15080
12	reinforced concrete 350 kg/m3	m3	2400	209.3	600	279.1	27840
	masonry (masonry of blocks including joint cement mortar 250 kg/m3)						
13	masonry work in elevator	m3	400	34.9	100	46.5	4640
14	masonry work in foundation	m3	300	26.2	75	34.9	3480
15	waterproof lining	m2	42	3.7	11	4.9	487
16	mortar coating	m2	30	2.6	8	3.5	348
17	concrete for reinforced concrete foundation	m3	838	73.1	209	97.4	9721
18	mild steel	kg	11	1.0	3	1.3	128
19	high tensile steel	kg	13	1.1	3	1.5	151
20	blockwork, 20 cm	m2	37	3.2	9	4.3	429
21	formwork for for concrete, 10 cm	m2	66	5.8	17	7.7	766
22	brick work	m2	150	13.1	38	17.4	1740
23	fence for reservoir	m	100	8.7	25	11.6	1160
24	gate, 1.5 m * 1.0 m	unit	1200	104.7	300	139.5	13920
25	manhole, 0.8 m * 0.64 m * 0.6 m	unit	600	52.3	150	69.8	6960
	lining						
26	plastering, 5 cm thick	m2	160	14.0	40	18.6	1856
27	cement lining, smooth or rough	m2	53	4.6	13	6.2	615
	plumbing (supply, install., joints, testing & disinfection)						
	asbestos cement pipe, class 10, dia. 80 mm	m	220	19.2	55	25.6	2552
	asbestos cement pipe, class 10, dia. 100 mm	m	230	20.1	58	26.7	2668
	asbestos cement pipe, class 10, dia. 150 mm	m	400	34.9	100	46.5	4640
	asbestos cement pipe, class 10, dia. 250 mm	m	900	78.5	225	104.7	10440
	asbestos cement pipe, class 20, dia. 100 mm	m	400	34.9	100	46.5	4640
	asbestos cement pipe, class 20, dia. 125 mm	m	560	48.8	140	65.1	6496
	asbestos cement pipe, class 20, dia. 150 mm	m	750	65.4	188	87.2	8700
	asbestos cement pipe, class 40, dia. 100 mm	m	800	69.8	200	93.0	9280
	asbestos cement pipe, class 40, dia. 150 mm	m	1200	104.7	300	139.5	13920
	asbestos cement pipe, class 40, dia. 200 mm	m	2000	174.4	500	232.6	23200
	concrete pipe for sewerage, dia 600 mm	m	1360	118.6	340	158.1	15776
	concrete pipe for sewerage, dia 400 mm	m	500	43.6	125	58.1	5800
	concrete pipe for sewerage, dia 200 mm	m	180	15.7	45	20.9	2088
	concrete pipe for sewerage, dia 100 mm	m	165	14.4	41	19.2	1914
	ductile iron pipe, dia. 100 mm	m	530	46.2	133	61.6	6148

Table 6.2 Unit Construction Costs (2/3)

No.	Work items	Unit	Unit construction cost Total (DH)	F.C (US$)	L.C (DH)	Equivalent total (US$)	Equivalent total (Y)
	ductile iron pipe, dia. 150 mm	m	770	67.2	193	89.5	8932
	ductile iron pipe, dia. 200 mm	m	1100	95.9	275	127.9	12760
	ductile iron pipe, dia. 300 mm	m	2050	178.8	513	238.4	23780
	galvanized steel pipe, dia 75 mm (3 ")	m	170	14.8	43	19.8	1972
	galvanized steel pipe, dia 50 mm (2")	m	165	14.4	41	19.2	1914
	galvanized steel pipe, dia 25 m (1")	m	140	12.2	35	16.3	1624
	PVC pipe, dia. 50 mm (2 ")	m	100	8.7	25	11.6	1160
	PVC pipe, dia. 75 mm (3")	m	150	13.1	38	17.4	1740
	fittings for PVC pipe, all dia. & class		(50 % of pipe cost)				
	fittings other than PVC pipe, all dia. & class		(water feeder main : 10 % of pipe cost)				
			(distribution network : 30 % of pipe cost)				
	gate valve, NP40, dia 100 mm	unit	18500	1613.4	4625	2151.2	214600
	gate valve, NP40, dia 150 mm	unit	19000	1657.0	4750	2209.3	220400
	gate valve, NP40, dia 200 mm	unit	31000	2703.5	7750	3604.7	359600
	gate valve, NP40, dia 250 mm	unit	62000	5407.0	15500	7209.3	719200
	gate valve, NP40, dia 300 mm	unit	122000	10639.5	30500	14186.0	1415200
	stop valve, 40 mm	unit	179	15.6	45	20.8	2076
	stop valve, 26 mm	unit	135	11.8	34	15.7	1566
	valve, 20/27	unit	139	12.1	35	16.2	1612
	saddle for intake on main line, dia 100 mm	unit	1000	87.2	250	116.3	11600
	saddle for intake on main line, dia 150 mm	unit	1100	95.9	275	127.9	12760
	saddle for intake on main line, dia 200 mm	unit	5000	436.0	1250	581.4	58000
	saddle for intake on main line, dia 250 mm	unit	15000	1308.1	3750	1744.2	174000
	gate valve for service connection, dia 15 mm	unit	470	41.0	118	54.7	5452
	gate valve for service connection, dia 20 mm	unit	480	41.9	120	55.8	5568
	gate valve for service connection, dia 25 mm	unit	490	42.7	123	57.0	5684
	gate valve for service connection, dia 32 mm	unit	500	43.6	125	58.1	5800
	isolation valve, dia 15 mm	unit	175	15.3	44	20.3	2030
	isolation valve, dia 20 mm	unit	180	15.7	45	20.9	2088
	isolation valve, dia 25 mm	unit	350	30.5	88	40.7	4060
	isolation valve, dia 32 mm	unit	600	52.3	150	69.8	6960
	flow meter, dia 15 mm	unit	850	74.1	213	98.8	9860
	flow meter, dia 20 mm	unit	890	77.6	223	103.5	10324
	flow meter, dia 25 mm	unit	2000	174.4	500	232.6	23200
	flow meter, dia 32 mm	unit	2500	218.0	625	290.7	29000
	flow meter, dia 200 mm	unit	22000	1918.6	5500	2558.1	255200
	flow meter, dia 250 mm	unit	25000	2180.2	6250	2907.0	290000
	box for flow meter, complete	unit	550	48.0	138	64.0	6380
	float valve, 250 mm	unit	84000	7325.6	21000	9767.4	974400
	float valve, 200 mm	unit	61000	5319.8	15250	7093.0	707600
	float valve, 150 mm	unit	36000	3139.5	9000	4186.0	417600
	float valve, 100 mm	unit	32000	2790.7	8000	3720.9	371200
	public stand pipe facility, dia 20 mm	unit	450	39.2	113	52.3	5220
	public stand pipe facility, dia 25 mm	unit	820	71.5	205	95.3	9512
	drain pipe	m	457	39.9	114	53.1	5301
	water closet, turkish type	unit	1027	89.6	257	119.4	11913
	water closet, European type	unit	1285	112.1	321	149.4	14906
	wash basin	unit	1253	109.3	313	145.7	14535
	thrust block, 150 kg reinforced concrete	m3	650	56.7	163	75.6	7540
	electric work						
	cable 4, 1000 R, 4 * 50 mm2	m	245	21.4	61	28.5	2842
	- do -, 4 * 35 mm2	m	206	18.0	52	24.0	2390
	- do -, 4 * 16 mm2	m	120	10.5	30	14.0	1392
	- do -, 4 * 10 mm2	m	92	8.0	23	10.7	1067
	- do -, 4 * 4 mm2	m	49	4.3	12	5.7	568
	distribution box	unit	3886	338.9	972	451.9	45078
	circuit breaker, 10 to 30 amps	unit	1030	89.8	258	119.8	11948
	circuit breaker, 20 to 4 amps	unit	1000	87.2	250	116.3	11600
	disjnction box	unit	1943	169.4	486	225.9	22539
	branching box	unit	1760	153.5	440	204.7	20416
	outlet monophase	unit	152	13.3	38	17.7	1763

Table 6.2 Unit Construction Costs (3/3)

No.	Work items	Unit	Unit construction cost			Equivalent total	Equivalent total
			Total (DH)	F.C (US$)	L.C (DH)	(US$)	(Y)
	fluorescent light, 2*40 w	unit	534	46.6	133	62.1	6194
	duct forcable	m	129	11.3	32	15.0	1496
	painting						
	vinyl painting on external coating	m2	23	2.0	6	2.7	267
	vinyl painting on internal coating	m2	26	2.3	7	3.0	302
	wood painting	m2	32	2.8	8	3.7	37[illegible]
	pipe painting	m2	25	2.2	6	2.9	290

Table 6.3 Unit Prices of Construction Materials and Charges

US$ 1.0=DH 8.6 = Y 100

No.	Materials	Unt	Unit Price (DH)	Equivalent (US$)	Equivalent (Y)
	Unit Price of Materials				
1	portland cement 35 (50 kg)	sac	40	4.7	464
2	portland cement 45 (50 kg)	sac	43	5.0	499
3	white cement (50 kg)	sac	112	13.0	1299
4	gravel, 5/15 and 15/25 mm	m3	145	16.9	1682
5	sand	m3	103	12.0	1195
6	plaster, 50 kg	sac	33	3.8	383
7	reinforcement mild steel, 6 mm	kg	6	0.7	70
8	ditto but TOR 8 mm	kg	7	0.8	81
9	ditto but TOR 10 mm	kg	7	0.8	81
10	ditto but TOR 12 mm	kg	7	0.8	81
11	ditto but TOR 14 mm	kg	7	0.8	81
12	ditto but TOR 16 mm	kg	7	0.8	81
13	stone, 7 cm	pc	3	0.3	35
14	stone, 10 cm	pc	3	0.3	35
15	stone, 15cm	pc	3	0.3	35
16	stone, 20 cm	pc	4	0.5	46
17	brick, 3 holes	pc	1	0.1	12
18	brick, 6 holes	pc	2	0.2	23
19	brick, 8 holes	pc	2	0.2	23
20	brick, 12 holes	pc	3	0.3	35
21	concrete block, 15 cm	pc	4	0.5	46
22	concrete block, 20 cm	pc	5	0.6	58
23	concrete block, 25 cm	pc	5	0.6	58
24	white tile, 15 * 15 cm	pc	2	0.2	23
25	felt for waterproofing, 27S	m2	14	1.6	162
26	felt for waterproofing, 36S	m2	15	1.7	174
27	bitumen	kg	10	1.2	116
28	vinyl paint, 30 kg	unit	621	72.2	7204
29	galvanized pipe, 13 mm (1/2")	m	14	1.6	162
30	galvanized pipe, 19 mm (3/4")	m	23	2.7	267
31	PVC pipe, 100 mm	m	21	2.4	244
32	PVC pipe, 150 mm	m	29	3.4	336
33	light oil	lit	7.3	0.8	85
34	gasoline	lit	4.3	0.5	50
35	lubricant, engine oil	lit	16.8	2.0	195
36	lubricant, grease	kg	35	4.1	406
37	wooden material	m3	700	81.4	8120
38	steel casing 14 " * t 6.35 mm	m	1000	116.3	11600
39	steel casing 12" * t 6.35 mm	m	700	81.4	8120
40	steel casing 10"3/4 * t 6.35 mm	m	650	75.6	7540
41	steel casing 9"5/8 * t 5 mm	m	600	69.8	6960
42	steel casing 8"5/8 * t 4 mm	m	580	67.4	6728
43	steel screen 14 " * t 6.35 mm	m	1200	139.5	13920
44	steel screen 12" * t 6.35 mm	m	1000	116.3	11600
45	steel screen 10"3/4 * t 6.35 mm	m	850	98.8	9860
46	steel screen 9"5/8 * t 5 mm	m	800	93.0	9280
47	steel screen 8"5/8 * t 4 mm	m	650	75.6	7540
	Charges				
1	electricity, public	kwh	0.79	0.1	9
2	Inland transportaion	km.ton	0.45	0.1	5
3	custom & tax duties for pump		(C & F price * DH 1.4)		
4	water boring equipment		(duty free)		
5	port berthing fee for container vessel		(1st day : depends on vessel capacity, & 25 % per every additional day after 1st day)		

Table 6.4 Labor Charges (Daily 8:00 - 17:00)

US$ 1.0 = DH 8.6 = Y 100

No	Descriptions	unit	Unit Charge (DH)	Equivalent (US$)	Equivalent (Y)
0	engineer	day	440	51.2	5104
1	foreman	day	250	29.1	2900
2	plant operator	day	225	26.2	2610
3	equipment operator	day	225	26.2	2610
4	vehicle driver	day	150	17.4	1740
5	mechanic	day	225	26.2	2610
6	electrician	day	225	26.2	2610
7	rigger	day	175	20.3	2030
8	welder	day	175	20.3	2030
9	carpenter	day	175	20.3	2030
10	reinforcement bar worker	day	150	17.4	1740
11	common labour	day	125	14.5	1450

Table 6.5 Rental Charges of Equipment

Conditions 1 : daily basis 8 : 00 - 17 : 00 (per shift)
Conditions 2 : excluding oprator, fuel & lubricants

US$ 1.0 = DH 8.6 = Y 100

No	equipment / capacity	unit	Charge (DH)	Equivalent (US$)	Equivalent (Y)
1	truck trailer, 20 t	day	4620	537.2	53592
2	cargo truck, 6 t	day	616	71.6	7146
3	dump truck, 6 t	day	616	71.6	7146
4	dump truck, 8 t	day	1000	116.3	11600
5	excavator (backhoe), 0.3 m3	day	3000	348.8	34800
6	crawler loader, 1.0 m3	day	3700	430.2	42920
7	wheel loader, 2.0 m3	day	2982	346.7	34591
8	bulldozer, 11 t	day	6523	758.5	75667
9	portable concrete mixer, 0.5 m3	day	500	58.1	5800
10	agitator truck, 3 m3	day	3000	348.8	34800
11	concrete pump car, 20 m3/hr	day	3500	407.0	40600

Table 6.6 Investment Cost for Renovation of Water Source

Type of Intake	Equipment	Unit	Investment (DH)*
Dughole	Dughole	place	3500 HC
	Hand Pump	set	10000
	Drinking facility	lot	5000
	Total		15000+3500 HC
Well (Shallow)	Well	place	1500 HC
	Hand pump	set	10000
	Drinking facility	lot	5000
	Total		15000+1500 HC
Deep Well	Well	place	2500 HC
	Hand pump	set	10000
	Drinking facility	lot	5000
	Total		15000+2500 HC
Spring	Intake facility	lot	30000
	Drinking facility	lot	5000
	Total		35000

* H = Depth of water facility
C = Coefficient related to preliminary design and relation of the rate of % of success.

Table 6.7 Investment Cost of Stand Pipes (1/2)

Water resource	Facility	Equipment	Housing type	Investment (DH) Size of rural village (persons) 300	500	700	900
Ground water	Distribution Network	Reservoir	–	20000	29000	32000	35000
		Stand-pipe with drinking facility	G	40000	80000	120000	160000
			FD	60000	120000	180000	240000
	Intake	Dughole	–	3500HC	3500HC	3500HC	3500HC
		Shallow well	–	1500HC	1500HC	1500HC	1500HC
		Deep well	–	2500HC	2500HC	2500HC	2500HC
	Type of Extraction	Electric pump	–	51000	42500	49000	49500
		Thermal (i.e. Pump + Generator	–	61500	50000	59500	67500
		Solar pump	–	102000 + 2580 h	90000 + 3350 h (h<40 m)	84000 + 5600 h (h<30 m)	99000 + 7020 h (h<20 m)
		Wind pump (Favorable condition)	–	102000 + 1740 h	50000 + 1400 h (h<40 m)	70000 + 2800 h (h<20 m)	–
		Wind pump (Unfavorable condition)	–	78000 + 1890 h (h<25 m)	–	–	–

Notes:

G	Grouped housing distance (<1 km)
FD	Lightly disperses/scattered housing (1 to 2 km)
H	Depth of water facility
C	Coefficient related to preliminary design and is function of rate of success
h	Piezometric level of water

- 1 Stand pipe + 1 Drinking facility serving 200 to 300 person using PVC pipe ø40 mm
- 1 Reservoir having one day capacity
- 1 Stand pipe in the vicinity of the reservoir, either stand pipes are located at 350 m in Grouped housing and 700 m in scattered housing

Table 6.7 Investment Cost of Stand Pipes (2/2)

Water resource	Equipment	Type of housing	Investment (DH)			
			Population served (persons)			
			300	500	700	900
Daily water consumption (m^3/day)			11	19	27	34
Spring	Intake facility	-	30000	30000	30000	30000
	Pipework	-	68L	72L	72 L	77 L
	Diameter	-	40 mm	50 mm	50 mm	63 mm
	Stand pipe and drinking facility (No.)	G	40000 (1)	80000 (2)	120000 (3)	160000 (4)
		FD	60000 (1)	120000 (2)	180000 (3)	240000 (4)
	Total*	G	138000	180000	220500	270000
		FD	159000	220000	280000	351000
Surface water	Filter facility	-	45000	55000	70000	90000
	Volume (m^3)		13	20	30	40
	Reservoir	-	15000	24000	27000	30000
	Volume (m)		10	20	25	30
	Transmission line		68 L	72 L	72 L	77 L
	Diameter		40 mm	50 mm	50 mm	63 mm
	Stand pipes with drinking facility (No.)	G	40000 (1)	80000 (2)	120000 (3)	160000 (4)
		FD	60000 (1)	120000 (2)	180000 (3)	24000 (4)
	Total*	G	168000	231000	289000	357000
		FD	188000	271000	349000	437000

Notes:

L	Distance to water source: 1 km
G	Grouped housing type (<1 km)
FD	Lightly scattered housing (1 to 2 km)

Table 6.8 Investment Cost for House Connections (1/2)

Rural Locality with 1700 persons

Water source	Component	Type of facility	Equipment		Investment (DH)	Equipment operating on									
						Electric power					Generator				
Ground water	Provision of water source	Intake facility	Dughole > 3 l/s		3500 HC	x					x				
			Dughole 1 to 2 l/s		3500 HC		xx					xx			
			Shallow well	>3 l/s	1500 HC			x					x		
				1 to 2 l/s	1500 HC				xx					xx	
			Deep well		2500 HC					x					x
			Pump + panel board + pipes + accessories		60000	x	xx	x	xx	x	x	xx	x	xx	x
			Generator + accessories		100000						x	xx	x	xx	x
			Disinfection facility		15000	x	x	x	x	x	x	x	x	x	x
			Shelter		20000	x	x	x	x	x	x	x	x	x	x
	Transmission + Storage	Gravity	Pipes		185 L			x					x		
			Reservoir		440000			x					x		
		Pumping	Pipes		155 L			x					x		
			Reservoir		220000			x					x		
	Distribution	G	Network		714000			x					x		
			House connection		255000			x					x		
		FD	Network		1071000			x					x		
			House connection		255000			x					x		

Notes

L	: Length of pipe in meters
B.P.	: 8 persons per house connection
Pipework	: 50% Asbestos cement and 50% PVC
Reservoir	: Capacity = daily water consumption
Losses in the network	: 20%
G	: Grouped housing (<1 km)
F.D.	: Lightly scattered housing (1 to 2 km)
Water demand	: 50 l/c/day - 20 l/large livestock/day
C	: Coefficient relative to preliminary design and is function of the rate of success of the project
H	: Depth of water supply facility in meters

Table 6.8 Investment Cost for House Connections (2/2)

Rural Locality with 1700 persons

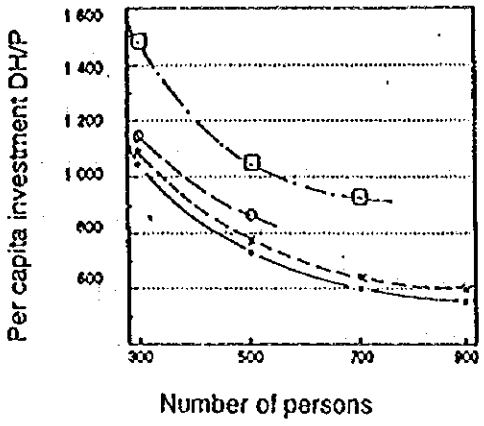
Water resource	Component	Type of facility	Equipment	Investment (DH)
Surface water	Provision of water source	Pumping/ Force main	Prefiltration basin/Tank	200,000
			Filtration basin	250,000
			Reservoir	200,000
			Pump house	60,000
			Pumps/Control panel + pipes + accessories	60,000
			Generator + accessories	35,000
			Disinfection facility	15,000
		Gravity	Prefiltration tank	200,000
			Filtration basin/tank	250,000
			Disinfection facility	15,000
	Transmission + Storage	Gravity	Pipes	185 L
			Reservoirs	440,000
		Pumping	Pipes	155 L
			Reservoirs	220,000
	Distribution	G	Network	714,000
			House connection	255,000
		FD	Network	1,071,000
			House connection	255,000
Spring	Provision of water source	Gravity	Intake at spring	30,000
		Pumping	Intake at spring	30,000
			Pump + control panel + pipes + accessories	60,000
			Generator	100,000
			Disinfection	15,000
			Pump house	60,000
	Transmission + Storage	Gravity	Pipes	185 L
			Reservoir	440,000
		Pumping	Pipes	155 L
			Reservoir	220,000
	Distribution	G	Network	220,000
			House connection	225,000
		FD	Network	1,071,000
			House connection	255,000

Notes

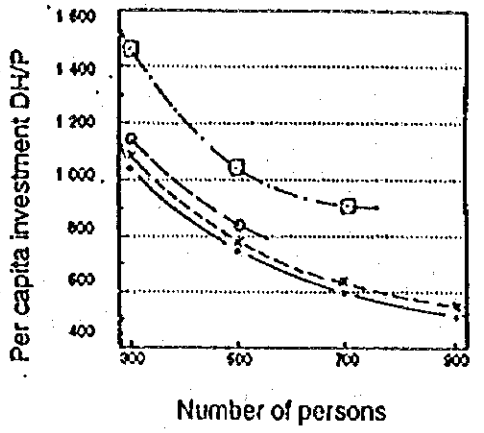
L	: Length of pipe in meters
B.P.	: 8 persons per house connection
Pipework	: 50% Asbestos cement and 50% PVC
Reservoir	: Capacity = daily water consumption
Losses in the network	: 20%
G	: Grouped housing (<1 km)
F.D.	: Lightly scattered housing (1 to 2 km)
Water demand	: 50 l/c/day - 20 l/large livestock/day - 0.4 large livestock/capita

Figure 6.1 **Per Capita Investment**
Stand Pipes - Lightly Scattered Housing 1 to 2 km

Ground water
Dughole
D = 35 m SWL = 30 m

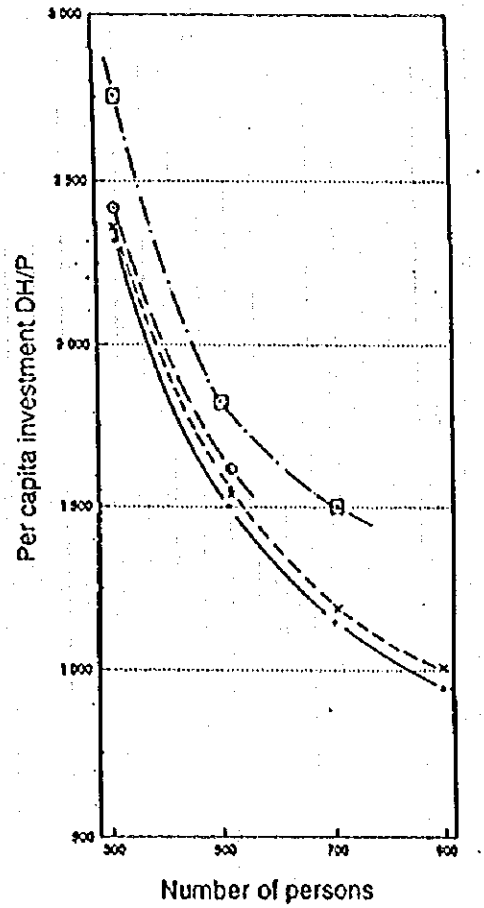


Ground water
Shallow well
D = 80 m SWL = 30 m

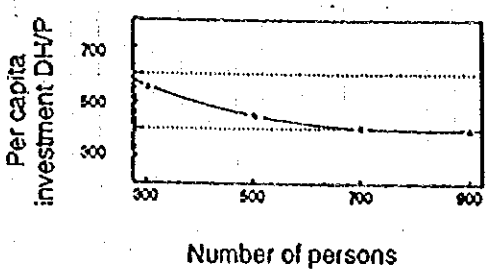


Legend
- Electric pump
- Pump with generator
- Solar pump
- Wind pump

Ground water
Deep well
D = 150 m SWL = 30 m



Spring water



Surface water

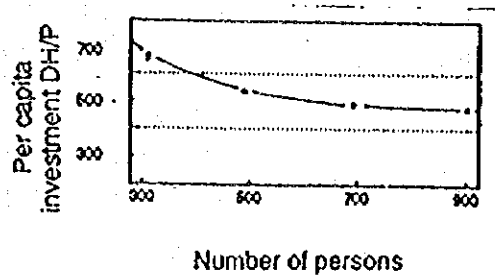


Figure 6.2 Per Capita Investment
Stand Pipes - Grouped Housing (< 1 km)

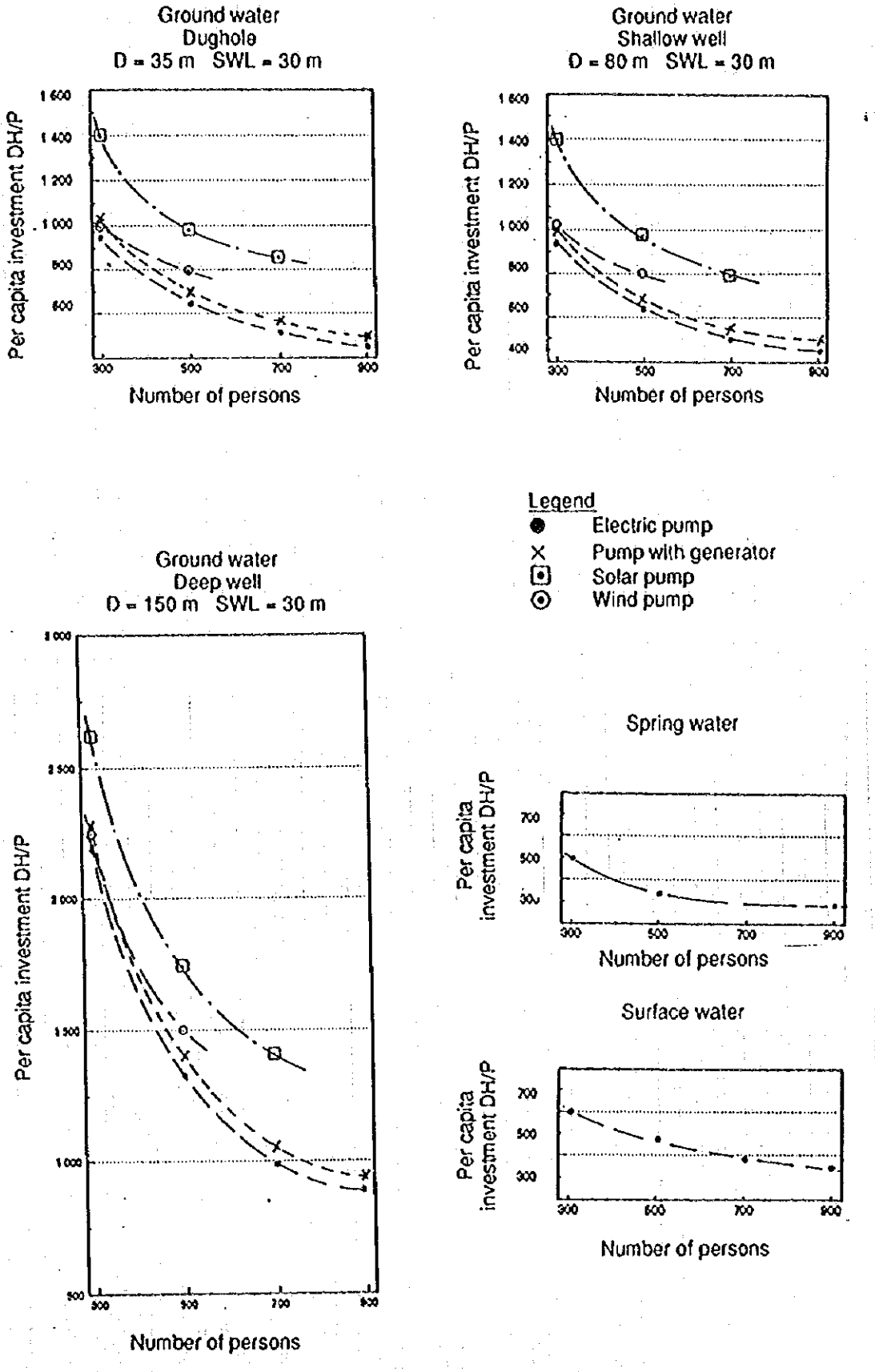
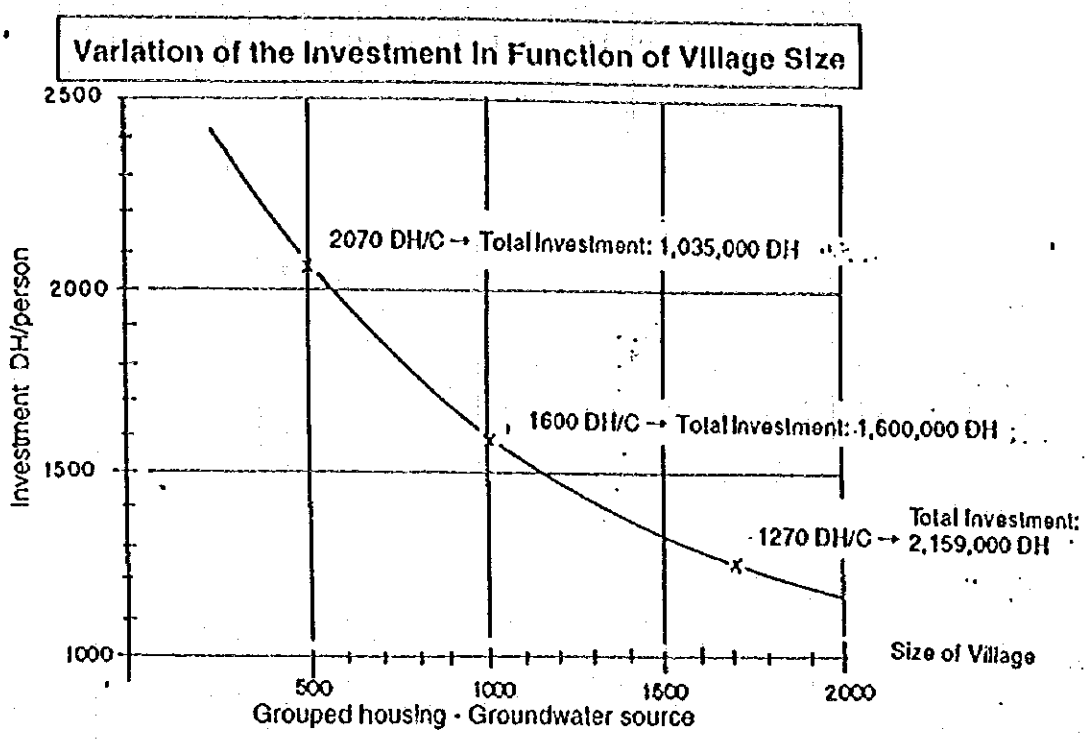
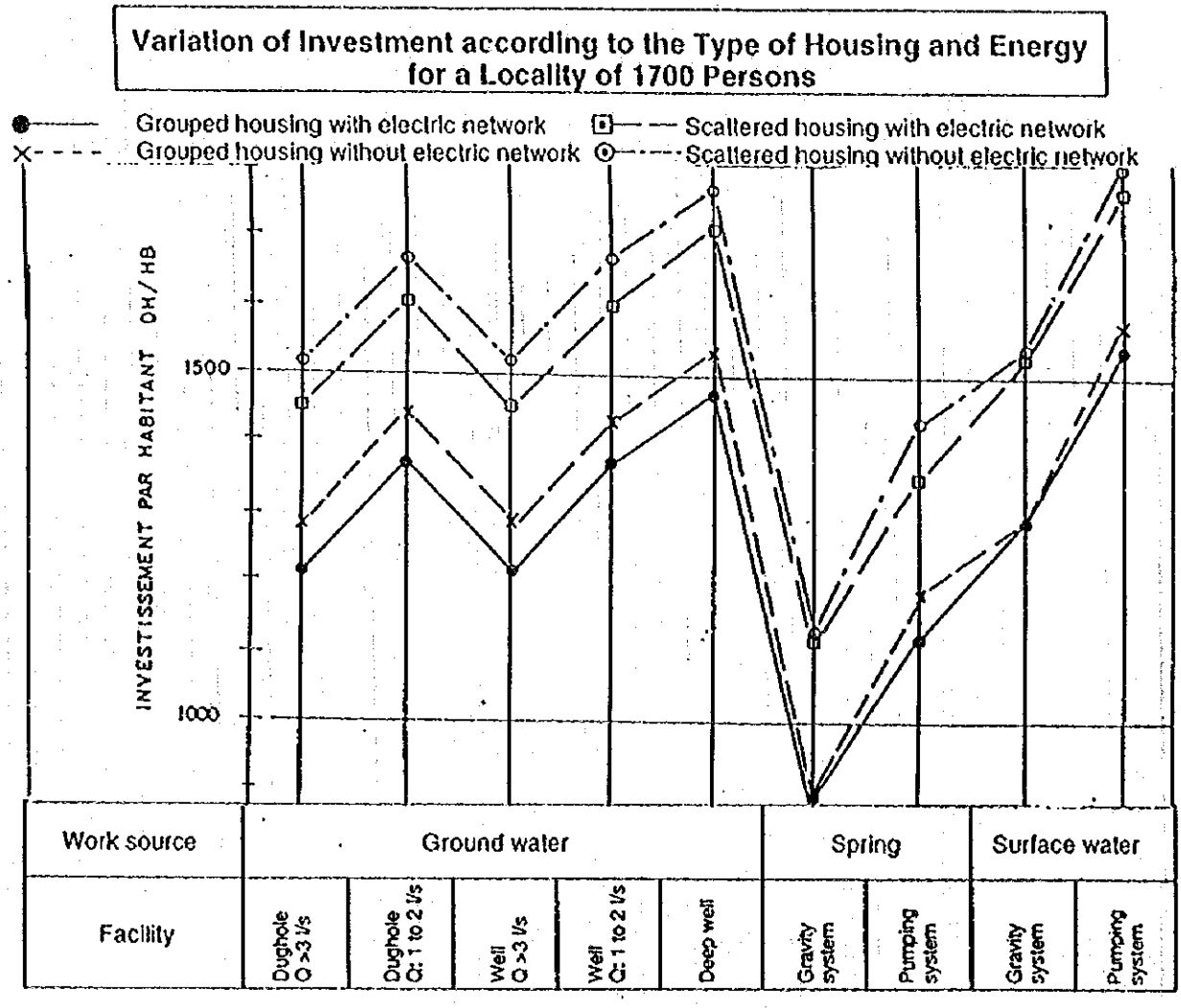


Figure 6.3 Per Capita Investment
House Connection & Distribution Network





Distance from water point to locating: 1000 m – Depth of well: 35 m – Rural well: 80 m – Deep well: 150 m