Figures

Figure 4.1.1 Categorization of governorates

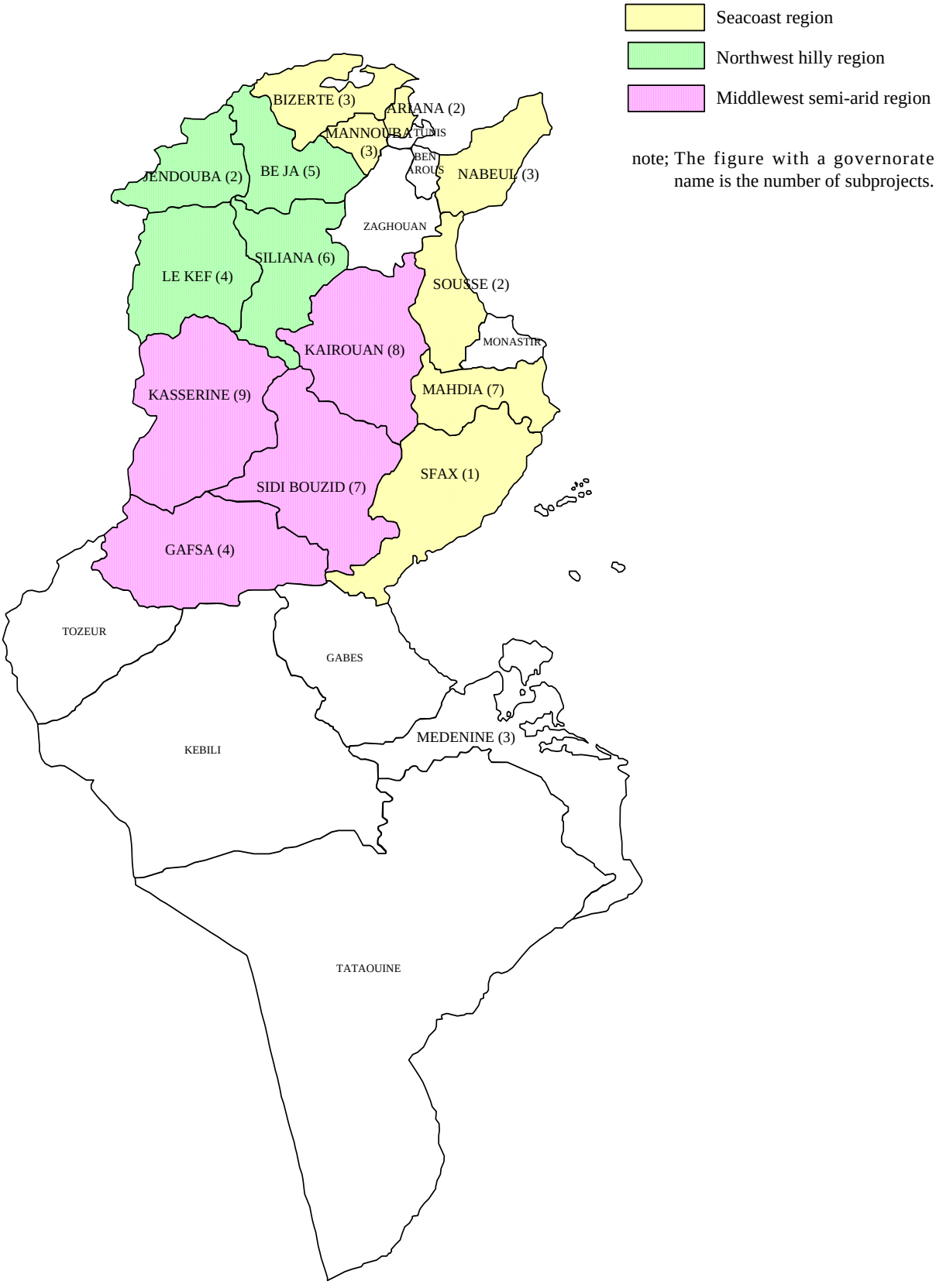


Figure 7.2.1 Feasibility study work flow

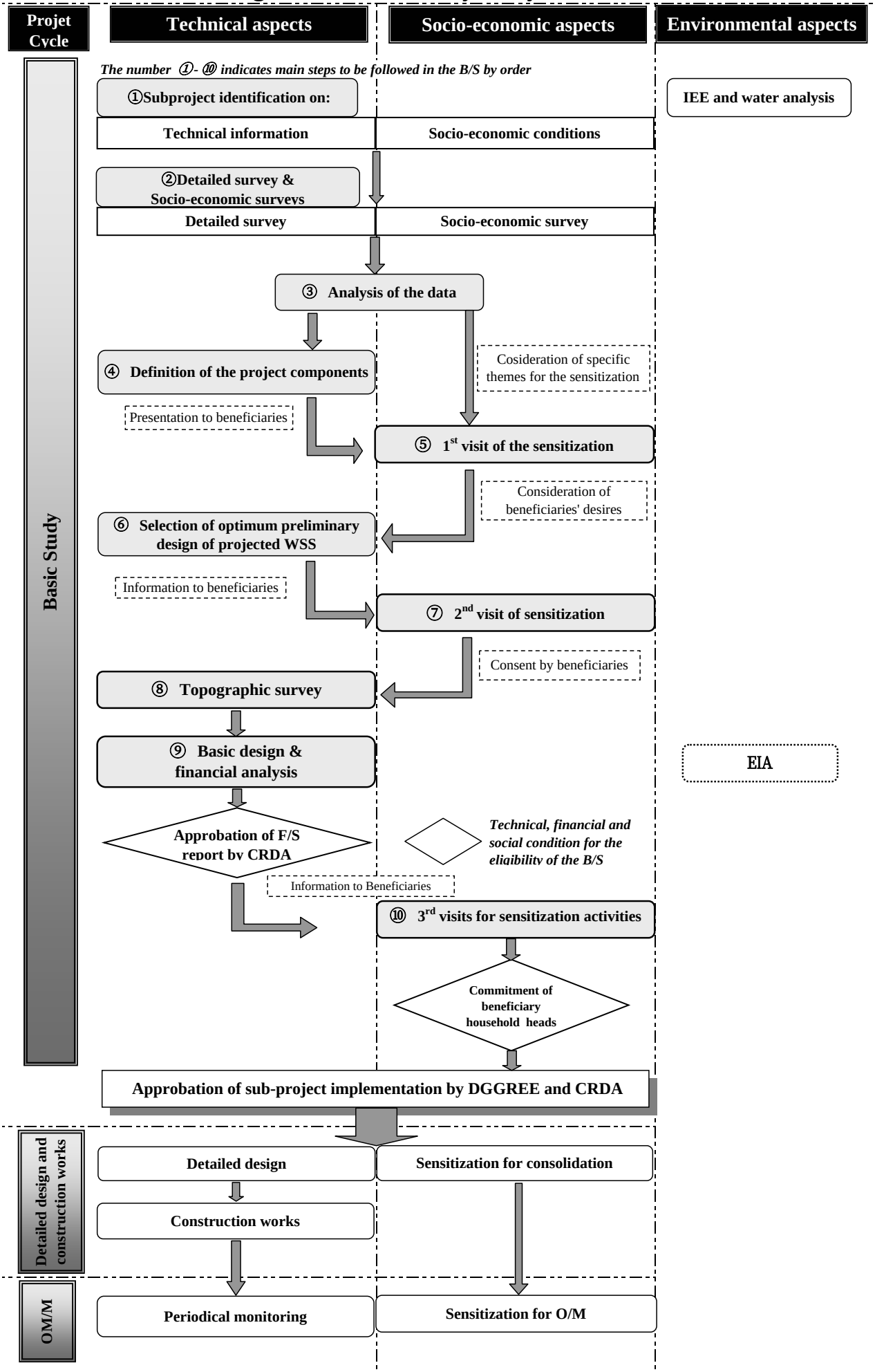


Figure 8.4.1 Type of distribution systems

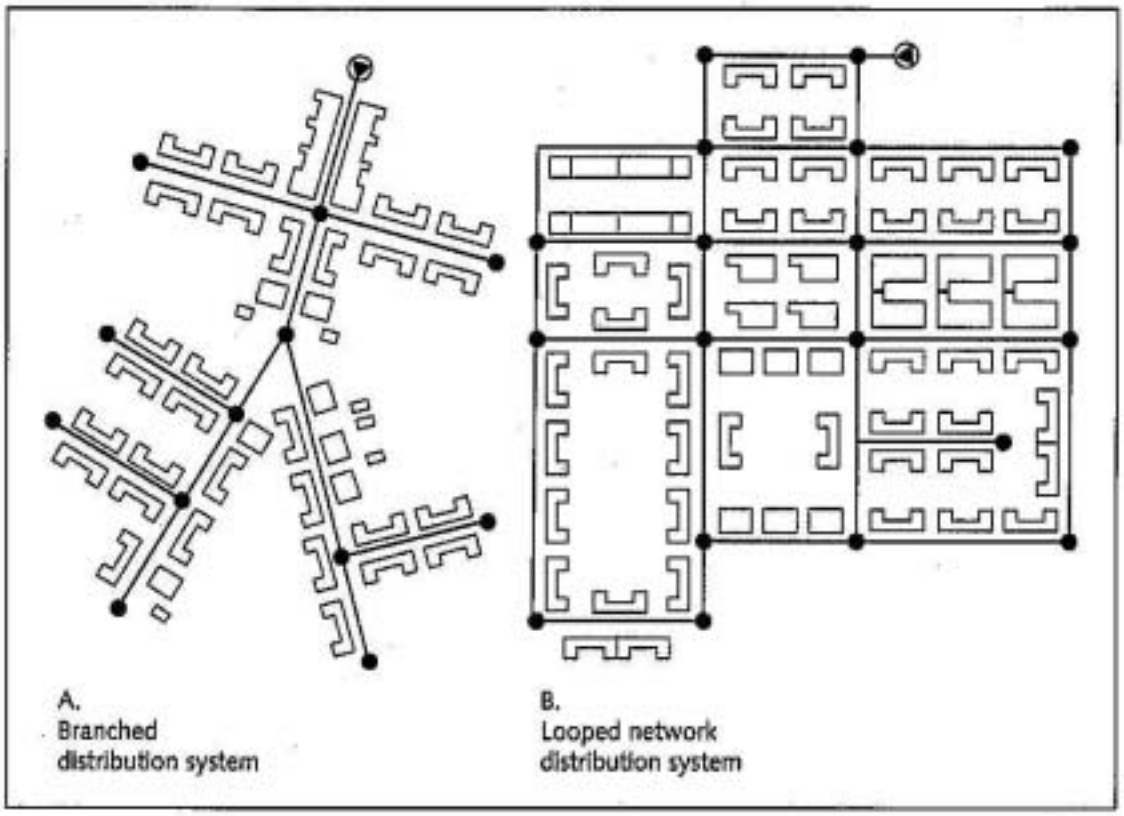


Figure 9.1 Sub-project Identification Card (1/4)

ALIMENTATION EN EAU POTABLE DES ZONES RURALES
GOUVERNORAT DE SILIANA

FICHE D'IDENTIFICATION
PROJET DE Knaziz
Année de réalisation 2004

1/ SITUATION GEOGRAPHIQUE/ADMINISTRATIVE

DELEGATION	Bargou
SECTEUR	Drija
ZONE/LOGALITE	Knaziz

2/ POPULATION, ELEVES, CHEPTEL PAR LOCALITE

Localités	Knaziz	*Tilel*	Ouled Said				TOTAL
Population	210	180	140				530
Dispensaire	1						1
Mosquée							-
Ecole	1						1
Elèves	100						100
Ovins + Caprins	150	200	100				450
Bovins + Equidés	60	80	50				180

3/ SITUATION ACTUELLE DETAILLEE D'AEP

La population de la zone du projet s'alimente à partir de :
- Ain Tricha pour la localité Ouled Saad
- citernes publics et citernes tractées pour la localité Knaziz
- Forage Tilel de quantité médiocre (exés de nitrate)

Figure 9.1 Sub-project Identification Card (2/4)

4/ SOLUTION PROPOSEE ET COMPOSANTES DU PROJET

L'alimentation de la zone du projet sera à partir du réseau AEP/GIC ouled Ben Amor qui est en cours d'exécution. Les composantes du projet sont :

- Construction et équipement d'une station de reprise de 15 m3
- Refoulement sur un linéaire de 5 km
- Construction d'un reservoir de 20 m3 et distribution sur un linéaire de 4 km
- 4 Borne fontaine et 3 Bache de reprise

5/ RESSOURCES EN EAU ENVISAGEES

NATURE	Forage	Puits	Source
Existant A créer A aménager			

Piquage SONEDE	Extension GR
	x

6/ COMPOSANTES DU PROJET

Réservoir 1	
Volume (m³) Type	20

Ouvrage de distribution

Désignation	Nombre
Borne Fontaine	7
Potence	
Abreuvoir	
Branchement particulier	2 6

Conduites

Nature	Diamètre	Long (ml)
	110	
	90	9000
	75	
PHED	63	

7/ ESTIMATION DES COUTS 1000DT

Désignation	Coût(1000 DT)
Ressource eau	
Réseau - Fournitures	100
- Travaux	120
Equipement	30
Electrification	
Imprévus (15%)	50
Total	300

Coût/habitant	566DT/h

Figure 9.1 Sub-project Identification Card (3/4)

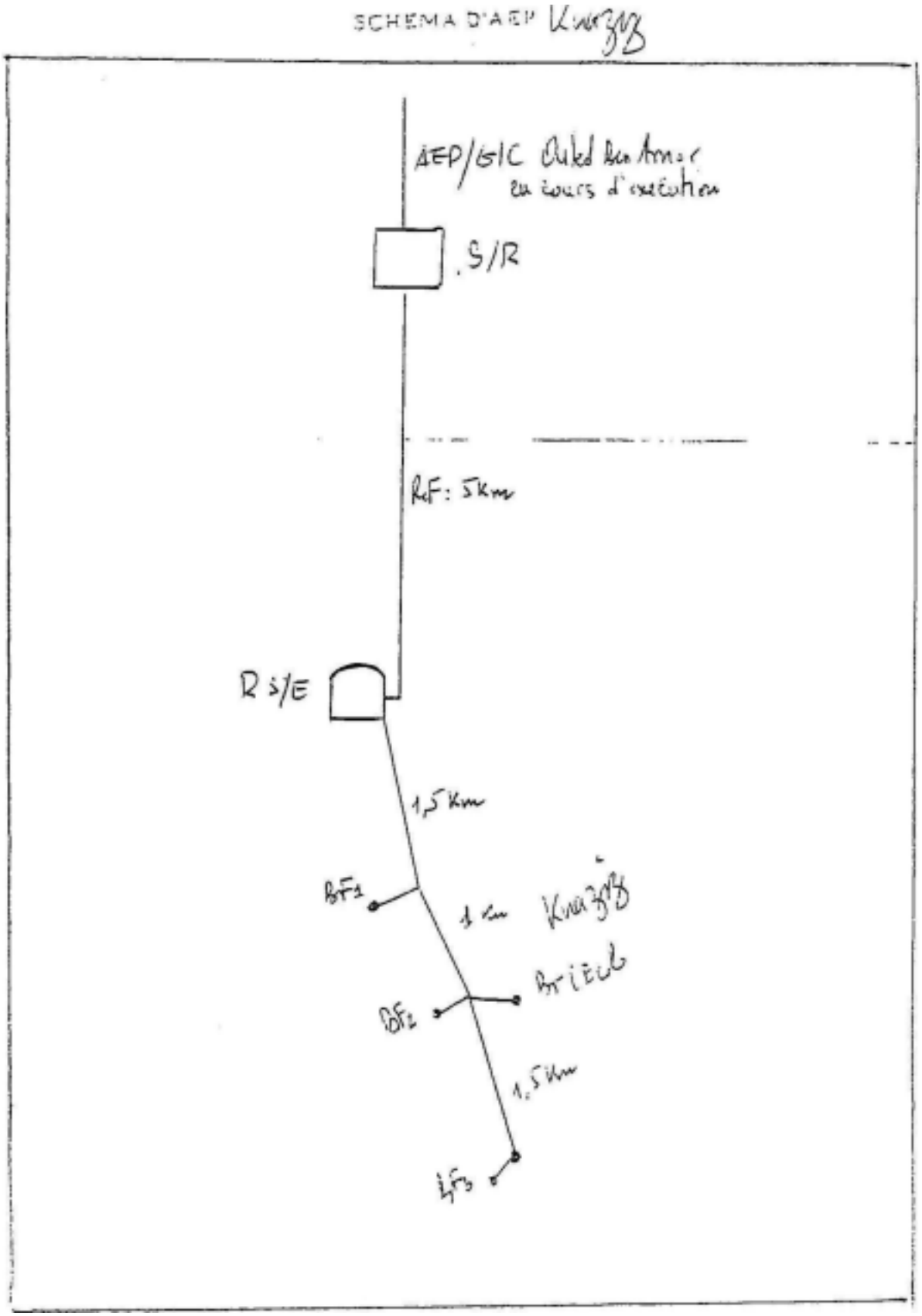
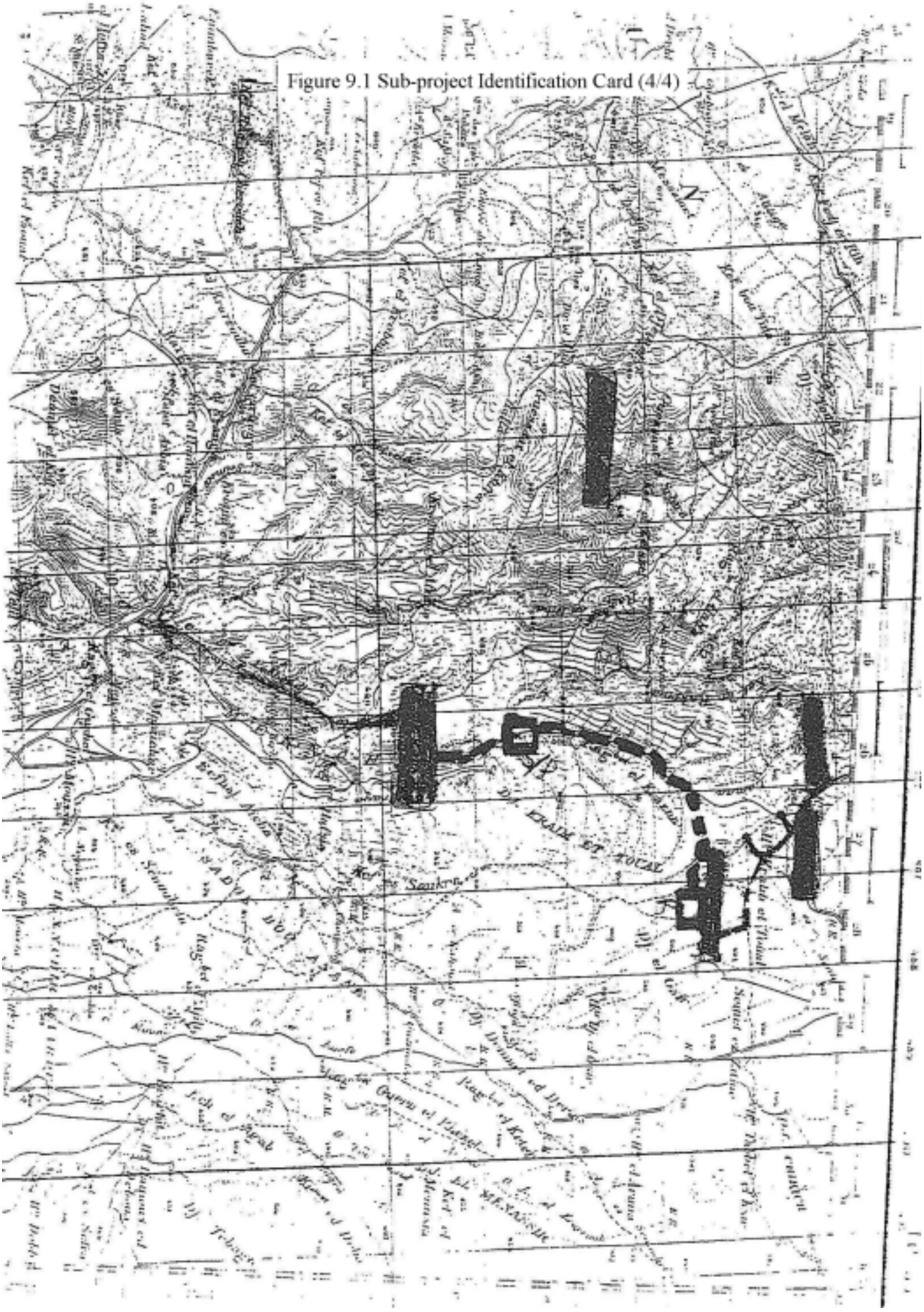


Figure 9.1 Sub-project Identification Card (4/4)



Tables

Table 3.3.1a Sub-projects for 2005

Initial	Starting of the Study	Present	Governorate	Sub-project	Basis sur les fiches d'identification				Based on Basic Study					Remark
					Water Source	No. of Localities	Present Population 2002	Projected Population 2020	Maximum Daily Water Supply in 2020 m3/day	Water Source	No. of Localities	Present Population 2004	Projected Population 2020	Maximum Daily Water Supply in 2020 m^3/day	
1			~~NABEUL~~	~~RMIL ET FARJOUN~~	~~SONEDE CONNECTION~~	~~3~~	~~300~~	~~384~~	~~27.98~~						Covered by SONEDE
	1	1	NABEUL	BASSATINE	EXTENSION GR	5	450	574	29.87	EXTENSION GR	14	927	1141	78.42	Replaces the sub-project above
2	2	2	NABEUL	BEN THAMEUR	SONEDE CONNECTION	2	200	255	14.78	SONEDE CONNECTION	2	174	214	11.71	
3	3	3	NABEUL	BIR BEN ZAHRA	SONEDE CONNECTION	6	625	800	41.64	SONEDE CONNECTION	14	533	655	38.32	
4			~~BEJA~~	~~AIN SOLTANE~~	~~DEEP WELL~~	~~8~~	~~1179~~	~~1203~~	~~62.61~~						to 2006
5			~~BEJA~~	~~OULED BEN ABID-LAHOUACHE~~	~~DEEP WELL~~	~~2~~	~~360~~	~~367~~	~~26.75~~						to 2006
6	4	4	BEJA	MZOUGHA-ZELDOU (1st PHASE	SONEDE CONNECTION	5	709	722	52.62	SONEDE CONNECTION	22	1794	1824	129.66	
7	5	5	BEJA	MZOUGHA-ZELDOU (2ndPHASE	EXTENSION GR	3	556	567	41.31						
	6	6	BEJA	KEF DAROUGUI-SFAYA	SPRING	1	270	275	20.03	EXTENSION GR	5	465	473	33.62	from 2006
	7		~~BEJA~~	~~GASR HDID A BEJA SUD~~	~~DEEP WELL~~	~~2~~	~~505~~	~~515~~	~~37.53~~		~~15~~	~~962~~	~~979~~	~~71.34~~	from 2006
8	8		~~MEDENINE~~	~~CITE KRICHID~~	~~SONEDE CONNECTION~~	~~1~~	~~174~~	~~235~~	~~20.54~~		~~9~~	~~308~~	~~397~~	~~22.23~~	
9	9		~~MEDENINE~~	~~CITE KRID~~	~~SONEDE CONNECTION~~	~~4~~	~~234~~	~~317~~	~~19.8~~		~~5~~	~~254~~	~~328~~	~~14.74~~	
10	10		~~MEDENINE~~	~~CITE MARS~~	~~SONEDE CONNECTION~~	~~1~~	~~306~~	~~414~~	~~30.17~~		~~10~~	~~400~~	~~517~~	~~30.32~~	
11	11	7	SFAX	GUERGOUR-BRAHMIA FKAYHI	SONEDE CONNECTION	15	6155	8166	539.53	SONEDE CONNECTION	47	3622	4591	314.58	
12	12	8	SOUSSE	OULED FALEH	SONEDE CONNECTION	3	185	245	12.75	SONEDE CONNECTION	4	179	226	19.27	
13			~~KAIROUAN~~	~~CHANZOUR~~	~~DEEP WELL~~	~~6~~	~~800~~	~~948~~	~~49.34~~						to 2006
14	13		~~KAIROUAN~~	~~CRAIRIA~~	~~EXTENSION GR~~	~~2~~	~~275~~	~~326~~	~~16.97~~		~~10~~	~~499~~	~~577~~	~~39.49~~	Covered by SONEDE
15	14	9	KAIROUAN	DOUAR EL BELDI	EXTENSION GR	3	462	548	28.52	EXTENSION GR	6	355	409	32.46	
	15		~~KAIROUAN~~	~~ROUAOUNA~~	~~DEEP WELL to SONEDE~~	~~4~~	~~1440~~	~~1722~~	~~89.63~~		~~4~~	~~1440~~	~~1662~~	~~86.5~~	Insufficient capacity of the projected water source
16	16	10	KAIROUAN	OULED ABBES	EXTENSION GR	4	350	414	21.55	EXTENSION GR	17	741	852	63.27	
17	17	11	KAIROUAN	OULED BOUDABOUS	EXTENSION GR	2	480	569	29.62	EXTENSION GR	10	599	692	48.12	
18			~~GABES~~	~~GRADOU~~	~~DEEP WELL~~	~~1~~	~~480~~	~~548~~	~~47.92~~						Study has been completed
19	18	12	MANOUBA	EL MAAFRINE	SONEDE CONNECTION	1	120	151	7.86	EXTENSION GR	9	353	478	33.98	
20			~~MANOUBA~~	~~EL MEHRINE EL MAHFOURA~~	~~SONEDE CONNECTION~~	~~1~~	~~150~~	~~188~~	~~9.79~~						Study has been completed
21	19	13	MANOUBA	TIRASSET	SONEDE CONNECTION	1	216	271	14.11	SONEDE CONNECTION	6	196	264	16.24	
22	20		~~SILIANA~~	~~BIR EZZOUZ~~	~~SONEDE CONNECTION~~	~~7~~	~~423~~	~~414~~	~~21.55~~		~~8~~	476	468	34.1	
23	21		~~SILIANA~~	~~SFINA~~	~~SONEDE CONNECTION + DEEP~~	~~12~~	~~2988~~	~~2932~~	~~152.61~~		~~28~~	3200	3151	229.6	
24	22	14	SILIANA	FEJ-ASSEKRA	EXTENSION GR	3	690	677	35.24	EXTENSION GR	10	648	638	45.36	
25	23	15	SILIANA	KSAR-OULED BOUHANI	SONEDE CONNECTION	3	700	686	35.71	SONEDE CONNECTION	17	1039	1022	72.65	
26			~~ZAGHOUAN~~	~~EL GHNEIATTE~~	~~EXTENSION GR~~	~~1~~	~~394~~	~~442~~	~~30.51~~						Study has been completed
27			~~BIZERTE~~	~~SIDI ABDELBASET~~	~~DEEP WELL~~	~~3~~	~~449~~	~~553~~	~~40.3~~						Study has been completed
28			~~BIZERTE~~	~~BENI LABBOUZ~~	~~DEEP WELL~~	~~4~~	~~2100~~	~~2586~~	~~154.07~~						Study has been completed
29			~~BIZERTE~~	~~EL MA LABIADH~~	~~EXTENSION GR~~	~~1~~	~~359~~	~~442~~	~~27.75~~						Study has been completed
30			~~BIZERTE~~	~~OULED RAHMA~~	~~DEEP WELL~~	~~4~~	~~1495~~	~~1840~~	~~100.94~~						Study has been completed
31	24	16	ARIANA	CEBALET BEN AMMAR	SONEDE CONNECTION	1	54	77	4.18	SONEDE CONNECTION	4	77	103	6.54	
32	25	17	MAHDIA	SLAYMIA	SONEDE CONNECTION	1	1494	1874	132.95	SONEDE CONNECTION	18	1380	1674	111.41	
33	26	18	MAHDIA	SKHAIBIA	EXTENSION GR	1	390	489	38.48	EXTENSION GR	8	484	587	50.07	
34	27	19	MAHDIA	KHIOUR	SONEDE CONNECTION	1	1200	1505	112.11	SONEDE CONNECTION	18	1453	1760	124.37	
35	28	20	MAHDIA	RMADHNIA	SONEDE CONNECTION	1	160	201	13.85	SONEDE CONNECTION	5	110	134	9.08	
	29	21	MAHDIA	RQUIAT	SONEDE CONNECTION	1	507	644	49.19	EXTENSION GR	11	421	516	38.5	Implementation scheduled for 2006
36	30	22	JENDOUBA	SOUALHIA	SONEDE CONNECTION	5	424	458	32.61	SONEDE CONNECTION	8	364	388	27.58	
37	31	23	JENDOUBA	EL ISLAH	SONEDE CONNECTION	3	351	378	27.51	SONEDE CONNECTION	9	476	507	29.09	
38	32	24	LE KEF	EZZAGUAYA	SONEDE CONNECTION	6	456	456	33.22	SONEDE CONNECTION	11	340	340	24.16	
39	33		~~LE KEF~~	~~OULED GANA~~	~~EXTENSION GR (SPRING)~~	~~3~~	~~366~~	~~366~~	~~19.05~~		~~7~~	~~253~~	~~253~~	~~17.93~~	
40	34		~~GAFSA~~	~~HENCHIR BONCHMEL~~	~~EXTENSION GR~~	~~1~~	~~90~~	~~99~~	~~6.18~~		~~5~~	~~446~~	~~483~~	~~34.03~~	
41	35	25	GAFSA	HCHACHNA	EXTENSION GR	2	100	110	6.87	EXTENSION GR	9	363	394	33.62	
42			~~GAFSA~~	~~OUED JEDARI~~	~~SONEDE CONNECTION~~	~~6~~	~~300~~	~~330~~	~~20.61~~						Study has been completed
43			~~GAFSA~~	~~EL ALANDO II~~	~~EXTENSION GR~~	~~1~~	~~360~~	~~396~~	~~24.73~~						Study has been completed
44	36	26	GAFSA	OUED ZITON	EXTENSION GR	1	100	110	6.87	EXTENSION GR	4	135	146	12.45	
45			~~GAFSA~~	~~EL AABACHGA~~	~~EXTENSION GR~~	~~1~~	~~120~~	~~132~~	~~8.24~~						Study has been completed
46	37	27	KASSERINE	AIN DEFLA	DEEP WELL	3	950	1261	85.76	EXTENSION GR	22	1044	1325	95.14	
47	38	28	KASSERINE	FAKET EL KHADEM	DEEP WELL	2	600	796	53.72	IRRIGATION SYSTEM	32	1207	1528	112.44	
48	39	29	KASSERINE	OULED BARKA	DEEP WELL	2	550	730	53.19	EXTENSION GR	40	1575	1998	136.74	
49	40	30	KASSERINE	SIDI SHIL	DEEP WELL	6	1200	1593	94.41	IRRIGATION SYSTEM	20	727	922	75.37	
50	41	31	SIDI BOUZID	M'BARKIA	EXTENSION GR	1	210	279	22.69	EXTENSION GR	13	848	1078	109.68	
51	42	32	SIDI BOUZID	OULED NAOUI	EXTENSION GR	4	600	796	59.38	EXTENSION GR	14	931	1181	80.14	
52			~~SIDI BOUZID~~	~~BLAHDIA~~	~~DEEP WELL~~	~~6~~	~~1200~~	~~1592~~	~~127.03~~						Study has been completed
53	43	33	SIDI BOUZID	OULED YOUSSEF GALLEL	EXTENSION GR	1	300	398	31.76	EXTENSION GR	5	321	408	28.22	
54			~~SIDI BOUZID~~	~~GARD HADID~~	~~DEEP WELL~~	~~2~~	~~500~~	~~663~~	~~52.45~~						to 2006
55	44		~~SIDI BOUZID~~	~~OUAMRIA-ABABSIA~~	~~EXTENSION GR~~	~~2~~	~~480~~	~~637~~	~~53.59~~		~~9~~	~~905~~	~~1149~~	~~84.96~~	
56	45		~~SIDI BOUZID~~	~~GOULEB~~	~~EXTENSION GR~~	~~2~~	~~1200~~	~~1593~~	~~133.13~~		~~23~~	~~1844~~	~~2340~~	~~171.52~~	
57	46		~~SIDI BOUZID~~	~~GHRIST EST~~	~~SONEDE Connection~~	~~6~~	~~900~~	~~1194~~	~~81.82~~		~~10~~	~~1559~~	~~1978~~	~~158.72~~	
					Total	99	21,814	27,075	1,784		434	23,881	28,468	2,042	

Withdrawal from JBIC funded project
Replaced by the subproject for 2006
Study has b Study has been completed
Study is sus Suspended due to inappropriate source water quality

Table 3.3.1b Sub-projects for 2006

Initial	Starting of the Study	Present	Governorate	Sub-project	Based on Subproject Identification Cards					Based on Basic Study					Remark
					Water Source	No. of Localities	Present Population	Projected Population	Maximum Daily Water Supply in 2020	Water Source	No. of Localities	Present Population	Projected Population	Maximum Daily Water Supply in 2020	
							2002	2021	m3/day			2005	2021	m^3/day	
1	~~1~~	~~1~~	ARIANA	EL ACHICH	SONEDE CONNECTION	1	150	219	11.40	SONEDE CONNECTION	7	290	392	20.87	
2	2	2	MANOUBA	SIDI ACHOUR	SONEDE CONNECTION	1	126	160	8.33	SONEDE CONNECTION	8	162	220	14.96	
3	3		~~NABEUL~~	~~BOULAHOUADH~~	~~SONEDE CONNECTION~~	2	175	226	11.76						covered by SONEDE
4	4		~~NABEUL~~	~~TASSELMINE ET SOUASSI~~	~~EXTENSION GR~~	6	335	434	29.19						Withdrawal from JBIC funded project
5			~~BIZERTE~~	~~JAAFAR HAMMAMET~~	~~SONEDE CONNECTION~~	2	520	647	47.10						Study has been completed.
6			~~BIZERTE~~	~~BORJ EL GOLLI~~	~~SONEDE CONNECTION~~	3	477	594	39.80						Study has been completed.
7			~~BIZERTE~~	~~SERYA EL GRAGUIB~~	~~DEEP WELL~~	2	650	809	49.00						Study has been completed.
	5	3	BIZERTE	ETRAMIS-EDMAIN	DEEP WELL	6	610	751	53.38	DEEP WELL	21	622	743	49.92	
	6	4	BIZERTE	EL KALBOUSSI	DEEP WELL	6	1120	1379	98.00	DEEP WELL	41	1185	1414	100.36	
	7	5	BIZERTE	SIDI HASSEN	SONEDE CONNECTION	4	353	435	30.89	SONEDE CONNECTION	**25**	**477**	**569**	40.4	
8			~~BEJA~~	~~AIN SOTTARA BOUCHEB~~	DEEP WELL	3	768	783	56.60						Insufficient capacity of deep well
9			~~BEJA~~	~~EL YOUSSER 2~~	DEEP WELL	1	250	255	18.60						Insufficient capacity of deep well
10			~~BEJA~~	~~OULED BEN ABID LAHOUAD~~	DEEP WELL	2	360	367	26.75						Insufficient capacity of deep well
11			~~BEJA~~	~~AIN SOLTANE~~	~~SPRING~~	8	1179	1203	62.61						Study has been suspended due to source water quality.
12	8	6	BEJA	AIN DAM-NEFZA	SONEDE CONNECTION	1	1480	1510	99.51	SONEDE CONNECTION	**23**	**1672**	**1699**	109.36	
	9	7	BEJA	GMARA	SONEDE CONNECTION	5	2225	2268	161.19	SONEDE CONNECTION	12	957	970	69.08	
	10		~~JENDOUBA~~	~~EL FRACHICHE~~	~~DEEP WELL~~	5	802	865	61.50						Study has been suspended due to source water quality.
13	11		~~LE KEF~~	~~EL ARGOUB ERRHAMNA~~	~~DEEP WELL~~	4	650	650	46.20						Study has been suspended due to source water quality.
	12	8	LE KEF	FORNA	SONEDE CONNECTION	5	625	625	44.43	SONEDE CONNECTION	15	410	410	23.57	
	13	9	LE KEF	EL OUENA	EXTENSION GR	6	400	400	28.43	EXTENSION GR	11	481	481	29.02	
		10	LE KEF	ESBIAAT, EL AGROUB ET SOUALHIA	DEEP WELL	3	780	780	55.44	DEEP WELL	21	1298	1298	92.21	
14	14	11	SILIANA	GHANGUET ZGALASS	EXTENSION GR	1	210	206	10.72	EXTENSION GR	3	143	140	8.54	
15	15	12	SILIANA	SIDI DAHER	EXTENSION GR	5	950	931	48.46	EXTENSION GR	13	822	809	51.19	
16	16	13	SILIANA	AGBA	SONEDE CONNECTION	4	582	571	29.72	SPRING	9	655	645	45.79	
17	17	14	SILIANA	NSIRAT	SONEDE CONNECTION	4	360	352	18.32	SONEDE CONNECTION	8	273	268	19.09	
18	18	15	KAIROUAN	GHANZOUR	DEEP WELL	6	800	948	49.34	DEEP WELL	18	723	834	69.79	
19	19	16	KAIROUAN	GOUAAD	EXTENSION GR	5	570	683	35.55	EXTENSION GR	11	673	775	63.64	
	20	17	KAIROUAN	KHOUALDIA	EXTENSION GR	7	450	352	45.51	EXTENSION GR	15	477	551	45.62	
	21	18	KAIROUAN	HSAINIA	EXTENSION GR	3	340	403	34.38	EXTENSION GR	10	687	793	62.53	
		19	KAIROUAN	MAAMRIA	EXTENSION GR	6	342	405	34.59	EXTENSION GR	15	666	767	64.8	
20			~~KASSERINE~~	~~AMVOUN~~	~~DEEP WELL~~	4	1050	1414	85.20						Deep well has not been constructed
21			~~KASSERINE~~	~~AWINET DHIBEN~~	~~DEEP WELL~~	3	1100	1482	87.90						Deep well has not been constructed
22	22	20	KASSERINE	BNANA/OULED BENAJEH	DEEP WELL	8	1500	2021	135.38	DEEP WELL	47	2418	3062	191.42	
23	23	21	KASSERINE	MKIMEN	DEEP WELL	7	1450	1953	131.84	DEEP WELL	16	1269	1611	89.38	
	24	22	KASSERINE	CHAAIBIA	DEEP WELL	2	1500	1990	169.78	DEEP WELL	52	2438	3091	230.64	
	25	23	KASSERINE	OULED LAHTAB	DEEP WELL	2	1500	1990	169.78	DEEP WELL	31	1196	1518	115.38	
		24	KASSERINE	OULED MASSOUD RIZG	DEEP WELL	2	1500	1990	169.78	DEEP WELL	25	868	1101	78.03	
24			~~SIDI BOUZID~~	~~SOUASSIA~~	~~DEEP WELL~~	2	500	673	58.85						Study has been suspended due to source water quality.
25			SIDI BOUZID	~~KHAOUI~~	~~SONEDE CONNECTION~~	3	800	1077	68.99						Study has been suspended due to source water quality.
26			SIDI BOUZID	~~MBARKIA (OULED HAFFOUZ)~~	~~DEEP WELL~~	1	600	808	56.33						same project for 2005
27			SIDI BOUZID	~~MEGLI~~	~~DEEP WELL~~	1	240	323	27.42						Deep well has not been constructed
28	26	25	SIDI BOUZID	GARD HADID	DEEP WELL	2	500	663	56.55	DEEP WELL	45	2802	3554	240.85	
29	27	26	SIDI BOUZID	AIN JAFFEL	DEEP WELL	3	1800	2424	179.17	DEEP WELL	37	2455	3116	265.77	
	28	27	SIDI BOUZID	SLATNIA	EXTENSION GR	6	500	663	56.59	EXTENSION GR	20	1617	2050	160.35	
	29	28	SIDI BOUZID	OULED MOUSSA	EXTENSION GR	4	350	464	39.62	EXTENSION GR	12	421	534	45.58	
30	30	29	SOUSSE	CHRAIFIA	EXTENSION GR	1	188	253	13.17	EXTENSION GR	5	342	435	35.13	
31			~~MAHDIA~~	~~RQUIAT~~	~~SONEDE CONNECTION~~	1	507	644	49.20						same project studied in 2004
32	31	30	MAHDIA	AMMAR	SONEDE CONNECTION	1	1500	1904	118.92	SONEDE CONNECTION	20	1260	1526	126.27	
33	32	31	MAHDIA	ESSAAFI	SONEDE CONNECTION	1	522	663	55.12	SONEDE CONNECTION	14				
34	33	32	GAFSA	ENJAIMIA	SONEDE CONNECTION	1	660	729	45.53	SONEDE CONNECTION	7	939	1018	61.79	
	34	33	GAFSA	SMAIDIA	DEEP WELL	4	400	440	37.51	DEEP WELL	13	503	543	46.47	
35			~~MEDENINE~~	~~CITE CHAABAT EL MAAR~~	~~SONEDE CONNECTION~~	1	120	165	10.40						Study has been suspended due to source water quality.
36			~~MEDENINE~~	~~HLALMA ET OUDHANA~~	~~SONEDE CONNECTION~~	1	258	354	25.00						Study has been suspended due to source water quality.
37			~~MEDENINE~~	~~TOGUI ET RAHIAL~~	~~SONEDE CONNECTION~~	1	188	253	13.20						Study has been suspended due to source water quality.
					Total	123	26,343	31,525	2,276		630	31,201	36,937	2,668	

Study has been completed
Deep well is not available yet
Insufficient capacity of deep wel
Water source is not suitable
Other reasons

Table 3.3.2 Progress of sub-projects for 2005

Governorate	Sub-project	Progress
ARIANA	CEBALET BEN AMMAR	10%
MANOUBA	EL MAAFRINE	Tender evaluation
MANOUBA	TIRASSET	Tender evaluation
NABEUL	BASATINE	Tender evaluation
NABEUL	BEN THAMEUR ET BKIR	Tender evaluation
NABEUL	BIR BEN ZAHRA	Tender evaluation
BEJA	KEF DAROUGUI-SFAYA	scheduled to execute in 2006
BEJA	MZOUGHA-ZELDOU (1st PHASE)	10%
JENDOUBA	EL ISLAH	Tender evaluation
JENDOUBA	SOUALHIA	15%
LE KEF	EZZAGUAYA	Tender evaluation
SILIANA	FEJ-ASSEKRA	20%
SILIANA	KSAR-OULED BOUHANI	Tender notice
KAIROUAN	DOUAR EL BELDI	Contract procedure
KAIROUAN	OULED ABBES	5%
KAIROUAN	OULED BOUDABOUS	10%
KASSERINE	AIN DEFLA	40%
KASSERINE	FAKET EL KHADEM (EL AITHA)	Retender is now under eveluation
KASSERINE	FAKET EL KHADEM (NASSIRIA)	
KASSERINE	OULED BARKA	Retender is now under eveluation
KASSERINE	SIDI SHIL	40%
SIDI BOUZID	M'BARKIA	10%
SIDI BOUZID	OULED NAOUI	10%
SIDI BOUZID	OULED YOUSSEF GALLEL	10%
SOUSSE	OULED EL FALEH	15%
MAHDIA	KHIOUR	20%
MAHDIA	RMADHNIA	20%
MAHDIA	RQUIAT	scheduled to execute in 2006
MAHDIA	SKHAIBIA	1%
MAHDIA	SLAYMIA	1%
SFAX	GUERGOUR-BRAHMIA FKAYHIA	Contract procedure
GAFSA	HCHACHNA	Contract procedure
GAFSA	OUED ZITON	Contract procedure

Table 6.1.1 Project Categorization of JBIC Guidelines

Categorization	Classification
Category A	A proposed project is classified as Category A if it is likely to have significant adverse impacts on the environment. A project with complicated impact or unprecedented impact which are difficult to assess is also classified as Category A. The impact of Category A projects may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors (i.e., sectors that are liable to cause adverse environmental impact) or with sensitive characteristics (i.e., characteristics that are liable to cause adverse environmental impact) and projects located in or near sensitive areas[1].
Category B	A proposed project is classified as Category B if its potential adverse environmental impact is less adverse than that of Category A projects. Typically, this is site-specific, few if any are irreversible, and in most cases normal mitigation measures can be designed more readily. Projects funded by Engineering Service Loans that are yen loans for survey and design, are classified as Category B, with the exception of those belonging to Category C.
Category C	A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impact. Projects that correspond to one of the following are, in principle, classified as Category C, with the exception of projects with sensitive characteristics and projects located in sensitive areas[<1]: 1) Projects for which the JBIC's share is not above SDR 10 million (equivalent to around 10 million TD); 2) Sectors or projects in which no particular environmental impact would be normally expected (e.g., human resources development, support for international balance of payments, maintenance of existing facilities, acquisition of rights and interests without additional capital investment); or 3) Cases in which there is only minor involvement of the project by the borrower or JBIC, such as the export/import or lease of items of machinery or equipment that is not connected with a particular project, and where would be little reasonable significance in JBIC's conducting an environmental review.

<1: Sensitive areas: the JBIC Guidelines defines that sensitive areas are the following areas; (1) national parks. Nationally designated protected areas, (2) Areas considered to require careful consideration by the country or locality, which includes, 2-a) primary forests or natural forests in tropical areas, 2-b) Habitats with important ecological value, 2-c) habitats of rare species requiring protection under domestic legislation, international treaties, 2-d) Areas in danger of large scale salt accumulation or soil erosion, 2-e) Areas with remarkable desertification, 2-f) Areas with unique archeological, historical or cultural value, and 2-g) Areas inhabited by ethnic, indigenous peoples or nomadic peoples with traditional ways of life and other areas with special social value.

Source*: JBIC, the JBIC Guidelines, April 2002*

Table 6.3.1a Summary of screening for sub-projects for 2005

Number	Governorate	Delegation	Name of sub-project	Type of water source	Questions in screening form (see note)																			Categorization
					Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q13	Q14							
																	pipe	tank			distribution volume (m^3/year)			
																	length (km)	type	capacity(m^3)	remarks				
1	NABEUL	MENZEL TEMIME	BASATINE	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	11	SP	50		19,900	Category C
2	NABEUL	KORBA	BEN THAMEUR ET BKIR	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	2	_			3,000	Category C
3	NABEUL	HAMMAMET	BIR BEN ZAHRA	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	10	SP	25		9,700	Category C
4	BEJA	TESTOUR	MZOUGHA-ZELDOU (1ST)	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	48	SP	25	existing	32,900	Category C
5	BEJA	TESTOUR	MZOUGHA-ZELDOU (1st&2nd)	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_		N		SE	40			Category C
6	BEJA	BEJA NORD	KEF DAROUGUI-SFAYA	Extension GR	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	6	SE	20		8,500	Category C
11	SFAX	AGAREB	GUERGOUR-BRAHMIA FKAYHIA	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	56	SE SP	30 150		66,600	Category C
12	SOUSSE	SIDI EL HANI	OULED FALEH	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	3	SP	25		4,100	Category C
14	KAIROUAN	NASR ALLAH	DOUAR EL BELDI	Extension GR	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	7	SE	150	existing	6,900	Category C
16	KAIROUAN	BOUHAJLA	OULED ABBES	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	18	SP	25		13,400	Category C
17	KAIROUAN	BOUHAJLA	OULED BOUDABOUS	Extension GR	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	9	SP	50		10,200	Category C
18	MANOUBA	MORNAGUIA	EL MAAFRINE	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	6	SE	15		8,600	Category C
19	MANOUBA	TEBOURBA	TIRASSET	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	6	SE	15		4,100	Category C
22	SILIANA	SILIANA SUD-SILIANA NORD	FEJ ASSEKRA	Extension GR (deep well)	Y	Y	1	3	_	3	N	Y	7	Y	2	1	Y	N	22	SE	10		11,500	Category C
23	SILIANA	BOU ARADA	KSAR-OULED BOUHANI	SONEDE Connection	Y	Y	1	3	_	3	N	Y	7	N	_	_	Y	N	28	SE SE	10 20		18,400	Category C
24	ARIANA	SIDI THABET	CEBELAT A AMMAR	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	1	_			1,700	Category C
25	MAHDIA	ESSOUASSI	SLAIMIA	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	19	SE	100	existing	23,600	Category C
26	MAHDIA	ESSOUASSI	SKHAIBIA	Extension GR	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	11	SE	150	existing	10,600	Category C
27	MAHDIA	SIDI ALOUANE	KHIOUR	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	10	_			26,300	Category C
28	MAHDIA	BOU MERDES	RMADHNIA	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	3	_			2,000	Category C
29	JENDOUBA	AIN DRAHAM	SOUALHIA	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	5	SE	20		7,000	Category C
30	JENDOUBA	AIN DRAHAM	EL ISLAH	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	7	SE	20		7,400	Category C
31	LE KEF	KALAAT SENAN	EZZAGAYA	SONEDE Connection	Y	Y	1	3	_	3	N	Y	7	N	_	_	Y	N	13	SP	25	existing	6,100	Category C
34	GAFSA	EL GUETAR	EL AHCHACHNA	Extension GR	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	12	SE	100		7,100	Category C
35	GAFSA	SNED	OUED ZITON	Extension GR	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	4	SE	60	existing	2,600	Category C
36	KASSERINE	HAIDRA	AIN DEFLA	Deep well	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	12	SE	100		20,100	Category C
37	KASSERINE	MAJEL BEL ABBES	FAKET EL KHADEM	Irrigation system (2 new deep wells)	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	22	SP SP	150 150		23,800	Category C
38	KASSERINE	FOUSSANA	OULED BARKA	Extension GR	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	21	SE SE	100 50		28,900	Category C
39	KASSERINE	THALA	SIDI SHIL	Irrigation system (Deep well)	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	27	SE	30		15,900	Category C
40	SIDI BOUZID	SIDI ALI BEN AOUN	M'BARKIA	Extension GR	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	22	SE	40		23,200	Category C
41	SIDI BOUZID	OULED HAFFOUZ	OULED NAOUI	Extension GR	Y	Y	1	3	_	3	N	Y	7	Y	2	1	Y	N	21	SE	30		17,000	Category C
42	SIDI BOUZID	MENZEL BOUZAIENE	OULED YOUSSEF GALLEL	Extension GR	Y	Y	1	3	_	3	N	N	_	Y	2	1	Y	N	6	SE	30		6,000	Category C
43	MAHDIA	SIDI ALOUANE	RQUIAT	SONEDE Connection	Y	Y	1	3	_	3	N	N	_	N	_	_	Y	N	7	SE	150	existing	8,100	Category C

Note) Number of questions corresponds to screening forms of JBIC Guidelines

Legend: -: no reply, Y: yes, N: no

Table 6.3.1b Summary of screening for sub-projects 2006

Number	Governorate	Delegation	Name of sub-project	Type of water source	Questions in screening form																					Categorization
																			Q14							
																			pipe	tank				distribution volume (m^3/year)	Requirement of EIA	
					Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8		Q9		Q10	Q11	Q13	length (km)	type	capacity(m^3)	remarks			
1	ARIANA	EL MNIHLA	EL ACHICH	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	5	SE	20		6,100	N	Category C
2	MANOUBA	MORNAGUIA	SIDI ACHOUR	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	6	SE	20		4,400	N	Category C
3	BIZERTR	BIZERTR SUD	ETRAMIS-EDMAIN	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	13	SE	30		20,300	N	Category C
4	BIZERTR	GHAZALA	EL KAHBOUSSI	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	35	SE	10-30 (7)		29,300	N	Category C
5	BIZERTR	GHAR EL MELEH	SIDI HASSEN	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	12	SE	15		11,800	N	Category C
6	KAIROUAN	EL ALAA	MAAMRIA	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	13	SE	15,20		15,800	N	Category C
7	BEJA	NEFZA	AIN DAM-NEFZA	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	12	SE	10 -30 (3)		31,900	N	Category C
8	BEJA	NEFZA	GMARA	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	8	SE	40		20,200	N	Category C
9	SILIANA	ER-ROUHIA	GHANGUET ZGLASS	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	7	SE	10		2,500	N	Category C
10	SILIANA	ER-ROUHIA	SIDI DAHER	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	16	SE	10,20		14,900	N	Category C
11	SILIANA	MAKTHAR	AGBA	SPRING	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	5	SE	30		13,400	N	Category C
12	SILIANA	MAKTHAR	NSIRAT	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	7	SE	10		5,600	N	Category C
13	LE KEF	JRISSA ET KHEOBA	ESBIAAT, EL AGROUB ET SOUALI	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	-	Y	N	23	SE	20,30		26,900	N	Category C
14	KAIROUAN	EL OUESLATIA	GHANZOUR	DEEP WELL	Y	Y	1	3	-	3	N	Y	7	Y	2	1	Y	N	12	SE	30		17,000	N	Category C
15	KAIROUAN	EL OUESLATIA	GOUAAD	EXTENSION GR	Y	Y	1	3	-	3	N	Y	7	N	-	1	Y	N	15	SE	30		15,500	N	Category C
16	KAIROUAN	HADJEB	KHOUALDIA	EXTENSION GR	Y	Y	1	3	-	3	N	Y	7	N	-	1	Y	N	15	SE	30		11,100	N	Category C
17	KAIROUAN	NASRALLAH	HSAINIA	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	1	Y	N	6	Tour	40	existing	15,200	N	Category C
18	SOUSSE	BOUFICHA	CHRAIFIA	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	1	Y	N	7	SE	25		8,500	N	Category C
19	MAHDIA	SIDI ALOUANE	AMMAR	SONEDE CONNECTION	Y	Y	1	3	-	3	N	Y	7	N	-	-	Y	N	28	SP	50		30,700	N	Category C
20	MAHDIA	SIDI ALOUANE	ESSAAFI	SONEDE CONNECTION	Y	Y	1	3	-	3	N	Y	7	N	-	-	Y	N						N	Category C
21	LE KEF	KALAAT KHASBA	FORNA	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	12	SP	25		6,900	N	Category C
22	LE KEF	NEBEUR	EL OUENA	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	8	SE	10,10		44,000	N	Category C
23	KASSERINE	FOUSSANA	BNANA/OULED BENAJEH	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	49	SP SE	25 75,20		46,600	N	Category C
24	KASSERINE	HAIDRA	MKIMEN	DEEP WELL	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	49	SP SE	25 10,10,50	include. Existing	21,800	N	Category C
25	KASSERINE	SBIBA	CHAAIBIA	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	30	SE	75,30		56,100	N	Category C
26	KASSERINE	SBIBA	OUED LAHTAB	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	25	SP SE	50 10		28,100	N	Category C
27	KASSERINE	FOUSSANA	OULED MASSOUD RIZG	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	23	SE	50, 10		27,700	N	Category C
28	SIDI BOUZID	JELMA	AIN JAFFEL	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	43	SE	10-40 (7)		64,700	N	Category C
29	SIDI BOUZID	SIDI BOUZID EST	GARD HADID	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	40	SE	150		58,600	N	Category C
30	SIDI BOUZID	JELMA	OULED MOUSSA	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	19	SP	100	other project	11,100	N	Category C
31	SIDI BOUZID	REGUEB	SLATNIA	EXTENSION GR	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	21	SE	150		39,000	N	Category C
32	GAFSA	MDHILA	ENJAMIA	SONEDE CONNECTION	Y	Y	1	3	-	3	N	N	-	N	-	-	Y	N	32	SP	100		15,000	N	Category C
33	GAFSA	GAFSA NORD	SMAIDIA	DEEP WELL	Y	Y	1	3	-	3	N	N	-	Y	2	1	Y	N	14	SP	25		11,300	N	Category C

Note) Number of questions corresponds to screening forms of JBIC Guidelines

Legend: -: no reply, Y: yes, N: no

Tabl 8.2.1 Result of identification

No.*	Governorate	Sub-project	Beneficiary Families						Relay Persons				
			Identification by CRDA		Identification by the Study		Difference	Difference	Gender				Total
			household	Population	household	Population	household	(Fois)	women	%	men	%	
1	ARIANA	CEBELAT A AMMAR	n/d	54	19	77	-	1.43	2	33.3	4	66.7	6
2	ARIANA	EL ACHICH	n/d	150	59	290	-	1.93	0	0.0	6	100	6
3	MANOUBA	EL MAAFRINE	n/d	120	69	353	-	2.94	7	70.0	3	30.0	10
4	MANOUBA	TIRASSET	n/d	216	42	196	-	0.91	0	0.0	11	100	11
5	MANOUBA	SIDI ACHOUR	n/d	126	41	162	-	1.29	0	0.0	3	100	3
6	NABEUL	BASSATINE	n/d	450	218	927	-	2.06	0	0.0	13	100	13
7	NABEUL	BEN THAMEUR ET BKIR	n/d	200	33	174	-	0.87	0	0.0	3	100	3
8	NABEUL	BIR BEN ZAHRA	n/d	625	127	533	-	0.85	0	0.0	6	100	6
9	BIZERTE	ETRAMIS-EDMAIN	144	610	147	622	1.02	1.02	2	15.4	11	84.6	13
10	BIZERTE	EL KALBOUSSI	n/d	1,120	248	1,185	-	1.06	1	11.1	8	88.9	9
11	BIZERTE	SIDI HASSEN	n/d	353	106	477	-	1.35	4	25.0	12	75.0	16
12	BEJA	MZOUGHA-ZELDOU	n/d	1265	418	1794	-	1.42	10	45.5	12	54.5	22
13	BEJA	KEF DAROUGUI-SFAYA	n/d	270	103	465	-	1.72	8	47.1	9	52.9	17
14	BEJA	AIN DAM-NEFZA	361	1,480	407	1,672	1.13	1.13	5	18.5	22	81.5	27
15	BEJA	GMARA	567	2,225	226	957	0.40	0.43	1	14.3	6	85.7	7
16	JENDOUBA	SOUALHIA	n/d	424	84	364	-	0.86	0	0.0	8	####	8
17	JENDOUBA	EL ISLAH	n/d	351	116	476	-	1.36	1	12.5	7	87.5	8
18	LE KEF	EZZAGAYA	n/d	456	75	340	-	0.75	4	36.4	7	63.6	11
19	LE KEF	ESBIAAT, EL AGROUB ET SOUALHIA	195	780	293	1,298	1.50	1.66	13	50.0	13	50.0	26
20	LE KEF	FORNA	125	625	97	410	0.78	0.66	8	50.0	8	50.0	16
21	LE KEF	EL OUENA	80	400	88	481	1.10	1.20	0	0.0	9	####	9
22	SILIANA	FEJ-ASSEKRA	n/d	690	152	648	-	0.94	1	33.3	2	66.7	3
23	SILIANA	KSAR-OULED BOUHANI	n/d	700	203	1039	-	1.48	9	42.9	12	57.1	21
24	SILIANA	GHANGUET ZGALASS	35	210	24	143	0.69	0.68	7	50.0	7	50.0	14
25	SILIANA	SIDI DAHER	187	950	155	822	0.83	0.87	5	50.0	5	50.0	10
26	SILIANA	AGBA	123	582	136	655	1.11	1.13	0	0.0	5	####	5
27	SILIANA	NSIRAT	76	360	59	273	0.78	0.76	4	25.0	12	75.0	16
28	KAIROUAN	DOUAR EL BELDI	n/d	462	67	355	-	0.77	5	35.7	9	64.3	14
29	KAIROUAN	OULED ABBES	100	500	135	741	1.35	1.48	8	47.1	9	52.9	17
30	KAIROUAN	OULED BOUDABOUS	70	350	107	599	1.53	1.71	4	40.0	6	60.0	10
31	KAIROUAN	MAAMRIA	64	324	111	666	1.73	2.06	11	52.4	10	47.6	21
32	KAIROUAN	GHANZOUR	148	800	130	723	0.88	0.90	7	50.0	7	50.0	14
33	KAIROUAN	GOUAAD	106	570	112	673	1.06	1.18	0	0.0	8	100	8
34	KAIROUAN	KHOUALDIA	81	450	88	477	1.09	1.06	0	0.0	8	100	8
35	KAIROUAN	HSAINIA	65	340	112	687	1.72	2.02	0	0.0	8	100	8
36	KASSERINE	AIN DEFLA	190	950	201	1044	1.06	1.10	26	50.0	26	50.0	52
37	KASSERINE	FAKET EL KHADEM	120	600	206	1207	1.72	2.01	20	50.0	20	50.0	40
38	KASSERINE	OULED BARKA	110	550	301	1575	2.74	2.86	12	50.0	12	50.0	24
39	KASSERINE	SIDI SHIL	240	1200	119	727	0.50	0.61	18	50.0	18	50.0	36
40	KASSERINE	BNANA / OULED BENAJEH	n/d	1,500	453	2,418	-	1.61	10	50.0	10	50.0	20
41	KASSERINE	MKIMEN	n/d	1,450	216	1,269	-	0.88	0	0.0	9	100	9
42	KASSERINE	CHAAIBIA	n/d	1,500	442	2,438	-	1.63	0	0.0	9	100	9
43	KASSERINE	OUED LAHTAB	n/d	1,500	205	1,196	-	0.80	0	0.0	9	100	9
44	KASSERINE	OULED MASSOUD RIZG	n/d	1,500	170	868	-	0.58	0	0.0	8	100	8
45	SIDI BOUZID	M'BARKIA	42	210	140	848	3.33	4.04	8	24.2	25	75.8	33
46	SIDI BOUZID	OULED NAOUI	118	600	186	931	1.58	1.55	10	22.2	35	77.8	45
47	SIDI BOUZID	OULED YOUSSEF GALLEL	50	300	57	321	1.14	1.07	5	38.5	8	61.5	13
48	SIDI BOUZID	AIN JAFFEL	n/d	1,800	424	2,455	-	1.36	7	41.2	10	58.8	17
49	SIDI BOUZID	GARD HADID	n/d	500	532	2,802	-	5.60	3	20.0	12	80.0	15
50	SIDI BOUZID	OULED MOUSSA	n/d	350	93	421	-	1.20	5	50.0	5	50.0	10
51	SIDI BOUZID	SLATNIA	n/d	500	304	1,617	-	3.23	2	28.6	5	71.4	7
52	SOUSSE	CHRAIFIA	32	188	68	342	2.13	1.82	4	50.0	4	50.0	8
53	MAHDIA	SLAYMIA	n/d	1494	293	1380	-	0.92	0	0.0	5	100	5
54	MAHDIA	SKHAIBIA	n/d	390	99	484	-	1.24	15	50.0	15	80.0	30
55	MAHDIA	KHIOUR	n/d	1200	305	1453	-	1.21	2	9.1	20	90.9	22
56	MAHDIA	RMADHNIA	n/d	160	22	110	-	0.69	0	0.0	2	100	2
57	MAHDIA	RQUIAT	101	507	89	421	0.88	0.83	2	22.2	7	77.8	9
58	MAHDIA	OULED AMMAR ET OULED ESSAAFI	399	2,022	253	1,260	0.63	0.62	4	26.7	11	73.3	15
59	SFAX	GUERGOUR-BRAHMIA FKAYH	1207	6155	705	3622	0.58	0.59	0	0.0	5	100	5
60	SOUSSE	OULED FALEH	n/d	185	27	179	-	0.97	0	0.0	15	100	15
61	GAFSA	ELAHCHACHNA	n/d	100	63	363	-	3.63	5	33.3	10	66.7	15
62	GAFSA	OUED ZITON	n/d	100	26	135	-	1.35	9	45.0	11	55.0	20
63	GAFSA	ENJAIMIA	n/d	660	132	939	-	1.42	0	0.0	8	100	8
64	GAFSA	SMAIDIA	n/d	400	84	503	-	1.26	0	0.0	5	100	5

*The Mzougha Zeldou sub-project (1st and 2nd phase) (Beja) and that of Ouled Ammar and Essaafi in the governorate of Mahdia are considered as one sub-project.

Table 8.2.4 Result of the first visit of the sensitization

Total No.	Governorate	Sub-project	Household*1	Population	Date	Number of Meetings of General Information	Meetings with limited groups	Participants						Remarks
								Men	%*2	Women	%	Total	%	
1	ARIANA	CEBELAT A AMMAR	18	75	23/03/04	1	0	8	44.4	8	44.4	16	88.9	
2	ARIANA	EL ACHICH	52	265	29/03/05	2	0	14	26.9	22	42.3	10	19.2	The locality "Sanhaja" was added after the 1st visit
3	MANOUBA	EL MAAFRINE	62	316	24/03/04	1	0	25	40.3	14	22.6	39	62.9	
4	MANOUBA	TIRASSET	42	196	31/03/04	1	0	16	38.1	5	11.9	21	50	
5	MANOUBA	SIDI ACHOUR	37	152	09/04/05	1	0	18	48.6	11	29.7	29	78.4	
6	NABEUL	BASSATINE	218	927	09, 26 /04/04	2	0	91	41.7	11	5.0	102	46.8	
7	NABEUL	BEN THAMEUR	33	174	27/03/04	1	0	13	39.4	5	15.2	18	54.5	
8	NABEUL	BIR BEN ZAHRA	127	533	22/03/04	1	0	50	39.4	28	22.0	78	61.4	
9	NABEUL	TASSELMINE ET SOUSASSI	131	594	31/03/05	2	0	53	40.5	12	9.2	65	49.6	This subproject was eliminated after the 1st visit.
10	BIZERTE	ETRAMIS-EDMAIN	212	947	05/04/05	2	0	27	12.7	37	17.5	64	30.2	The locality "Fhiss" was eliminated after the 1st visit.
11	BIZERTE	EL KALBOUSSI	260	1235	6-7/04/05	4	4	109	41.9	36	13.8	162	62.3	The localities "El Mnasria", "Brahmia" and "Aouachiria" were eliminated after the 1st visit.
12	BIZERTE	SIDI HASSEN	106	477	01/04/05	2	2	33	31.1	21	19.8	54	50.9	
13	BEJA	MZOUGHA-ZELDOU (1ST)	171	687	23-24/03/04	3	0	52	30.4	18	10.5	70	40.9	
14	BEJA	MZOUGHA-ZELDOU (2ND)	247	1111	24-25/03/04	3	0	73	29.6	16	6.5	89	36	
15	BEJA	KEF DAROUGUI-SFAYA	103	465	26/03/04	4	0	25	24.3	15	14.6	40	38.8	
16	BEJA	AIN DAM-NEFZA	407	1672	24/03/05	3	0	106	26	53	13	159	39.1	
17	BEJA	GMARA	226	957	25/03/05	2	0	45	19.9	50	22.1	95	42	
18	JENDOUBA	SOUALHIA	84	364	29/03/04	2	0	15	17.9	17	20.2	32	38.1	
19	JENDOUBA	EL ISLAH	116	476	30/03/04	2	0	20	17.2	16	13.8	36	31	
20	LE KEF	EZZAGUAYA	63	290	25/03/04	2	0	22	34.9	20	31.7	42	66.7	
21	LE KEF	ESBIAAT, EL AGROUB ET SOUALHIA	163	633	08/04/05	3	0	52	31.9	26	16	86	52.8	The number of households and the population do not included those of the area in charge of the CRDA for the sensitization.
22	LE KEF	FORNA	97	410	28/03/05	1	0	51	52.6	19	19.6	71	73.2	
23	LE KEF	EL OUENA	88	481	29/03/05	2	0	47	53.4	29	33	76	86.4	
24	SILIANA	FEJ ASSEKRA	138	554	03/04/04	4	0	52	37.7	45	32.6	97	70.3	
25	SILIANA	KSAR-OULED BOUHANI	136	737	3 & 10/04/04	5	0	130	95.6	79	58.1	209	153.7	
26	SILIANA	GHANGUET ZGALASS	24	143	28/03/05	1	0	17	70.8	11	45.8	28	116.7	
27	SILIANA	SIDI DAHER	155	822	30/03/05	2	0	51	32.9	50	32.3	101	65.2	
28	SILIANA	AGBA	100	466	26/03/05	2	0	50	50	32	32	82	82	The locality "Mouwaysia" was added after the 1st visit.
29	SILIANA	NSIRAT	59	273	29/03/05	2	0	36	61	37	62.7	73	123.7	
30	KAIROUAN	DOUAR EL BELDI	63	314	17/03/04	2	0	31	49.2	30	47.6	61	96.8	
31	KAIROUAN	OULED ABBES	124	717	18/03/04	3	0	77	62.1	47	37.9	124	100	
32	KAIROUAN	OULED BOUDABOUS	100	558	16/03/04	1	0	42	42	12	12.0	54	54	
33	KAIROUAN	MAAMRIA	111	666	08/04/05	1	0	21	18.9	14	12.6	35	31.5	
34	KAIROUAN	GHANZOUR	130	723	31/03/05	2	0	36	27.7	35	26.9	71	54.6	
35	KAIROUAN	GOUAAD	112	673	30/03/05	3	0	41	36.6	19	17	60	53.6	
36	KAIROUAN	KHOUALDIA	88	477	01/04/05	2	0	21	23.9	20	22.7	41	46.6	
37	KAIROUAN	HSAINIA	112	687	29/03/05	2	0	57	50.9	63	56.3	120	107.1	

*1: The number of household is based on that targeted in each visit of sensitization activities.

*2: The % is calculated against the total household number.

Table 8.2.4 Result of the first visit of the sensitization

Total No.	Governorate	Sub-project	Household*1	Population	Date	Number of Meetings of General Information	Meetings with limited groups	Participants						Remarks
								Men	%*2	Women	%	Total	%	
38	KASSERINE	AIN DEFLA	201	1044	02/04/04	1	0	101	50.2	26	12.9	127	63.2	
39	KASSERINE	FAKET EL KHADEM	206	1207	01/04/04	4	0	135	65.5	14	6.8	149	72.3	
40	KASSERINE	OULED BARKA	326	1770	31/03/04	2	0	120	36.8	21	6.4	141	43.3	
41	KASSERINE	SIDI SHIL	116	661	30/03/04	5	0	54	46.6	14	12.1	68	58.6	
42	KASSERINE	BNANA / OULED BENAJEH	453	2418	05/04/05	2	0	116	25.6	26	5.7	142	31.3	
43	KASSERINE	MKIMEN	216	1269	30/03/05	3	0	122	56.5	33	15.3	155	71.8	
44	KASSERINE	CHAAIBIA	442	2438	05/04/05	3	0	65	14.7	64	14.5	129	29.2	
45	KASSERINE	OUED LAHTAB	170	868	06/04/05	3	0	60	35.3	43	25.3	103	60.6	
46	KASSERINE	OULED MASSOUD RIZG	250	1250	05/05/05	2	0	113	45.2	74	29.6	187	74.8	The localities "El Brika", "Abaydia", "Zorg" and "Dlahmia - Ghdhabnia" were included until the 2nd visi
47	SIDI BOUZID	M'BARKIA	174	1051	04/04/04	3	0	72	41.4	31	17.8	103	59.2	
48	SIDI BOUZID	OULED NAOUI	186	931	05/04/04	3	0	53	28.5	33	17.7	86	46.2	
49	SIDI BOUZID	OULED YOUSSEF GALLEL	57	321	03/04/04	1	0	49	86	19	33.3	68	119.3	
50	SIDI BOUZID	AIN JAFFEL	424	2455	28 & 29/03/05	4	0	151	35.6	114	26.9	265	62.5	
51	SIDI BOUZID	GARD HADID	532	2802	25 & 26/03/05	4	0	112	21.1	65	12.2	177	33.3	
52	SIDI BOUZID	OULED MOUSSA	93	421	27/03/05	2	0	37	39.8	37	39.8	74	79.6	
53	SIDI BOUZID	SLATNIA	304	1617	24/03/05	2	0	110	36.2	47	15.5	157	51.6	
54	SOUSSE	OULED FALEH	51	315	26/03/04	1	0	8	15.7	5	9.8	13	25.5	
55	SOUSSE	CHRAIFIA	68	342	02/04/05	1	0	24	35.3	16	23.5	40	58.8	
56	MAHDIA	SLAYMIA	284	1365	30/03/04	5	0	71	25	15	5.3	86	30.3	
57	MAHDIA	SKHAIBIA	99	484	01/04/04	2	0	31	31.3	44	44.4	75	75.8	
58	MAHDIA	KHIOUR	280	1314	31/03/04	2	0	66	23.6	2	0.7	68	24.3	
59	MAHDIA	RQUIAT	89	421	02/04/04	1	0	28	31.5	19	21.3	47	52.8	
60	MAHDIA	RMADHNIA	22	140	01/04/04	1	0	19	86.4	14	63.6	33	150	
61	MAHDIA	AMMAR	159	818	26/03/05	2	0	28	17.6	19	11.9	64.6	40.6	
62	MAHDIA	ESSAAFI	94	1260	27/03/05	2	0	41	43.6	30	31.9	71	75.5	
63	SFAX	GARGOUR-BRAHMA FKAHIA	662	3467	24-25/03/04	6	0	96	14.5	27	4.1	123	18.6	
64	GAFSA	HCHACHNA	59	339	07/04/04	5	0	60	101.7	24	40.7	84	142.4	
65	GAFSA	OUED ZITOUN	26	135	06/04/04	1	0	17	65.4	17	65.4	34	130.8	
66	GAFSA	ENJAIMIA	132	939	30/03/05	2	0	84	63.6	59	44.7	143	108.3	
67	GAFSA	SMAIDIA	72	431	31/03/05	2	0	32	44.4	14	19.4	46	63.9	The locality "Errbaiia" was added after the 1st visit.

*1: The number of household is based on that targeted in each visit of sensitization activities.

*2: The % is calculated against the total household number.

Table 8.2.6 Management of service point

No.	Gouvernorat	Sub-projet	Number[1] of service insallations	Number of tap keepers	Woman tap keepers		Water charge system applied	Cost of 1m^3 water (TD)	Proposed watger charge per m^3				Amout of revolving fund per family (TD)	Observations
					Number	%			TD (without commission)		TD (with commission)	Remarks		
1	ARIANA	EL ACHICH	7	7	4	57.1	commodity charge	1.000	1.000	/m^3	-	Volunteer	20	
2	ARIANA	CEBALET BEN AMMAR	4	4	0	0	commodity charge	0.817	0.900		-	Volunteer	19	
3	MANOUBA	SIDI ACHOUR	8	8	1	12.5	commodity charge	0.857	1.000	/m^3	-	Volunteer	15	
4	MANOUBA	EL MAAFRINE	8	8	0	0	commodity charge	0.697	0.700		-	Volunteer	15	
5	MANOUBA	TIRASSET	6	6	0	0	commodity charge	1.072	1.100		-	Volunteer	18	
6	NABEUL	BASSATINE	13	13	0	0	commodity charge	0.725	0.800		-	Volunteer	20	
7	NABEUL	BEN THAMEUR	2	2	0	0	commodity charge	0.528	0.600		-	Volunteer	14	
8	NABEUL	BIR BEN ZAHRA	13	13	1	7.7	commodity charge	0.925	1.000		-	Volunteer	20	
9	BIZERTE	ETRAMIS-EDMAIN	21	21	6	28.6	flat rate		5.000	/month	-	Volunteer	15	
10	BIZERTE	EL KALBOUSSI	41	41	7	17.1	flat rate		5.500	/month	-	Volunteer	15	
11	BIZERTE	SIDI HASSEN	25	25	1	4	commodity charge	0.694	0.800	/m^3	-	Volunteer	15	
12	BEJA	AIN DAM-NEFZA	23	23	5	21.7	commodity charge	0.645	0.650	/m^3	-	Volunteer	15	
13	BEJA	GMARA	12	12	7	58.3	commodity charge	0.716	0.750	/m^3	-	Volunteer	15	
14	BE JA	KEF DAROUGUI-SFAYA	8	8	0	0	commodity charge	0.827	1.000		1.000	20%	25	
15	BE JA	MZOUGHA-ZELDOU	32	32	2	6.3	commodity charge	0.861	1.000		-	Volunteer	25	
16	JENDOUBA	EL ISLAH	13	12	1	8.3	commodity charge	0.899	1.000		-	Volunteer	10	1tap keeper for 2 communal taps (Ghraibia 1and 2)
17	JENDOUBA	SOUALHIA	9	9	2	22.2	commodity charge	0.939	1.000		-	Volunteer	15	
18	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	13	13	1	7.7	commodity charge	0.451	0.550	/m^3	0.700	25%	10	
19	LE KEF	FORNA	15	15	3	20	commodity charge	1.242	1.250	/m^3	1.250	20%	16	
20	LE KEF	EL OUENA	11	11	3	27.3	commodity charge	0.852	0.800	/m^3	1.000	25%	16	Water charge applied by an existing GIC
21	LE KEF	EZZAGUAYA	11	11	0	0	commodity charge	1.116			1.250	20%	15	
22	SILIANA	GHANGUET ZGALASS	3	3	2	66.7	commodity charge	0.800	1.000	/m^3	-	Volunteer	12	
23	SILIANA	SIDI DAHER	13	13	2	15.4	commodity charge	0.843	0.950	/m^3	0.950	Volunteer	15	
24	SILIANA	AGBA	8	8	3	37.5	commodity charge	0.410	0.410	/m^3	0.550	20%	10	
25	SILIANA	NSIRAT	9	9	6	66.7	commodity charge	0.679	0.750	/m^3	-	Volunteer	15	
26	SILIANA	FEJ ASSEKRA	10	10	0	0	commodity charge	0.828			1.000	20%	20	
27	SILIANA	KSAR-OULED BOUHANI	17	17	0	0	commodity charge	0.829			1.000	20%	25	
28	KAIROUAN	MAAMRIA	17	17	10	58.8	commodity charge	0.604	0.800	/m^3	1.000	25%	16	
29	KAIROUAN	GHANZOUR	18	18	12	66.7	commodity charge	0.747	1.000	/m^3	1.000	Volunteer	12	
30	KAIROUAN	GOUAAD	11	11	7	63.6	commodity charge	0.750	0.750	/m^3	1.000	20%	12	
31	KAIROUAN	KHOUALDIA	15	15	8	53.3	commodity charge	0.866	1.000	/m^3	-	Volunteer	12	
32	KAIROUAN	HSAINIA	10	10	9	90	commodity charge	0.385	0.500	/m^3	0.600	20%	10	Water charge applied by an existing GIC
33	KAIROUAN	DOUAR EL BELDI	6	6	0	0	commodity charge	0.372			0.600	25%	11	
34	KAIROUAN	OULED ABBES	16	16	0	0	commodity charge	0.535			0.800	25%	12	Water charge applied by an existing GIC
35	KAIROUAN	OULED BOUDABBOUS	10	10	0	0	commodity charge	0.273			0.700	25%	10	Water charge applied by an existing GIC

1:Particular connection for public institutions is not includec

Table 8.2.6 Management of service point

No.	Gouvernorat	Sub-projet	Number[1] of service insallations	Number of tap keepers	Woman tap keepers		Water charge system applied	Cost of 1m^3 water (TD)	Proposed watger charge per m^3				Amout of revolving fund per family (TD)	Observations
					Number	%			TD (without commission)		TD (with commission)	Remarks		
36	KASSERINE	BNANA / OULED BENAJEH	47	47	13	27.7	commodity charge	0.888	0.750	/m^3	0.900	20%	16	
37	KASSERINE	MKIMEN	16	16	1	6.3	commodity charge	0.785	0.825	/m^3	1.000	20%	16	
38	KASSERINE	CHAAIBIA	52	52	16	30.8	commodity charge	0.621	0.750	/m^3	0.900	20%	16	
39	KASSERINE	OUED LAHTAB	31	31	2	6.5	commodity charge	0.630	0.750	/m^3	0.900	20%	16	
40	KASSERINE	OULED MASSOUD RIZG	25	25	5	20	commodity charge	0.900	0.900	/m^3	1.100	20%	15	
41	KASSERINE	AIN DEFLA	18	18	2	11.1	commodity charge	0.610			0.750	25%	11	
42	KASSERINE	FAKKET EL KHADEM (EL AITHA)	21	21	0	0	commodity charge	0.488			0.650	20%	11	Same water charge for tow sub-projects of El Aitha et Nassiria
43	KASSERINE	FAKKET EL KHADEM (NASSIRIA)	10	10	0	0	commodity charge	0.525			0.650	20%	11	
44	KASSERINE	OULED BARKA	39	39	0	0	commodity charge	0.542			0.650	20%	10	
45	KASSERINE	SIDI SHIL	19	19	1	5.3	commodity charge	0.504			0.600	20%	12	
46	SIDI BOUZID	AIN JAFFEL	36	36	3	8.3	commodity charge	0.584	0.650	/m^3	0.800	23%	10	
47	SIDI BOUZID	GARD HADID	43	43	2	4.7	commodity charge	0.384	0.480	/m^3	0.600	25%	10	
48	SIDI BOUZID	OULED MOUSSA	11	11	2	18.2	commodity charge	0.473	0.500	/m^3	0.600	20%	11	
49	SIDI BOUZID	SLATNIA	19	19	0	0	commodity charge	0.435	0.480	/m^3	0.600	25%	10	
50	SIDI BOUZID	M'BARKIA	13	13	0	0	commodity charge	0.445			0.600	25%	12	Water charge applied by an existing GIC
51	SIDI BOUZID	OULED NAOUI	14	14	2	14.3	commodity charge	0.429			0.600	25%	14	Water charge applied by an existing GIC
52	SIDI BOUZID	OULED YOUSSEF GALLEL	5	5	1	20	commodity charge	0.408			0.600	25%	10	Water charge applied by an existing GIC
53	SOUSSE	CHRAIFIA	5	5	2	40	commodity charge	0.500	0.500	/m^3	0.600	20%	15	Water charge applied by an existing GIC
54	SOUSSE	OULED EL FALEH	4	4	0	0	commodity charge	1.058	1.100		-	Volunteer	21	
55	MAHDIA	AMMAR	20	20	11	55	commodity charge	0.617	0.667	/m^3	0.800	20%	15	
56	MAHDIA	ESSAAFI	14	14	10	71.4								
57	MAHDIA	KHIOUR	19	19	2	10.5	commodity charge	0.447	0.650		0.650	40%	12	
58	MAHDIA	RMADHNIA	5	5	2	40	commodity charge	0.383	0.550		0.550	40%	11	
59	MAHDIA	RQUIAT	11	11	3	27.3	commodity charge	0.344	0.500		0.500	25%	6	
60	MAHDIA	SKHAIBIA	10	10	0	0	commodity charge	0.384	0.550		0.550	40%	13	
61	MAHDIA	SLAYMIA	24	24	0	0	commodity charge	0.542	0.750		0.750	40%	13	
62	SFAX	GUERGOUR-BRAHMIA-FKAYHIA	52	52	15	28.8	commodity charge	0.576	0.750		0.750	30%	17	
63	GAFSA	ENJAIMIA	7	7	0	0	commodity charge	0.594	0.600	/m^3	0.750	25%	15	
64	GAFSA	SMAIDIA	13	13	0	0	commodity charge	0.494	0.600	/m^3	0.750	25%	15	
65	GAFSA	HCHACHNA	9	9	0	0	commodity charge	0.506	0.600		0.600	20%	12	
66	GAFSA	OUED ZITON	4	4	0	0	commodity charge	0.404	0.500		0.500	20%	10	

1:Particular connection for public institutions is not includec

Table 8.2.8 Members of provisional committee of the GIC

No.	Governorate	Sub-project	Possibility to participate in existing GIC	Participated	Number of members selected	Man	Woman	Observations
1	ARIANA	EL ACHICH			6	4	2	
2	ARIANA	CEBALET BEN AMMAR			6	6	0	
3	MANOUBA	SIDI ACHOUR			3	2	1	
4	MANOUBA	EL MAAFRINE			3	3	0	
5	MANOUBA	TIRASSET			3	3	0	
6	NABEUL	BASSATINE			6	6	0	
7	NABEUL	BEN THAMEUR			3	3	0	
8	NABEUL	BIR BEN ZAHRA			9	8	1	
9	BIZERTE	ETRAMIS-EDMAIN			6	4	2	
10	BIZERTE	EL KALBOUSSI			9	7	2	
11	BIZERTE	SIDI HASSEN	1	1	0	0	0	participate in the existing GIC of which board of directors has 6 man members.
12	BE JA	KEF DAROUGUI-SFAYA			6	6	0	
13	BE JA	MZOUGHA-ZELDOU			9	9	0	
14	BEJA	AIN DAM-NEFZA			9	7	2	
15	BEJA	GMARA	1	1	0	0	0	particpate in the existing GIC
16	JENDOUBA	EL ISLAH			3	3	0	
17	JENDOUBA	SOUALHIA			6	6	0	
18	LE KEF	ESBIAAT, EL AGROUB ET SOUALHIA			9	9	0	
19	LE KEF	FORNA			6	6	0	
20	LE KEF	EL OUENA	1	1	0	0	0	particpate in the existing GIC
21	LE KEF	EZZAGUAYA			6	6	0	
22	SILIANA	GHANGUET ZGALASS	1		3	3	0	
23	SILIANA	SIDI DAHER	1		9	8	1	
24	SILIANA	AGBA			6	4	2	
25	SILIANA	NSIRAT			9	6	3	
26	SILIANA	FEJ ASSEKRA			6	6	0	
27	SILIANA	KSAR-OULED BOUHANI			6	6	0	
28	KAIROUAN	MAAMRIA	1	1	0	0	0	participate in the existing GIC of which board of directors has 9 man members.
29	KAIROUAN	GHANZOUR			6	4	2	
30	KAIROUAN	GOUAAD	1		3	3	0	
31	KAIROUAN	KHOUALDIA	1		6	6	0	
32	KAIROUAN	HSAINIA	1	1	0	0	0	particpate in the existing GIC
33	KAIROUAN	DOUAR EL BELDI	1	1	9	9	0	participate in the existing GIC of which board of directors has 9 man members.
34	KAIROUAN	OULED ABBES	1	1	0	0	0	participate in the existing GIC of which board of directors has 4 man members.
35	KAIROUAN	OULED BOUDABBOUS	1	1	0	0	0	participate in the existing GIC of which board of directors has 7 man members.
36	KASSERINE	BNANA / OULED BENAJEH			9	9	0	
37	KASSERINE	MKIMEN	1	1	6	6	0	participate in the existing GIC of which board of directors has 3 man members. The number of six (6) listed was proposed by the target population of sub-project.
38	KASSERINE	CHAAIBIA			9	8	1	
39	KASSERINE	OUED LAHTAB			6	6	0	
40	KASSERINE	OULED MASSOUD RIZG			6	5	1	
41	KASSERINE	AIN DEFLA			6	6	0	
42	KASSERINE	FAKKET EL KHADEM (EL AITHA)			6	6	0	
43	KASSERINE	FAKKET EL KHADEM (NASSIRIA)			6	6	0	
44	KASSERINE	OULED BARKA	1		6	6	0	
45	KASSERINE	SIDI SHIL	1	1	0	0	0	participate in the existing GIC of which board of directors has 7 man members.
46	SIDI BOUZID	AIN JAFFEL			6	4	2	
47	SIDI BOUZID	GARD HADID			6	5	1	
48	SIDI BOUZID	OULED MOUSSA	1		6	4	2	
49	SIDI BOUZID	SLATNIA	1		6	5	1	
50	SIDI BOUZID	M'BARKIA	1	1	0	0	0	participate in the existing GIC of which board of directors has 6 man members.
51	SIDI BOUZID	OULED NAOUI	1	1	0	0	0	participate in the existing GIC of which board of directors has 9 man members.
52	SIDI BOUZID	OULED YOUSSEF GALLEL	1	1	0	0	0	participate in the existing GIC of which board of directors has 6 man members.
53	SOUSSE	CHRAIFIA	1	1	3	3	0	participate in the existing GIC of which board of directors has 3 man members. The number of six (6) listed was proposed by the target population of sub-project.
54	SOUSSE	OULED EL FALEH			3	3	0	
55	MAHDIA	OULED AMMAR et ESSAAFI			9	9	0	1 GIC for the sub-projects of AMMAR et ESSAAFI.
56	MAHDIA	KHIOUR			6	6	0	
57	MAHDIA	RMADHNIA	1	1	0	0	0	participate in the existing GIC of which board of directors has 3 man members.
58	MAHDIA	RQUIAT	1	1	0	0	0	participate in the existing GIC of which board of directors has 6 man members.
59	MAHDIA	SKHAIBIA	1	1	0	0	0	participate in the existing GIC of which board of directors has 9 man members.
60	MAHDIA	SLAYMIA	1	1	0	0	0	participate in the existing GIC of which board of directors has 6 man members.
61	SFAX	GUERGOUR-BRAHMIA-FKAYHIA			9	9	0	
62	GAFSA	ENJAIMIA			6	4	2	
63	GAFSA	SMAIDIA	1	1	6	6	0	The GIC will be established for water supply and irrigation. 3 members will participate in the committee from the beneficiaries of irrigation project.
64	GAFSA	HCHACHNA	1	1	0	0	0	participate in the existing GIC of which board of directors has 6 man members.
65	GAFSA	OUED ZITON	1	1	0	0	0	participate in the existing GIC of which board of directors has 9 man members.

Table 8.2.10 Result of the second visit of the sensitization

(1/2)

Total No.	Governorate	Sub-project	hh (household)	Population	Meeting for general information						Meeting with limited groups						Total						Remarks
					Men	% (vs. hh)	Women	% (vs. hh)	Sub-Total	% (vs. hh)	Men	% (vs. hh)	Women	% (vs. hh)	Sub-Total	% (vs. hh)	Men	% (vs. hh)	Women	% (vs. hh)	Total	% (vs. hh)	
1	ARIANA	EL ACHICH	59	290	15	25.4	15	25.4	30	50.8	18	30.5	19	32.2	37	62.7	33	55.9	34	57.6	67	113.6	The locality "Sanhaja" was added after the 1st visit
2	ARIANA	CEBALET BEN AMMAR	19	77	17	89.5	15	78.9	32	168.4	14	73.7	11	57.9	25	131.6	31	163.2	26	136.8	57	300.0	
3	MANOUBA	SIDI ACHOUR	41	162	15	36.6	11	26.8	26	63.4	19	46.3	19	46.3	38	92.7	34	82.9	30	73.2	64	156.1	The locality "Mathlouthi" was added in the 2nd visit.
4	MANOUBA	EL MAAFRINE	69	353	17	24.6	8	11.6	25	36.2	34	49.3	22	31.9	56	81.2	51	73.9	30	43.5	81	117.4	
5	MANOUBA	TIRASSET	42	196	42	100	29	69.0	71	169	18	42.9	25	59.5	43	102.4	60	142.9	54	128.6	114	271.4	
6	NABEUL	BASSATINE	218	927	141	64.7	99	45.4	240	110.1	64	29.4	62	28.4	126	57.8	205	94	161	73.9	366	167.9	
7	NABEUL	BEN THAMEUR	33	174	35	106.1	24	72.7	59	178.8	16	48.5	14	42.4	30	90.9	51	154.5	38	115.2	89	269.7	
8	NABEUL	BIR BEN ZAHRA	127	533	143	112.6	79	62.2	222	174.8	42	33.1	41	32.3	83	65.4	185	145.7	120	94.5	305	240.2	
9	BIZERTE	ETRAMIS-EDMAIN	147	622	53	36.1	38	25.9	91	61.9	72	49	60	40.8	132	89.8	125	85	98	66.7	223	151.7	
10	BIZERTE	EL KALBOUSSI	248	1185	31	12.5	1	0.4	32	12.9	138	55.6	173	69.8	311	125.4	169	68.1	174	70.2	343	138.3	
11	BIZERTE	SIDI HASSEN	106	477	34	32.1	9	8.5	43	40.6	63	59.4	54	50.9	117	110.4	97	91.5	63	59.4	160	150.9	
12	BEJA	AIN DAM-NEFZA	407	1672	94	23.1	61	15.0	155	38.1	192	47.2	120	29.5	312	76.7	286	70.3	181	44.5	467	114.7	
13	BEJA	GMARA	226	957	48	21.2	51	22.6	99	43.8	67	29.6	60	26.5	127	56.2	115	50.9	111	49.1	226	100	
14	BEJA	MZOUGHA-ZELDOU (1ST)	171	687	47	27.5	17	9.9	64	37.4	47	27.5	47	27.5	94	55	94	55	64	37.4	158	92.4	
15	BEJA	MZOUGHA-ZELDOU (2ND)	247	1111	54	21.9	23	9.3	77	31.2	141	57.1	96	38.9	237	96	195	78.9	119	48.2	314	127.1	
16	BEJA	KEF DAROUGUI-SFAYA	103	465	53	51.5	50	48.5	103	100	53	51.5	57	55.3	110	106.8	106	102.9	107	103.9	213	206.8	
17	JENDOUBA	SOUALHIA	84	364	22	26.2	15	17.9	37	44.0	38	45.2	33	39.3	71	84.5	60	71.4	48	57.1	108	128.6	
18	JENDOUBA	EL ISLAH	116	476	10	8.6	11	9.5	21	18.1	44	37.9	33	28.4	77	66.4	54	46.6	44	37.9	98	84.5	
19	LE KEF	FORNA	97	410	28	28.9	36	37.1	64	66	N/A	-	N/A	-	N/A	-	28	28.9	36	37.1	64	66	
20	LE KEF	EL OUENA	88	481	59	67.0	32	36.4	91	103.4	N/A	-	N/A	-	N/A	-	59	67	32	36.4	91	103.4	
21	LE KEF	ESBIAAT, EL AGROUB ET SOUALHIA	155	633	68	43.9	38	24.5	106	68.4	78	50.3	49	31.6	127	81.9	146	94.2	87	56.1	233	150.3	The number of households and population of the part in service area where the CRDA was in charge are not included.
22	LE KEF	EZZAGUAYA	75	340	56	74.7	36	48	92	122.7	47	62.7	34	45.3	81	108	103	137.3	70	93.3	173	230.7	
23	SILIANA	GHANGUET ZGALASS	24	143	0	0	0	0	0	0	12	50	19	79.2	31	129.2	12	50	19	79.2	31	129.2	
24	SILIANA	SIDI DAHER	155	822	49	31.6	15	9.7	64	41.3	77	49.7	62	40	139	89.7	126	81.3	77	49.7	203	131	The locality "Mouwaysia" was added in the 2nd visit.
25	SILIANA	AGBA	136	655	18	13.2	22	16.2	40	29.4	44	32.4	34	25	78	57.4	62	45.6	56	41.2	118	86.8	
26	SILIANA	NSIRAT	59	273	29	49.2	22	37.3	51	86.4	32	54.2	28	47.5	60	101.7	61	103.4	50	84.7	111	188.1	
27	SILIANA	FEJ ASSEKRA	152	648	52	34.2	28	18.4	80	52.6	69	45.4	54	35.5	123	80.9	121	79.6	82	53.9	203	133.6	
28	SILIANA	KSAR-OULED BOUHANI	203	1039	68	33.5	45	22.2	113	55.7	54	26.6	39	19.2	93	45.8	122	60.1	84	41.4	206	101.5	
29	KAIROUAN	GHANZOUR	130	667	45	34.6	51	39.2	96	73.8	46	35.4	66	50.8	112	86.2	91	70	117	90	208	160	
30	KAIROUAN	MAAMRIA	111	666	17	15.3	9	8.1	26	23.4	55	49.5	64	57.7	119	107.2	72	64.9	73	65.8	145	130.6	
31	KAIROUAN	GOUAAD	112	723	16	14.3	27	24.1	43	38.4	37	33	44	39.3	81	72.3	53	47.3	71	63.4	124	110.7	
32	KAIROUAN	KHOUALDIA	88	477	34	38.6	27	30.7	61	69.3	40	45.5	48	54.5	88	100	74	84.1	75	85.2	149	169.3	
33	KAIROUAN	HSAINIA	112	687	26	23.2	44	39.3	70	62.5	21	18.8	56	50	77	68.8	47	42	100	89.3	147	131.3	
34	KAIROUAN	DOUAR EL BELDI	67	355	14	20.9	16	23.9	30	44.8	N/A	-	N/A	-	N/A	-	14	20.9	16	23.9	30	44.8	
35	KAIROUAN	OULED ABBES	135	741	52	38.5	28	20.7	80	59.3	N/A	-	N/A	-	N/A	-	52	38.5	28	20.7	80	59.3	
36	KAIROUAN	OULED BOUDABOUS	107	599	42	39.3	16	15	58	54.2	N/A	-	N/A	-	N/A	-	42	39.3	16	15	58	54.2	

*1: The number of households is based on targeted ones in each vist of the sensitization.

*2: The percentage shows the ratio to the total number of households.

Table 8.2.10 Result of the second visit of the sensitization

(2/2)

Total No.	Governorate	Sub-project	hh (household)	Population	Meeting for general information						Meeting with limited groups						Total						Remarks
					Men	% (vs. hh)	Women	% (vs. hh)	Sub-Total	% (vs. hh)	Men	% (vs. hh)	Women	% (vs. hh)	Sub-Total	% (vs. hh)	Men	% (vs. hh)	Women	% (vs. hh)	Total	% (vs. hh)	
37	KASSERINE	BNANA / OULED BENAJEH	453	2418	260	57.4	80	17.7	340	75.1	N/A	-	N/A	-	N/A	-	260	57.4	80	17.7	340	75.1	
38	KASSERINE	MKIMEN	216	1269	88	40.7	16	7.4	104	48.1	N/A	-	N/A	-	N/A	-	88	40.7	16	7.4	104	48.1	
39	KASSERINE	CHAAIBIA	442	2438	218	49.3	199	45	417	94.3	N/A	-	N/A	-	N/A	-	218	49.3	199	45	417	94.3	
40	KASSERINE	OUED LAHTAB	170	1196	67	39.4	34	20	101	59.4	N/A	-	N/A	-	N/A	-	67	39.4	34	20	101	59.4	
41	KASSERINE	OULED MASSOUD RIZG	250	1250	162	64.8	62	24.8	224	89.6	N/A	-	N/A	-	N/A	-	162	64.8	62	24.8	224	89.6	The localities "El Brika", "Abaydia", "Zorg" and "Dlahmia - Ghdhabnia" were excluded in the 2nd visit
42	KASSERINE	AIN DEFLA	201	1044	110	54.7	24	11.9	134	66.7	N/A	-	N/A	-	N/A	-	110	54.7	24	11.9	134	66.7	
43	KASSERINE	FAKET EL KHADEM	206	1207	152	73.8	4	1.9	156	75.7	N/A	-	N/A	-	N/A	-	152	73.8	4	1.9	156	75.7	
44	KASSERINE	OULED BARKA	337	1760	163	48.4	76	22.6	239	70.9	N/A	-	N/A	-	N/A	-	163	48.4	76	22.6	239	70.9	3 localities (Bit Jilani, Snoussi and Aaraar) were excluded after the 2nd visit.
45	KASSERINE	SIDI SHIL	119	727	46	38.7	10	8.4	56	47.1	N/A	-	N/A	-	N/A	-	46	38.7	10	8.4	56	47.1	
46	SIDI BOUZID	AIN JAFFEL	424	2455	117	27.6	93	21.9	210	49.5	295	69.6	356	84.0	651	153.5	412	97.2	449	105.9	861	203.1	
47	SIDI BOUZID	GARD HADID	532	2802	69	13.0	78	14.7	147	27.6	383	72	390	73.3	773	145.3	452	85	468	88	920	172.9	
48	SIDI BOUZID	OULED MOUSSA	93	421	66	71.0	48	51.6	114	122.6	70	75.3	81	87.1	151	162.4	136	146.2	129	138.7	265	284.9	
49	SIDI BOUZID	SLATNIA	304	1617	82	27.0	63	20.7	145	47.7	182	59.9	191	62.8	373	122.7	264	86.8	254	83.6	518	170.4	
50	SIDI BOUZID	M'BARKIA	140	848	73	52.1	51	36.4	124	88.6	65	46.4	67	47.9	132	94.3	138	98.6	118	84.3	256	182.9	
51	SIDI BOUZID	OULED NAOUI	186	931	142	76.3	104	55.9	246	132.3	69	37.1	50	26.9	119	64.0	211	113.4	154	82.8	365	196.2	
52	SIDI BOUZID	OULED YOUSSEF GALLEL	57	321	21	36.8	35	61.4	56	98.2	14	24.6	30	52.6	44	77.2	35	61.4	65	114	100	175.4	
53	SOUSSE	CHRAIFIA	68	342	19	27.9	4	5.9	23	33.8	17	25	18	26.5	35	51.5	36	52.9	22	32.4	58	85.3	
54	SOUSSE	OULED FALEH	29	179	14	48.3	7	24.1	21	72.4	9	31	3	10.3	12	41.4	23	79.3	10	34.5	33	113.8	
55	MAHDIA	SLAYMIA	293	1380	201	68.6	162	55.3	363	123.9	137	46.8	121	41.3	258	88.1	338	115.4	283	96.6	621	211.9	
56	MAHDIA	SKHAIBIA	99	484	55	55.6	46	46.5	101	102	55	55.6	46	46.5	101	102	110	111.1	92	92.9	202	204	
57	MAHDIA	KHIOUR	305	1314	148	48.5	118	38.7	266	87.2	113	37	106	34.8	219	71.8	261	85.6	224	73.4	485	159	
58	MAHDIA	RQUIAT	89	421	42	47.2	61	68.5	103	115.7	33	37.1	58	65.2	91	102.2	75	84.3	119	133.7	194	218	
59	MAHDIA	RMADHNIA	22	140	35	159.1	28	127.3	63	286.4	18	81.8	18	81.8	36	163.6	53	240.9	46	209.1	99	450	
60	MAHDIA	AMMAR	159	818	49	30.8	45	28.3	94	59.1	52	32.7	84	52.8	136	85.5	101	63.5	129	81.1	230	144.7	
61	MAHDIA	ESSAAFI	94	1260	33	35.1	29	30.9	62	66.0	36	38.3	62	66.0	98	104.3	69	73.4	91	96.8	160	170.2	
62	SFAX	GARGOUR-BRAHMA FKAHIA	705	3622	181	25.7	62	8.8	243	34.5	263	37.3	311	44.1	574	81.4	444	63	373	52.9	817	115.9	
63	GAFSA	HCHACHNA	63	363	48	76.2	0	0	48	76.2	N/A	-	N/A	-	N/A	-	48	76.2	0	0	48	76.2	
64	GAFSA	OUED ZITOUN	26	135	44	169.2	5	19.2	49	188.5	N/A	-	N/A	-	N/A	-	44	169.2	5	19.2	49	188.5	
65	GAFSA	ENJAIMIA	132	939	0	0	0	0	0	0	97	73.5	66	50.0	163	123.5	97	73.5	66	50	163	123.5	
66	GAFSA	SMAIDIA	84	503	12	14.3	27	32.1	39	46.4	65	77.4	81	96.4	146	173.8	77	91.7	108	128.6	185	220.2	The locality "Errbaiia" was added after the 1st visit.

*1: The number of households is based on targeted ones in each vist of the sensitization.
*2: The percentage shows the ratio to the total number of households.

Table 8.2.12 Result of the third visit of the sensitization

No.	Governorate	Sub-project	Household[1]	Population	Date	Number of meetings for general information	Participants						Observations
							Men	%[2]	Women	%[2]	Total	%[2]	
1	ARIANA	CEBALET BEN AMMAR	19	77	07/08/04	1	14	73.7	3	15.8	17	89.5	
2	ARIANA	EL ACHICH	59	290	06/09/05	2	11	18.6	16	27.1	27	45.8	
3	MANOUBA	EL MAAFRINE	69	353	11/08/04	2	33	47.8	7	10.1	40	58.0	
4	MANOUBA	TIRASSET	42	196	10/08/04	1	14	33.3	10	23.8	24	57.1	
5	MANOUBA	SIDI ACHOUR	41	162	10/09/05	1	17	41.5	3	7.3	20	48.8	
6	NABEUL	BASSATINE	218	927	08/08/04	2	71	32.6	1	0.5	72	33.0	
7	NABEUL	BEN THAMEUR	33	174	05/08/04	1	21	63.6	7	21.2	28	84.8	
8	NABEUL	BIR BEN ZAHRA	127	533	08/08/04	3	52	40.9	23	18.1	75	59.1	
9	BIZERTE	ETRAMIS-EDMAIN	147	622	12/09/05	1	36	24.5	23	15.6	59	40.1	
10	BIZERTE	EL KALBOUSSI	248	1185	19-21/09/05	5	90	36.3	88	35.5	178	71.8	
11	BIZERTE	SIDI HASSEN	106	477	12/09/05	2	39	36.8	26	24.5	65	61.3	
12	BEJA	MZOUGHA-ZELDOU (1ST)	171	687	7 & 9/08/04	4	62	36.3	41	24.0	103	60.2	
13	BEJA	MZOUGHA-ZELDOU (2ND)	247	1111	4-5/08/04	6	64	25.9	29	11.7	93	37.7	
14	BEJA	KEF DAROUGUI-SFAYA	103	465	06/08/04	4	21	20.4	16	15.5	37	35.9	
15	BEJA	AIN DAM-NEFZA	407	1672	11-12/08/05	4	131	32.2	27	6.6	158	38.8	
16	BEJA	GMARA	226	957	12/08/05	1	25	11.1	37	16.4	62	27.4	
17	JENDOUBA	SOUALHIA	84	364	12/08/04	2	26	31.0	15	17.9	41	48.8	
18	JENDOUBA	EL ISLAH	116	476	14/08/04	2	14	12.1	25	21.6	39	33.6	
19	LE KEF	EZZAGUAYA	75	340	11 & 16/08/04	4	45	60.0	15	20.0	60	80.0	
20	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	163	633	02 & 10/09/05	4	82	50.3	17	10.4	99	60.7	The number of households and the population do not included those of the area in charge of the CRDA for the sensitization.
21	LE KEF	FORNA	97	410	20/09/05	1	35	36.1	9	9.3	44	45.4	
22	LE KEF	EL OUENA	88	410	12/09/05	2	43	48.9	19	21.6	62	70.5	
23	SILIANA	FEJ ASSEKRA	152	648	12 et 14/08/04	3	45	29.6	24	15.8	69	45.4	
24	SILIANA	KSAR-OULED BOUHANI	203	1039	5-6/08/04	6	74	36.5	31	15.3	105	51.7	
25	SILIANA	GHANGUET ZGALASS	24	143	05/09/05	1	12	50.0	7	29.2	19	79.2	
26	SILIANA	SIDI DAHER	155	822	29/08 & 09/09/05	3	72	46.5	26	16.8	98	63.2	
27	SILIANA	AGBA	136	655	01/09/05	3	62	45.6	31	22.8	93	68.4	
28	SILIANA	NSIRAT	59	273	26/08/05	2	25	42.4	17	28.8	42	71.2	
29	KAIROUAN	DOUAR EL BELDI	67	355	11/08/04	6	29	43.3	23	34.3	52	77.6	
30	KAIROUAN	OULED ABBES	135	741	09/08/04	6	52	38.5	28	20.7	80	59.3	
31	KAIROUAN	OULED BOUDABOUS	107	599	10/08/04	2	65	60.7	11	10.3	76	71.0	
32	KAIROUAN	MAAMRIA	111	666	14/09/05	2	48	43.2	23	20.7	71	64.0	
33	KAIROUAN	GHANZOUR	130	723	01/09/05	3	77	59.2	57	43.8	134	103.1	
34	KAIROUAN	GOUAAD	112	673	30/08/05	2	38	33.9	14	12.5	52	46.4	
35	KAIROUAN	KHOUALDIA	88	477	27-28/08/05	4	64	72.7	44	50.0	108	122.7	
36	KAIROUAN	HSAINIA	112	687	26/08/05	5	67	59.8	94	83.9	161	143.8	

*1: The number of households is based on targeted ones in each vist of the sensitization

*2: The percentage shows the ratio to the total number of households

Table 8.2.12 Result of the third visit of the sensitization

No.	Governorate	Sub-project	Household[1]	Population	Date	Number of meetings for general information	Participants						Observations
							Men	%[2]	Women	%[2]	Total	%[2]	
37	KASSERINE	AIN DEFLA	201	1044	19/08/04	1	53	26.4	27	13.4	80	39.8	
38	KASSERINE	FAKET EL KHADEM	206	1207	23-24/08/04	12	134	65.0	4	1.9	138	67.0	
39	KASSERINE	OULED BARKA	301	1575	27-28/08, 6/09/04	15	107	35.5	45	15.0	152	50.5	
40	KASSERINE	SIDI SHIL	119	687	20-21/08/04	7	47	39.5	3	2.5	50	42.0	
41	KASSERINE	BNANA / OULED BENAJEH	453	2418	29-30/08/2005	2	316	69.8	39	8.6	355	78.4	
42	KASSERINE	MKIMEN	216	1269	8-9/09/2005	3	127	58.8	40	18.5	167	77.3	
43	KASSERINE	CHAAIBIA	442	2438	5, 6, 7/09/05	8	259	58.6	121	27.4	380	86.0	
44	KASSERINE	OUED LAHTAB	205	1196	13-14/09/05	1	96	46.8	35	17.1	131	63.9	
45	KASSERINE	OULED MASSOUD RIZG	170	868	31/08, 01/09/05	2	107	62.9	23	13.5	130	76.5	
46	SIDI BOUZID	M'BARKIA	140	848	11/08/04	4	69	49.3	64	45.7	133	95.0	
47	SIDI BOUZID	OULED NAOUI	186	931	09/08/04	4	69	37.1	64	34.4	133	71.5	
48	SIDI BOUZID	OULED YOUSSEF GALLEL	57	321	10/08/04	3	29	50.9	32	56.1	61	107.0	
49	SIDI BOUZID	AIN JAFFEL	424	2455	10 & 17/09/05	5	145	34.2	104	24.5	249	58.7	
50	SIDI BOUZID	GARD HADID	532	2802	13 & 18/09/05	5	156	29.3	38	7.1	194	36.5	
51	SIDI BOUZID	OULED MOUSSA	93	421	11/09/05	2	66	71.0	48	51.6	114	122.6	
52	SIDI BOUZID	SLATNIA	304	1617	14/09/05	2	117	38.5	52	17.1	169	55.6	
53	SOUSSE	OULED FALEH	29	179	06/08/04	1	15	51.7	5	17.2	20	69.0	
54	SOUSSE	CHRAIFIA	68	342	14/08/05	1	18	26.5	8	11.8	26	38.2	
55	MAHDIA	SLAYMIA	293	1380	17/08/04	3	40	13.7	28	9.6	68	23.2	
56	MAHDIA	SKHAIBIA	99	484	16/08/04	2	35	35.4	17	17.2	52	52.5	
57	MAHDIA	KHIOUR	305	1314	11-12/08/04	2	59	19.3	17	5.6	76	24.9	
58	MAHDIA	RQUIAT	89	421	17/08/04	5	44	49.4	46	51.7	90	101.1	
59	MAHDIA	RMADHNIA	22	140	17/08/04	1	20	90.9	14	63.6	34	154.5	
60	SFAX	GUERGOUR-BRAHMIA FKAYHIA	728	3739	5, 6, 7/08/04	10	215	29.5	78	10.7	293	40.2	
61	MAHDIA	AMMAR	159	818	18/08/05	2	37	23.3	10	6.3	47	29.6	
62	MAHDIA	ESSAAFI	94	1260	16/08/05	1	36	38.3	25	26.6	61	64.9	
63	GAFSA	HCHACHNA	62	361	17/08/04	4	54	87.1	15	24.2	69	111.3	
64	GAFSA	OUED ZITON	26	135	16/08/04	1	17	65.4	13	50.0	30	115.4	
65	GAFSA	ENJAIMIA	132	939	16/09/05	2	22	16.7	0	0.0	22	16.7	
66	GAFSA	SMAIDIA	84	503	15/09/05	1	37	44.0	13	15.5	50	59.5	

*1: The number of households is based on targeted ones in each vist of the sensitization

*2: The percentage shows the ratio to the total number of households

Table 8.4.1a Demographics of sub-project areas (sub-projects for 2005)

Governorate	Sub-project	Population growth rate	Population	Projected population	Grouped population		Scattered population		Sheep and goats	Horses, cows and donkeys
		(%)	2004	2020	2004	2020	2004	2020		
ARIANA	CEBALET BEN AMMAR	1.9	77	103	77	103			43	23
MANOUBA	EL MAAFRINE	1.9	353	478	353	478			340	233
MANOUBA	TIRASSET		196	264	196	264			70	54
NABEUL	BASSATINE	1.3	927	1,141	927	1,141			540	385
NABEUL	BEN THAMEUR		174	214	100	123	74	91	90	51
NABEUL	BIR BEN ZAHRA		533	655	533	655			135	95
BE JA	KEF DAROUGUI-SFAYA	0.1	465	473	465	473			649	247
BE JA	MZOUGHA-ZELDOU		1,794	1,824	1,794	1,824			4,759	724
JENDOUBA	EL ISLAH	0.4	476	507	476	507			351	19
JENDOUBA	SOUALHIA		364	388	364	388			1,015	206
LE KEF	EZZAGUAYA	0	340	340	340	340			2,059	75
SILIANA	FEJ ASSEKRA	-0.1	648	638	648	638			2,199	220
SILIANA	KSAR-OULED BOUHANI		1,039	1,022	1,039	1,022			3,019	178
KAIROUAN	DOUAR EL BELDI	0.9	355	409	355	409			658	36
KAIROUAN	OULED ABBES		741	852	741	852			901	69
KAIROUAN	OULED BOUDABBOUS		599	692	599	692			510	30
KASSERINE	AIN DEFLA	1.5	1,044	1,325	925	1,174	119	151	1,713	70
KASSERINE	FAKKET EL KHADEM (EL AITHA)		803	1,016	581	735	222	281	2,204	98
KASSERINE	FAKKET EL KHADEM (NASSIRIA)		404	512	244	309	160	203	1,354	92
KASSERINE	OULED BARKA		1,575	1,998	1,575	1,998			1,209	88
KASSERINE	SIDI SHIL		727	922	662	840	65	82	2,079	66
SIDI BOUZID	M'BARKIA	1.5	848	1,078	702	893	146	185	1,235	307
SIDI BOUZID	OULED NAOUI		931	1,181	691	877	240	304	1,245	106
SIDI BOUZID	OULED YOUSSEF GALLEL		321	408	234	298	87	110	534	32
SOUSSE	OULED EL FALEH	1.5	179	226	179	226			1,376	45
MAHDIA	KHIOUR	1.2	1,453	1,760	1,453	1,760			1,631	59
MAHDIA	RMADHNIA		110	134	110	134			69	6
MAHDIA	RQUIAT		421	516	421	516			273	91
MAHDIA	SKHAIBIA		484	587	484	587			1,441	56
MAHDIA	SLAYMIA		1,380	1,674	1,380	1,674			940	25
SFAX	GUERGOUR-BRAHMIA-FKAYHIA	1.5	3,622	4,591	2,718	3,444	904	1,147	5,305	375
GAFSA	HCHACHNA	0.5	363	394	363	394			1,085	55
GAFSA	OUED ZITON		135	146	135	146			381	17
	Total		23,881	28,468	21,864	25,914	2,017	2,554	41,412	4,233

* The projected population in 2021 is shown for RQUIAT sub-project, because its construction is scheduled to be executed in 2006.

Table 8.4.1b Demographics of sub-project areas (sub-projects for 2006)

Governorate	Sub-project	Population growth rate	Population	Projected population	Grouped population		Scattered population		Sheep and goats	Horses, cows and donkeys
		(%)	2005	2021	2005	2021	2005	2021		
ARIANA	EL ACHICH	1.9	290	392	290	392	0	0	45	15
MANOUBA	SIDI ACHOUR	1.9	162	220	162	220	0	0	294	40
BIZERTE	ETRAMIS-EDMAIN	1.1	622	743	622	743	0	0	599	187
BIZERTE	EL KALBOUSSI		1,185	1,414	1,185	1,414	0	0	1,450	457
BIZERTE	SIDI HASSEN		477	569	477	569	0	0	376	215
BEJA	AIN DAM-NEFZA	0.1	1,672	1,699	1,672	1,699	0	0	886	389
BEJA	GMARA		957	970	957	970	0	0	937	319
LE KEF	FORNA	0.0	410	410	310	310	100	100	575	19
LE KEF	EL OUENA		481	481	384	384	97	97	421	86
LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA		1,298	1,298	1,298	1,298	0	0	3,555	134
SILIANA	GHANGUET ZGALASS	-0.1	143	140	143	140	0	0	98	16
SILIANA	SIDI DAHER		822	809	822	809	0	0	1,033	63
SILIANA	AGBA		655	645	655	645	0	0	1,304	143
SILIANA	NSIRAT		273	268	273	268	0	0	1,108	140
KAIROUAN	GHANZOUR	0.9	723	834	690	796	32	38	2,599	120
KAIROUAN	GOUAAD		673	775	612	704	62	71	1,849	90
KAIROUAN	KHOUALDIA		477	551	446	516	31	36	1,738	112
KAIROUAN	HSAINIA		687	793	687	793	0	0	1,312	55
KAIROUAN	MAAMRIA		666	767	666	767	0	0	1,477	101
KASSERINE	BNANA / OULED BENAJEH	1.5	2,418	3,062	1,251	1,586	1,167	1,476	3,573	247
KASSERINE	MKIMEN		1,269	1,611	247	314	1,022	1,297	4,654	120
KASSERINE	CHAAIBIA		2,438	3,091	1,829	2,322	609	769	5,404	308
KASSERINE	OUED LAHTAB		1,196	1,518	896	1,138	300	380	6,006	113
KASSERINE	OULED MASSOUD RIZG		868	1,101	651	826	217	275	2,025	14
SIDI BOUZID	GARD HADID	1.5	2,802	3,554	2,802	3,554	0	0	1,670	189
SIDI BOUZID	AIN JAFFEL		2,455	3,116	2,455	3,116	0	0	8,026	497
SIDI BOUZID	SLATNIA		1,617	2,050	1,617	2,050	0	0	2,714	230
SIDI BOUZID	OULED MOUSSA		421	534	421	534	0	0	3,781	97
SOUSSE	CHRAIFIA	1.2	342	435	302	384	40	51	2,318	74
MAHDIA	AMMAR	1.2	1,260	1,526	1,260	1,526	0	0	2,252	269
MAHDIA	ESSAAFI									
GAFSA	ENJAIMIA	0.5	939	1,018	316	342	623	676	14,602	542
GAFSA	SMAIDIA		503	543	503	543	0	0	2,442	144
	Total		31,201	36,938	26,901	31,672	4,300	5,266	81,123	5,545

Table 8.4.3 Characteristics of population in Tunisia

الولاية	Taux d'accroisssement annuel moyen observé(1984-1994)			Taux d'accroissement annuel moyen(projection)	
	Communal (Dis)	N Communal (Dis)	Global (INS)	Non Communal adopté(Dis)	Global 1995 (INS)
Tunis تونس	1,3%	-	1,3%	-	1,3%
Ariana أريانة	4,7%	2,3%	4,2%	1,9%	3,3%
B.Arous بن عروس	4,2%	3,2%	4,1%	3,3%	4,1%
إقليم تونس					
Nabeul نابل	2,7%	1,4%	2,2%	1,3%	2,1%
Zaghouan زغوان	4,1%	0,8%	1,8%	0,6%	1,4%
Bizerte بنزرت	2,5%	1,2%	1,9%	1,1%	1,7%
الشمال الشرقي					
Béja باجة	2,4%	0,1%	0,9%	0,1%	1,2%
Jendouba جندوبة	2,9%	0,6%	1,1%	0,4%	0,8%
Le Kef الكاف	2,0%	0,0%	0,8%	0,0%	0,6%
Siliana سليانة	3,3%	-0,1%	0,9%	-0,1%	1,0%
الشمال الغربي					
Kairouan القيروان	3,7%	1,7%	2,3%	0,9%	1,2%
Kasserine القصرين	4,0%	1,8%	2,5%	1,5%	2,2%
S.Bouzid سيدي بوزيد	6,2%	1,8%	2,6%	1,5%	2,1%
الوسط الغربي					
Sousse سوسة	3,3%	1,6%	2,9%	1,5%	2,8%
Monastir المنستير	2,6%	-	2,6%	-	2,2%
Mahdia المهدية	2,1%	2,1%	2,1%	1,2%	1,2%
Sfax صفاقس	2,6%	1,9%	2,3%	1,5%	1,8%
الوسط الشرقي					
Gafsa قفصة	3,5%	0,8%	2,6%	0,5%	1,7%
Tozeur توزر	2,5%	3,1%	2,6%	2,3%	2,0%
Kébili قبلي	3,7%	2,6%	3,2%	1,5%	1,8%
الجنوب الغربي					
Gabès قابس	3,2%	1,4%	2,5%	0,7%	1,2%
Medenine مدنين	2,8%	2,3%	2,6%	1,6%	1,8%
Tataouine تطاوين	4,0%	1,8%	3,0%	1,0%	1,6%
الجنوب الشرقي					
المجموع	**2,9%**	**1,4%**	**2,2%**	**1,0%**	**1,8%**

Table 8.4.8a Projection of water demand, unaccounted-for water and designed water supply (sub-projects for 2005)

(m^3/day)

No.	Governorate	Sub-project	Population		Domestic animals (head)		Domestic water demand		Water demand for animal	Total water demand		Unaccounted-for water		Average daily water supply		Daily peak factor	Maximum daily water supply	
			2006	2020	Sheep and goats	Cows and horses	2006	2020		2006	2020	2006	2020	2006	2020		2006	2020
1	ARIANA	CEBELAT BEN AMMAR	80	103	43	23	2.00	3.64	0.91	2.91	4.55	0.44	0.68	3.35	5.23	1.25	4.18	6.54
2	MANOUBA	EL MAAFRINE	367	478	340	233	9.16	16.89	6.75	15.91	23.64	2.39	3.54	18.30	27.18	1.25	22.88	33.98
3	MANOUBA	TIRASSET	204	264	70	54	5.09	9.33	1.97	7.06	11.30	1.06	1.69	8.12	12.99	1.25	10.15	16.24
4	NABEUL	BASSATINE	951	1,141	540	385	23.78	40.30	14.25	38.03	54.55	5.71	8.19	43.74	62.74	1.25	54.67	78.42
5	NABEUL	BEN THAMEUR ET BKIR	182	214	90	51	4.08	6.16	1.98	6.06	8.14	0.91	1.23	6.97	9.37	1.25	8.72	11.71
6	NABEUL	BIR BEN ZAHRA	547	655	135	95	13.67	23.14	3.52	17.19	26.66	2.58	4.00	19.77	30.66	1.25	24.72	38.32
7	BEJA	KEF DAROUGUI-SFAYA	466	473	649	247	11.65	16.71	6.68	18.33	23.39	2.75	3.51	21.08	26.90	1.25	26.35	33.62
8	BEJA	MZOUGHA-ZELDOU	1,798	1,824	4,759	724	44.94	64.43	25.77	70.71	90.20	10.61	13.53	81.32	103.73	1.25	101.65	129.66
9	JENDOUBA	EL ISLAH	480	507	351	19	11.99	17.91	2.33	14.32	20.24	2.15	3.04	16.47	23.28	1.25	20.59	29.09
10	JENDOUBA	SOUALHIA	367	388	1,015	206	9.17	13.71	5.48	14.65	19.19	2.20	2.87	16.85	22.06	1.25	21.06	27.58
11	LE KEF	EZZAGUAYA	340	340	2,059	75	8.50	12.01	4.80	13.30	16.81	2.00	2.42	15.30	19.23	1.25	19.12	24.16
12	SILIANA	FEJ ASSEKRA	647	638	2,199	220	16.17	22.54	9.02	25.19	31.56	3.78	4.73	28.97	36.29	1.25	36.21	45.36
13	SILIANA	KSAR-OULED BOUHANI	1,037	1,022	3,019	178	25.92	36.10	14.44	40.36	50.54	6.06	7.58	46.42	58.12	1.25	58.02	72.65
14	KAIROUAN	DOUAR EL BELDI	361	409	658	36	9.04	14.45	4.37	13.41	18.82	2.01	2.82	15.42	21.64	1.50	23.12	32.46
15	KAIROUAN	OULED ABBES	754	852	901	69	18.86	30.09	6.58	25.44	36.67	3.82	5.51	29.26	42.18	1.50	43.88	63.27
16	KAIROUAN	OULED BOUDABOUS	610	692	510	30	15.25	24.44	3.45	18.70	27.89	2.80	4.19	21.50	32.08	1.50	32.25	48.12
17	KASSERINE	AIN DEFLA	1,081	1,325	1,713	70	26.28	44.49	10.66	36.94	55.15	5.54	8.27	42.48	63.42	1.50	63.71	95.14
18	KASSERINE	FAKET EL KHADEM (EL AITHA)	838	1,016	2,204	98	19.53	31.58	12.63	32.16	44.21	4.83	6.64	36.99	50.85	1.50	55.49	76.27
	KASSERINE	FAKET EL KHADEM (NASSIRIA)	423	512	1,354	92	9.58	14.98	5.99	15.57	20.97	2.34	3.14	17.91	24.11	1.50	26.86	36.17
19	KASSERINE	OULED BARKA	1,623	1,998	1,209	88	40.56	70.58	8.69	49.25	79.27	7.39	11.89	56.64	91.16	1.50	84.97	136.74
20	KASSERINE	SIDI SHIL	752	922	2,079	66	18.39	31.31	12.38	30.77	43.69	4.61	6.56	35.38	50.25	1.50	53.08	75.37
22	SIDI BOUZID	M'BARKIA	880	1,078	1,235	307	28.95	46.78	16.80	45.75	63.58	6.85	9.54	52.60	73.12	1.50	78.91	109.68
23	SIDI BOUZID	OULED NAOUI	971	1,181	1,245	106	22.74	37.06	9.40	32.14	46.46	4.82	6.97	36.96	53.43	1.50	55.45	80.14
24	SIDI BOUZID	OULED YOUSSEF GALLEL	335	408	534	32	7.82	12.73	3.63	11.45	16.36	1.72	2.45	13.17	18.81	1.50	19.75	28.22
25	SOUSSE	OULED FALEH	184	226	1,376	45	4.61	7.98	3.19	7.80	11.17	1.17	1.68	8.97	12.85	1.50	13.46	19.27
26	MAHDIA	KHIOUR	1,488	1,760	1,631	59	37.20	62.17	9.93	47.13	72.10	7.07	10.82	54.20	82.92	1.50	81.30	124.37
27	MAHDIA	RMADHNIA	113	134	69	6	2.82	4.73	0.53	3.35	5.26	0.50	0.79	3.85	6.05	1.50	5.77	9.08
28	MAHDIA	RQUIAT*	431	516	273	91	10.78	18.23	4.09	14.87	22.32	2.38	3.34	17.25	25.66	1.50	25.87	38.50
29	MAHDIA	SKHAIBIA	496	587	1,441	56	12.39	20.73	8.29	20.68	29.02	3.10	4.36	23.78	33.38	1.50	35.68	50.07
30	MAHDIA	SLAYMIA	1,413	1,674	940	25	35.33	59.13	5.45	40.78	64.58	6.12	9.69	46.90	74.27	1.50	70.35	111.41
31	SFAX	GUERGOUR-BRAHMIA FKAYHA	3,774	4,591	5,305	375	88.63	144.60	37.77	126.40	182.37	18.96	27.35	145.36	209.72	1.50	218.04	314.58
32	GAFSA	HCHACHNA	367	394	1,085	55	9.17	13.92	5.57	14.74	19.49	2.21	2.92	16.95	22.41	1.50	25.42	33.62
33	GAFSA	OUED ZITON	136	146	381	17	3.41	5.16	2.06	5.47	7.22	1.02	1.08	6.49	8.30	1.50	9.43	12.45
		Total	24,496	28,468	41,412	4,233	607.460	978.010	269.360	876.82	1247.37	131.90	187.02	1008.72	1434.39		1431.11	2042.26

* Rquiat subproject is scheduled to be executed its construction in 2006

Table 8.4.8b Projection of water demand, unaccounted-for water and designed water supply (sub-projects for 2006)

(m^3/day)

No.	Governorate	Sub-project	Population		Livestock		Domestic water demand		Water demand for livestock	Total water demand		Unaccounted-for water		Average daily water supply		Daily peak factor	Maximum daily water supply	
			2007	2021	Sheep and Goat	Cows and Horses	2007	2021		2007	2021	2007	2021	2007	2021		2007	2021
1	ARIANA	EL ACHICH	301	392	45	15	7.53	13.84	0.68	8.20	14.52	1.23	2.18	9.43	16.70	1.25	11.79	20.87
2	MANOUBA	SIDI ACHOUR	168	220	294	40	4.21	7.73	2.67	6.88	10.40	1.03	1.56	7.91	11.96	1.25	9.88	14.96
3	BIZERTE	ETRAMIS-EDMAIN	622	743	587	187	15.89	26.17	8.56	24.45	34.73	3.67	5.21	28.12	39.94	1.25	35.15	49.92
4	BIZERTE	EL KALBOUSSI	1,211	1,414	1,450	457	30.28	49.87	19.95	50.23	69.81	7.53	10.48	57.76	80.29	1.25	72.20	100.36
5	BIZERTE	SIDI HASSEN	488	569	376	215	12.19	20.07	8.03	20.22	28.10	3.03	4.22	23.25	32.32	1.25	29.06	40.40
6	BEJA	AIN DAM-NEFZA	1,675	1,699	886	389	41.88	59.97	16.10	57.98	76.07	8.70	11.41	66.68	87.48	1.25	83.35	109.36
7	BEJA	GMARA	957	970	937	319	23.97	34.33	13.73	37.70	48.06	5.66	7.21	43.36	55.27	1.25	54.20	69.08
8	LE KEF	FORNA	410	410	575	19	9.75	12.95	3.45	13.20	16.40	1.98	2.45	15.17	18.85	1.25	18.97	23.57
9	LE KEF	EL OUENA	481	481	421	86	11.54	15.50	4.69	16.23	20.19	2.43	3.03	18.66	23.22	1.25	23.32	29.02
10	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	1,298	1,298	3,555	134	32.45	45.82	18.33	50.78	64.15	7.61	9.62	58.39	73.77	1.25	72.99	92.21
11	SILIANA	GHANGUET ZGALASS	143	140	98	16	3.57	4.97	0.97	4.54	5.94	0.68	0.89	5.22	6.83	1.25	6.52	8.54
12	SILIANA	SIDI DAHER	820	809	1,033	63	20.51	28.56	7.06	27.56	35.61	4.14	5.34	31.70	40.95	1.25	39.62	51.19
13	SILIANA	AGBA	654	645	1,304	143	16.34	22.75	9.10	25.44	31.86	3.82	4.77	29.26	36.63	1.25	36.58	45.79
14	SILIANA	NSIRAT	272	268	1,108	140	6.81	9.48	3.79	10.60	13.28	1.60	1.99	12.20	15.27	1.25	15.24	19.09
15	KAIROUAN	GHANZOUR	736	834	2,599	120	18.24	28.90	11.56	29.80	40.46	4.47	6.07	34.27	46.53	1.50	51.40	69.79
16	KAIROUAN	GOUAAD	685	775	1,849	90	16.82	26.35	10.54	27.36	36.89	4.10	5.53	31.46	42.42	1.50	47.19	63.64
17	KAIROUAN	KHOUALDIA	486	551	1,738	112	11.98	18.89	7.56	19.54	26.45	2.93	3.97	22.47	30.42	1.50	33.70	45.62
18	KAIROUAN	HSAINIA	699	793	1,312	55	17.49	28.01	8.24	25.73	36.25	3.86	5.44	29.58	41.69	1.50	44.38	62.53
19	KAIROUAN	MAAMRIA	678	767	1,477	101	16.95	27.15	10.42	27.37	37.57	4.10	5.63	31.47	43.20	1.50	47.21	64.80
20	KASSERINE	BNANA / OULED BENAJEH	2,491	3,062	3,504	247	56.27	85.70	25.28	81.54	110.97	12.23	16.65	93.77	127.62	1.50	140.66	191.42
21	KASSERINE	MKIMEN	1,307	1,611	4,657	120	27.42	37.01	14.80	42.22	51.81	6.34	7.78	48.56	59.59	1.50	72.84	89.38
22	KASSERINE	CHAAIBIA	2,512	3,091	5,404	308	59.65	97.44	36.26	95.91	133.70	14.39	20.06	110.30	153.76	1.50	165.45	230.64
23	KASSERINE	OUED LAHTAB	1,232	1,518	6,006	113	29.26	47.78	19.11	48.37	66.89	7.26	10.03	55.63	76.92	1.50	83.44	115.38
24	KASSERINE	OULED MASSOUD RIZG	894	1,101	2,025	14	21.24	34.69	10.55	31.78	45.23	4.77	6.79	36.55	52.02	1.50	54.83	78.03
25	SIDI BOUZID	GARD HADID	2,887	3,554	1,670	189	72.17	125.60	14.02	86.19	139.62	12.93	20.95	99.12	160.57	1.50	148.67	240.85
26	SIDI BOUZID	AIN JAFFEL	2,529	3,116	8,026	497	63.23	110.05	44.02	107.25	154.07	16.09	23.11	123.34	177.18	1.50	185.00	265.77
27	SIDI BOUZID	SLATNIA	1,666	2,050	2,714	230	41.65	72.48	20.47	62.12	92.95	9.32	13.95	71.43	106.90	1.50	107.15	160.35
28	SIDI BOUZID	OULED MOUSSA	434	534	3,781	97	10.84	18.87	7.55	18.39	26.42	2.76	3.96	21.15	30.38	1.50	31.73	45.58
29	SOUSSE	CHRAIFIA	352	435	2,318	74	8.60	14.55	5.82	14.42	20.37	2.16	3.05	16.58	23.42	1.50	24.87	35.13
30	MAHDIA	AMMAR	1,290	1,526	615	154	32.26	53.87	19.33	51.59	73.20	7.74	10.98	59.33	84.18	1.50	88.99	126.27
31	MAHDIA	ESSAAFI			1,637	115												
32	GAFSA	ENJAIMIA	948	1,018	14,602	542	20.56	25.58	10.23	30.80	35.82	4.62	5.37	35.42	41.19	1.50	53.13	61.79
33	GAFSA	SMAIDIA	508	543	2,442	144	12.70	19.24	7.70	20.40	26.94	3.06	4.04	23.46	30.98	1.50	35.19	46.47
Total			31,834	36,937	81,045	5,545	774.25	1,224.17	400.56	1,174.77	1,624.72	176.24	243.72	1,351.00	1,868.45		1,924.70	2,667.79

Table 8.4.11a Allowable withdrawal from water source (sub-projects for 2005)

No.	Governorate	Sub-project	Water source	Design withdrawal (l/sec)	Allowable withdrawal (l/sec)	Remarks
1	ARIANA	CEBELAT BEN AMMAR	SONEDE Connection	0.10	2.00	
2	MANOUBA	EL MAAFRINE	Extension GR	0.39	1.50	
3	MANOUBA	TIRASSET	SONEDE Connection	0.19	3.00	
4	NABEUL	BASSATINE	Extension GR	2.86	3.00	Consumption by concerned GICs
5	NABEUL	BEN THAMEUR ET BKIR	SONEDE Connection	0.14	2.00	
6	NABEUL	BIR BEN ZAHRA	SONEDE Connection	0.44	5.00	
7	BEJA	KEF DAROUGUI-SFAYA	Extension GR	1.90	5.00	Consumption by 2 GICs
8	BEJA	MZOUGHA-ZELDOU	SONEDE Connection	1.50	2.00	
9	JENDOUBA	EL ISLAH	SONEDE Connection	0.34	1.00	
10	JENDOUBA	SOUALHIA	SONEDE Connection	0.32	1.00	
11	LE KEF	EZZAGUAYA	SONEDE Connection	0.28	1.00	
12	SILIANA	FEJ ASSEKRA	Extension GR	0.52	2.00	
13	SILIANA	KSAR-OULED BOUHANI	SONEDE Connection	0.84	1.00	
14	KAIROUAN	DOUAR EL BELDI	Extension GR	3.30	10.00	Consumption by 3 GICs
15	KAIROUAN	OULED ABBES	Extension GR	1.90	2.00	Consumption by 3 GICs
16	KAIROUAN	OULED BOUDABOUS	Extension GR	8.50	15.00	Consumption by 3 GICs
17	KASSERINE	AIN DEFLA	Extension GR	3.10	5.00	Consumption by 3 GICs
18	KASSERINE	FAKET EL KHADEM (EL AITHA)	Irrigation system	0.90	25.00	
	KASSERINE	FAKET EL KHADEM (NASSIRIA)	Irrigation system	0.42	25.00	
19	KASSERINE	OULED BARKA	Extension GR	3.00	20.00	Consumption by 3 GICs
20	KASSERINE	SIDI SHIL	Irrigation system	0.87	35.00	
22	SIDI BOUZID	M'BARKIA	Extension GR	6.50	20.00	Consumption by GICs and
23	SIDI BOUZID	OULED NAOUI	Extension GR	2.10	15.00	Consumption by existing and extension
24	SIDI BOUZID	OULED YOUSSEF GALLEL	Extension GR	2.00	15.00	Consumption by existing and extension
25	SOUSSE	OULED FALEH	SONEDE Connection	0.22	1.00	
26	MAHDIA	KHIOUR	SONEDE Connection	1.40	10.50	
27	MAHDIA	RMADHNIA	SONEDE Connection	0.10	2.50	
28	MAHDIA	SKHAIBIA	Extension GR	0.58	5.00	
29	MAHDIA	SLAYMIA	SONEDE Connection	1.29	15.50	
30	MAHDIA	RQUIAT	Extension GR	0.45	6.00	
31	SFAX	GUERGOUR-BRAHMIA-FKAYHIA	SONEDE Connection	3.64	6.00	
32	GAFSA	HCHACHNA	Extension GR	2.00	5.00	Consumption by 2 GICs
33	GAFSA	OUED ZITON	Extension GR	5.20	7.00	Consumption by 3 GICs

Table 8.4.11b Allowable discharge from water source (sub-projects for 2006)

No.	Governorate	Sub-project	Water source	Design withdrawal (l/sec)	Allowable withdrawal (l/sec)	Remarks
1	ARIANA	EL ACHICH	SONEDE Connection	0.24	0.5	
2	MANOUBA	SIDI ACHOUR	SONEDE Connection	0.17	0.5	
3	BIZERTE	ETRAMIS-EDMAIN	Deep well	0.81	10.0 (deep well) 5.0 (equipment)	Consumption including future extension (Taibet Lism and Fajet Errih)
4	BIZERTE	EL KALBOUSSI	Deep well	1.16	10.0 (deep well) 5.0 (equipment)	
5	BIZERTE	SIDI HASSEN	SONEDE Connection	0.47	0.5, 6.5	two SONEDE connections
6	BEJA	AIN DAM-NEFZA	SONEDE Connection	1.27	2.0	
7	BEJA	GMARA	SONEDE Connection	0.80	0.83 (3.0 m3/h)	
8	LE KEF	FORNA	SONEDE Connection	0.27	3.0	
9	LE KEF	EL OUENA	Extension GR	0.54	3.7	Consumption by 3 GICs (Khdayjia, Ouled Arfa, Ouled Ouena)
10	LE KEF	ESBIAAT, EL AGROUB ET SOUALHIA	Deep well	1.07	5.0 (deep well) 3.0 (equipment)	
11	SILIANA	GHANGUET ZGALASS	Extension GR	0.10	15.0 (deep well) 6.0 (equipment)	Consumption by 2 GICs (Hbabsa-Ouled Attia, Khanguet Zgalass)
12	SILIANA	SIDI DAHER	Extension GR	0.59	15.0	Consumption by 2 GICs (Ouled Labiadh and Sidi Daher)
13	SILIANA	AGBA	Spring	0.53	1.35-7.0 (varies by the season)	
14	SILIANA	NSIRAT	SONEDE Connection	0.22	1.0	
15	KAIROUAN	GHANZOUR	Deep well	0.81	6.0	
16	KAIROUAN	GOUAAD	Extension GR	0.74	30.0 (deep well) 12.5 (equipment)	Consumption by 2 GICs (Ksar Lemsa, Gouaad)
17	KAIROUAN	KHOUALDIA	Extension GR	0.53	5.0	Consumption for AEP of 2 GICs (Ain Sassi, Khoualdia)
18	KAIROUAN	HSAINIA	Extension GR	0.72	20.0 (deep well) 10.0 (equipment)	Consumption by 4 GICs (Ain Soltan, Ksour, Salah Mokhtar, Hsainia)
19	KAIROUAN	MAAMRIA	Extension GR	0.75	10.0	Consumption by 2 GICs (Sayada and Maamria)
20	KASSERINE	BNANA / OULED BENJAH	Deep well	3.62	22.85 (deep well) 8.0 (equipment)	Consumption by 3 GICs (Rtibat 1, Rtibat 2, Bnana-O.Benjah)
21	KASSERINE	MKIMEN	Deep well	1.03	8.0 (deep well) 5.0 (equipment)	Consumption by 4 GICs (Zaouiet Chaffai/Ouled Ahmed, Maguer, Ain Defla, Mkimen)
22	KASSERINE	CHAAIBIA	Deep well	2.67	5.0	
23	KASSERINE	OUED LAHTAB	Deep well	1.34	10.0 (deep well) 3.0 (equipment)	
24	KASSERINE	OULED MASSAOUD	Deep well	1.32	5.0	
25	SIDI BOUZID	GARD HADID	Deep well	2.79	20.0 (deep well) 8.0 (equipment)	
26	SIDI BOUZID	AIN JAFFEL	Deep well	3.08	15.0 (deep well) 6.0 (equipment)	
27	SIDI BOUZID	SLATNIA	Extension GR	1.86	6.0	Consumption by 3 GICs (Bouchiha, Goubrar, Slatnia)
28	SIDI BOUZID	OULED MOUSSA	Extension GR	1.79 (Zoghmar + O.Moussa)	45.0 (deep well) 3.0 (relay station)	Consumption by 2 GICs (Zoghmar and Ouled Moussa)
29	SOUSSE	CHRAIFIA	Extension GR	0.41	7.0	Consumption by 2 sub-projects (M'dass Ennaouara and Chraifia)
30	MAHDIA	AMMAR	SONEDE Connection	1.46	12.0	
31	MAHDIA	ESSAAFI				
32	GAFSA	ENJAIMIA	SONEDE Connection	0.72	2.5	
33	GAFSA	SMAIDIA	Deep well	0.54	15.0	Consumption by irrigation (12l/s) and AEP (3l/s)

Table 8.4.14a Number of pump facilities for sub-projects 2005

No	Governorate	Project	Pump capacity	Pump head	Rated motor output	Pump type	Number of pump	facilities to be installed	Capacity of relay tank	Power supply	Electric current	Trans-former	Length of power cable	Automatic control for operation		Notes
			l/s	m	kW		set		m3		phase	kVA	km	Type	Length	
1	ARIANA	CEBELAT BEN AMMAR	No need			Water is distributed directly from the SONEDE WSS										
2	MANOUBA	EL MAAFRINE	1.00	108	5.50	In-line	2	Relay tank	10	Power supply	Three	16	0.00	Sensors with pilot cable	1,312m	
3	MANOUBA	TIRASSET	1.00	70	1.50	In-line	2	Relay tank	10	Power supply	Three	16	0.00	Pressure gauge	3,156m	
4	NABEUL	BASSATINE	No need			Water is transmitted by dynamic pressure to the distribution tank										
5	NABEUL	BEN THAMEUR ET BKIR	No need			Water is distributed directly from the SONEDE WSS.										
6	NABEUL	BIR BEN ZAHRA	2.00	32	1.10	In-line	2	Relay tank	20	Power supply	Single	16	0.00	Sensors with pilot cable	756m	
7	BE JA	KEF DAROUGUI-SFAYA	(1.10 1.10)	(100 117)	(2.20 2.20)	(Submersible Submersible)	2 2	(Relay tank Relay tank)	0	Power supply	Single Single					Capacity of existing pump
8	BE JA	MZOUGHA-ZELDOU (A)	3.00	150	9.20	Submersible	2	Relay tank	40	Power supply	Three	25	1.00	Pressure gauge	3,318m	
8	BE JA	MZOUGHA-ZELDOU (B)*	0.75	120	2.20	Submersible	4*1	Relay tank	20	Power supply	Single	25	0.00	Pressure gauge	3,198m	*1: Two pumps in parallel
9	JENDOUBA	EL ISLAH	No need			Water is transmitted by dynamic pressure to the distribution tank										
10	JENDOUBA	SOUALHIA	No need			Ditto										
11	LE KEF	EZZAGAYA	1.00	128	2.20	Submersible	2	Existing Relay tank*2	Existing	Power supply	Single	(e)*	0.00	Pressure gauge	1,468m	*2: New pumps will replace the exisiting pumps.
12	SILIANA	FEJ-ASSEKRA	1.00	149	4.00	In-line	2	Relay tank	20	Power supply	Three	16	0.50	Pressure gauge	2,755m	
13	SILIANA	KSAR-OULED BOUHANI (A)	0.75	92	1.50	In-line	4*3	Relay tank	30	Power supply	Single	10	0.00	Sensors with pilot cable	1,068m	*3: Two pumps in parallel
13	SILIANA	KSAR-OULED BOUHANI (B)*	1.00	66	1.50	In-line	2	Relay tank	20	Power supply	Single	10	Single - 0.65	Sensors with pilot cable	701m	
14	KAIROUAN	DOUAR EL BELDI	No need			Water is distributed directly from the existing GR WSS.										
15	KAIROUAN	OULED ABBES	2.00	42	2.20	In-line	2	Relay tank	50	Power supply	Three	16	0.00	Pressure gauge	2,275m	
16	KAIROUAN	OULED BOUDABOUS	No need			Water is transmitted by dynamic pressure to the distribution tank										
17	KASSERINE	AIN DEFLA	No need			Ditto										
18	KASSERINE	FAKKET EL KHADEM (EL AITHA)	No need			Water is distributed directly from the exsiting GR WSS										
19	KASSERINE	FAKKET EL KHADEM (NASSIRIA)	No need			Ditto										
20	KASSERINE	OULED BARKA	No need			Water is transmitted by dynamic pressure to the distribution tank										
21	KASSERINE	SIDI SHIL	2.00	64	3.00	In-line	2	Relay tank	50	Power supply	Three	16	0.00	Pressure gauge	6,601m	
22	SIDI BOUZID	MBARKIA (SIDI ALIBEN AOUN)	2.00	100	4.00	In-line	2	In-line		Power supply	Three	100 (e)	0.00	Pressure gauge	6,824m	*Co-operating with irrigation
23	SIDI BOUZID	OULED NAOUI	4.00	185	15.00	Submersible	2	Existing Deep well	Not Neccesary	Power supply	Three	50 (e)	0.00	Sensors with pilot cable	1,302m	*A new deep well pump will replace an existing one
24	SIDI BOUZID	OULED YOUSSEF GALLEL	No need			Water is distributed directly from the exsiting GR WSS										
25	SOUSSE	OULED FALEH	1.00	38	1.10	In-line	2	Relay tank	10	Power supply	Three	16	0.00	Pressure gauge	1,345m	
26	MAHDIA	KHIOUR	No need			Water is distributed directly from the SONEDE WSS.										
27	MAHDIA	RMADHNIA	No need			Ditto										
28	MAHDIA	RQUIAT	No need			Ditto										
29	MAHDIA	SKHAIBIA	No need			Water is distributed directly from the exsiting GR WSS										
30	MAHDIA	SLAYMIA	No need			Ditto										
31	SFAX	GERGOUR-BRAHMIA-FKAYHIA	6.00	33	4.00	In-line	2	Relay tank	20	Power supply	Three	16	2.50	Sensors with pilot cable	1,455m	
32	GAFSA	HCHACHNA	No need			Water is distributed directly from the exsiting GR WSS										
33	GAFSA	OUED ZITON	No need			Ditto										
						Total	34	Including a reserving pump						*(e): Existing transformer		

Table 8.4.14b Number of pump facilities for sub-projects 2006

No	Governorate	Project	Pump capacity	Pump head	Rated motor output	Pump type	Number of pump	facilities to be installed	Capacity of relay tank	Power supply	Electric current	Trans-former	Length of power cable	Automatic control for operation		Notes
			l/s	m	kW		set		m3		phase	kVA	km	Type	Length	
1	ARIANA	EL ACHICH	1.38	74	2.20	In-line	2	Relay tank	10	Power supply	Three	16	0.00	Sensors with pilot cable	973m	
2	MANOUBA	SIDI ACHOUR	1.38	64	1.50	In-line	2	Relay tank	10	Power supply	Single	10	0.00	Sensors with pilot cable	374m	
3	BIZERTE	ETRAMIS-EDMAIN	5.00	145	13.00	submersible	2	Deep well	Not necessary	Power supply	Three	40	0.50	Pressure gauge	3,391m	
4	BIZERTE	EL KALBOUSSI (1)	5.00	155	13.00	submersible	2	Deep well	Not necessary	Power supply	Three	40	1.80	Sensors with pilot cable	612m	
4	BIZERTE	EL KALBOUSSI (2)	2.50	165	7.50	In-line	2	Relay tank	30	Power supply	Three	25	0.00	Pressure gauge	3,000m	
5	BIZERTE	SIDI HASSEN	0.50	30	0.37	In-line	2	In-line	Not necessary	Power supply	Single	10	0.00	Pressure gauge	1,470m	
6	KAIROUAN	MAAMRIA	No need			Water is transmitted by dynamicl pressure to the distribution tank										
8	BEJA	GMARA	1.50	181	7.50	submersible	2	Relay tank	30	Power supply	Three	25	0.30	Pressure gauge	1,770m	
7	BEJA	AIN DAM-NEFZA	2.50	194	11.00	submersible	2	Relay tank	40	Power supply	Three	25	0.70	Pressure gauge	2,260m	
9	SILIANA	GHANGUET ZGALASS	No need													
10	SILIANA	SIDI DAHER	2.00	127	5.50	In-line	2	Relay tank	50	Power supply	Three	25	0.00	Sensors with radio transmission	4,772m	
11	SILIANA	AGBA	No need			Water is transmitted by gravity from the spring to the distribution tank										
12	SILIANA	NSIRAT	No need			Water is transmitted by dynamic pressure to the distribution tank										
13	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	3.00	35	1.50	submersible	2	Deep well	Not necessary	Power supply	Three	25	2.00	Sensors with pilot cable	50m	
14	KAIROUAN	GHANZOUR	3.00	141	7.50	submersible	2	Deep well	Not necessary	Power supply	Three	25	3.00	Sensors with pilot cable	1,114m	
15	KAIROUAN	GOUAAD*	0.75	150	2.20	In-line	4[*1]	Relay tank	30	Power supply	Single	16	0.00	Pressure gauge	2,542m	*1: Two pumps in parallel
16	KAIROUAN	KHOUALDIA	1.00	61	1.50	In-line	2	Relay tank	50	Power supply	Single	10	0.00	Sensors with pilot cable	50m	
17	KAIROUAN	HSAINIA	No need			No transmission pipeline (Water is distributed directly from the exsiting tank)										
18	SOUSSE	CHRAIFIA	1.00	64	2.20	In-line	2	Relay tank	40	Power supply	Single	10	0.00	Sensors with pilot cable	1,117m	
19	MAHDIA	OULED AMMAR	5.00	30	3.00	In-line	2	In-line	Not necessary	Power supply	Three	10	1.00	Sensors with pilot cable	41m	
20	MAHDIA	OULED ESSAAFI	No need			Essaafi and Ammar sub-projects share one WSS.										
21	LE KEF	FORNA	No need			Water is transmitted by dynamic pressure to the distributi										
22	LE KEF	EL OUENA	1.00	249	5.00	In-line	2	Relay tank	50	Power supply	Three	16	Single - 0.2km[*2]	Pressure gauge	2,394m	*2: A phase converter (1-phase to 3-phase)
23	KASSERINE	BNANA/OULED BENAJEH (1)	8.00	174	22.00	submersible	2	Deep well	Not necessary	Power supply	Three	100 (e)*	0.00	Pressure gauge	2,518m	
23	KASSERINE	BNANA/OULED BENAJEH (2)	1.00	83	2.20	submersible	2	Relay tank	15	Power supply	Single	10	0.00	Pressure gauge	2,226m	
24	KASSERINE	MKIMEN	1.00	133	3.00	In-line	2	Existing Relay tank	Existing (20m3)	Power supply	Single[*3]	10	Single - 3.0km	Pressure gauge	7,897m	*3: 3-phase motor was selected under condition of 1-phase
25	KASSERINE	CHAAIBIA	5.00	118	9.20	submersible	2	Deep well	Not necessary	Power supply	Three	25	1.00	Sensors with pilot cable	1,153m	
26	KASSERINE	OUED LAHTAB	3.00	128	5.50	submersible	2	Deep well	Not necessary	Power supply	Three	25	1.50	Sensors with pilot cable	1,365m	
27	KASSERINE	OULED MASSOUD ZORG (1)	3.00	103	5.50	submersible	2	Deep well	Not necessary	Power supply	Three	25	1.10	Pressure gauge	2,695m	
27	KASSERINE	OULED MASSOUD ZORG (2)	1.00	82	2.20	In-line	2	In-line	Not necessary	Power supply	Single	10	Single - 0.3km	Pressure gauge	1,930m	
28	SIDI BOUZID	AIN JAFFEL (1A)	6.00	191	22.00	submersible	2	Deep well	Not necessary	Power supply	Three	100	6.00	Sensors with pilot cable		
28	SIDI BOUZID	AIN JAFFEL (1B)	6.00	225	30.00	In-line	2	Relay tank	50	Power supply	Three	ditto	ditto	Sensors with radio transmission	6,764m	
28	SIDI BOUZID	AIN JAFFEL (2)	1.00	150	4.00	In-line	2	Relay tank	15	Power supply	Single[*4]	10	0.00	Pressure gauge	2,766m	*4: 3-phase motor was selected under condition of 1-phase
29	SIDI BOUZID	GARD HADID	8.00	109	15.00	submersible	2	Deep well	Not necessary	Power supply	Three	40	1.50	Sensors with pilot cable	656m	
30	SIDI	OULED MOUSSA	No need			No transmission pipeline (Water is distributed directly from the exsiting tank)										
31	SIDI BOUZID	SLATNIA (1)	6.00	170	18.50	submersible	2	Existing Deep well	Not necessary	Power supply	Three	63	0.00	Sensors with pilot cable	29m	Three pumps share a transformer.
31	SIDI BOUZID	SLATNIA (2A)	3.00	142	7.50	In-line	2	Relay tank	100	Power supply	Three	ditto	ditto	Pressure gauge	5,503m	
31	SIDI BOUZID	SLATNIA (2B)	3.00	95	5.50	In-line	2	Relay tank	ditto	Power supply	Three	ditto	ditto	Pressure gauge	7,300m	Pump will be installed in the same tank as Slatnia(2A)
32	GAFSA	ENJAIMIA	No need			Water is transmitted by dynamic pressure to the distribution tank										
33	GAFSA	SMAIDIA	3.00	18	1.10	In-line	2	In-line	Not necessary	Power supply	Three	16	0.00	Sensors with pilot cable		
						Total	60	Including a reserving pump								

*(e): Existing transformer

Table 8.4.16a Distribution and transmission pipeline length (sub-projects for 2005)

Region	Governorate	Sub-project	Population in 2004	Households in 2004	Distribution pipeline			Transmission pipeline			Total pipelien Length			Distribution pipeline length per households
					HDPE PN10	HDPE PN16	Total	HDPE PN10	HDPE PN16	Total	HDPE PN10	HDPE PN16	Total	
Seacoast	ARIANA	CEBALET BEN AMMAR	77	19	1,474		1,474			0	1,474	0	1,474	77.6
	MANOUBA	EL MAAFRINE	353	69	4,706		4,706	1,312		1,312	6,018	0	6,018	68.2
	MANOUBA	TIRASSET	196	42	2,860		2,860	2,236	1,099	3,335	5,096	1,099	6,195	68.1
	NABEUL	BASSATINE	927	218	8,741		8,741	2,098		2,098	10,839	0	10,839	40.1
	NABEUL	BEN THAMEUR	174	33	1,825		1,825			0	1,825	0	1,825	55.3
	NABEUL	BIR BEN ZAHRA	533	127	9,547		9,547	756		756	10,303	0	10,303	75.2
	SOUSSE	OULED EL FALEH	179	29	1,917		1,917	1,352		1,352	3,269	0	3,269	66.1
	MAHDIA	KHIOUR	1,453	305	10,194		10,194			0	10,194	0	10,194	33.4
	MAHDIA	RMADHNIA	110	22	2,930		2,930			0	2,930	0	2,930	133.2
	MAHDIA	RQUIAT	421	89	6,804		6,804			0	6,804	0	6,804	76.4
	MAHDIA	SKHAIBIA	484	99	10,675		10,675			0	10,675	0	10,675	107.8
	MAHDIA	SLAYMIA	1,380	293	18,545		18,545			0	18,545	0	18,545	63.3
	SFAX	GUERGOUR-BRAHMIA-FKAYHIA	3,622	705	51,751		51,751	46,294		46,294	98,045	0	98,045	73.4
Sub-total			9,909	2,050	131,969	0	131,969	54,048	1,099	55,147	186,017		187,116	64.4
Northwest hilly	BE JA	KEF DAROUGUI-SFAYA	465	103	3,063		3,063	881	1,719	2,600	3,944	1,719	5,663	29.7
	BE JA	MZOUGHA-ZELDOU	1,794	418	34,306	6,835	41,141	4,297	4,100	8,397	38,603	10,935	49,538	82.1
	JENDOUBA	EL ISLAH	476	116	6,061		6,061	823		823	6,884	0	6,884	52.3
	JENDOUBA	SOUALHIA	364	84	4,723		4,723	38		38	4,761	0	4,761	56.2
	LE KEF	EZZAGUAYA	340	75	9,804	3,139	12,943			0	9,804	3,139	12,943	130.7
	SILIANA	FEJ ASSEKRA	648	152	14,772	4,143	18,915	1,377	1,378	2,755	16,149	5,521	21,670	97.2
	SILIANA	KSAR-OULED BOUHANI	1,039	203	15,512	11,122	26,634	1,569	200	1,769	17,081	11,322	28,403	76.4
	GAFSA	HCHACHNA	363	63	10,104	2,230	12,334			0	10,104	2,230	12,334	160.4
	GAFSA	OUED ZITON	135	26	3,917		3,917			0	3,917	0	3,917	150.7
Sub-total			5,624	1,240	102,262	27,469	129,731	8,985	7,397	16,382	111,247		146,113	82.5
Middle west semi-arid	KAIROUAN	DOUAR EL BELDI	355	67	7,084		7,084			0	7,084	0	7,084	105.7
	KAIROUAN	OULED ABBES	741	135	9,896		9,896	8,208		8,208	18,104	0	18,104	73.3
	KAIROUAN	OULED BOUDABBOUS	599	107	7,864		7,864	1,581		1,581	9,445	0	9,445	73.5
	KASSERINE	AIN DEFLA	1,044	201	10,936		10,936	1,073	356	1,429	12,009	356	12,365	54.4
	KASSERINE	FAKKET EL KHADEM (EL AITHA)	803	139	14,254		14,254			0	14,254	0	14,254	102.5
	KASSERINE	FAKKET EL KHADEM (NASSIRIA)	404	67	7,554		7,554			0	7,554	0	7,554	112.7
	KASSERINE	OULED BARKA	1,575	301	12,561	4,201	16,762	3,904		3,904	16,465	4,201	20,666	41.7
	KASSERINE	SIDI SHIL	727	119	18,418	1,967	20,385	6,601		6,601	25,019	1,967	26,986	154.8
	SIDI BOUZID	M'BARKIA	848	140	15,351		15,351	1,636	4,648	6,284	16,987	4,648	21,635	109.7
	SIDI BOUZID	OULED NAOUI	931	186	9,882	9,587	19,469	1,302		1,302	11,184	9,587	20,771	53.1
	SIDI BOUZID	OULED YOUSSEF GALLEL	321	57	5,720		5,720			0	5,720	0	5,720	100.4
Sub-total			8,348	1,519	119,520	15,755	135,275	24,305	5,004	29,309	143,825		164,584	78.7
Total			23,881	4,809	353,751	43,224	396,975	87,338	13,500	100,838	441,089	0	497,813	73.6

Table 8.4.16b Distribution and transmission pipeline length (sub-projects for 2006)

Region	Governorate	Sub-project	Population in 2005	Households in 2005	Distribution pipeline				Transmission pipeline				Total				Total pipeline length per households
					HDPE PN10	HDPE PN16	Ductile PN25 /SGP	Total	HDPE PN10	HDPE PN16	Ductile PN25 /SGP	Total	HDPE PN10	HDPE PN10	Ductile PN25 /SGP	Total	
Seacoast	ARIANA	EL ACHICH	290	59	3,702			3,702	1,100	0		1,100	4,802	0		4,802	81.4
	MANOUBA	SIDI ACHOUR	162	41	5,458			5,458	530	0		530	5,988	0		5,988	146.0
	BIZERTE	ETRAMIS-EDMAIN	622	147	9,627			9,627	0	3,140		3,140	9,627	3,140		12,767	86.9
	BIZERTE	EL KALBOUSSI	1,185	248	19,093	11,940		31,033	0	3,815	608	4,423	19,093	15,755	608	35,455	143.0
	BIZERTE	SIDI HASSEN	477	106	10,302			10,302	1,464	0		1,464	11,766	0		11,766	111.0
	SOUSSE	CHRAIFIA	342	68	5,673			5,663	1,117	0		1,117	6,790	0		6,790	99.9
	MAHDIA	AMMAR	1,260	253	28,171			28,171	41	0		41	28,212	0		28,212	111.5
	MAHDIA	ESSAAFI															
Sub-total			4,338	922	82,026	11,940		93,956	4,252	6,955	608	11,815	86,278	18,895	608	105,780	114.7
Northwest hilly	BEJA	AIN DAM-NEFZA	1,672	407	9,077			9,077	2,095	734	425	3,254	11,172	734	425	12,331	30.3
	BEJA	GMARA	957	226	4,316	2,065		6,381	847	650	220	1,717	5,163	2,715	220	8,098	35.8
	LE KEF	FORNA	410	97	9,837			9,837	2,024	0		2,024	11,861	0		11,861	122.3
	LE KEF	EL OUENA	481	88	4,833			4,833	1,125	1,438	1,025	3,588	5,958	1,438	1,025	8,421	95.7
	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	1,298	293	23,237		100	23,337	0	0	50 [<2]	50	23,237	0	150	23,387	79.8
	SILIANA	GHANGUET ZGALASS	143	24	5,864			5,864	882	0		882	6,746	0		6,746	281.1
	SILIANA	SIDI DAHER	822	155	9,618	1,423		11,041	597	4,176		4,773	10,215	5,599		15,814	102.0
	SILIANA	AGBA	655	136	4,571	359		4,930	246	0		246	4,817	359		5,176	38.1
	SILIANA	NSIRAT	273	59	4,596			4,596	2,513	0		2,513	7,109	0		7,109	120.5
Sub-total			6,711	1,485	75,949	3,847	100	79,896	10,329	6,998	1,720	19,047	86,278	10,845	1,820	98,943	66.6
Middle west semi-arid	KAIROUAN	GHANZOUR	723	130	11,247			11,247	483	631		1,114	11,730	631		12,361	95.1
	KAIROUAN	GOUAAD	673	112	9,707	1,969		11,676	1,458	1,703		3,161	11,165	3,672		14,837	132.5
	KAIROUAN	KHOUALDIA	477	88	13,818			13,818	1,428	0		1,428	15,246	0		15,246	173.3
	KAIROUAN	HSAINIA	687	112	5,978			5,978	0	0		-	5,978	0		5,978	53.4
	KAIROUAN	MAAMRIA	666	124	10,362	1,338		11,700	844	0		844	11,206	1,338		12,544	101.2
	KASSERINE	BNANA / OULED BENAJHE	2,418	453	35,338			35,338	12,021	1,254		13,275	47,359	1,254		48,613	107.3
	KASSERINE	MKIMEN	1,269	216	25,794			25,794	8,973	14,076		23,049	34,767	14,076		48,843	226.1
	KASSERINE	CHAAIBIA	2,438	442	28,987			28,987	1,154	0		1,154	30,141	0		30,141	68.2
	KASSERINE	OUED LAHTAB	1,196	205	23,474			23,474	1,366	0		1,366	24,840	0		24,840	121.2
	KASSERINE	OULED MASSAOUD	868	170	18,624			18,624	4,329	296		4,625	22,953	296		23,249	136.8
	SIDI BOUZID	GARD HADID	2,802	532	39,343			39,343	656	0		656	39,999	0		39,999	75.2
	SIDI BOUZID	AIN JAFFEL	2,455	424	28,744	4,319		33,063	2,681	2,167	4,682	9,530	31,425	6,486	4,682	42,593	100.5
	SIDI BOUZID	SLATNIA	1,617	304	15,604			15,604	3,228	2,304		5,532	18,832	2,304		21,136	69.5
	SIDI BOUZID	OULED MOUSSA	421	93	19,407			19,407	0	0		-	19,407	0		19,407	208.7
	GAFSA	ENJAIMIA	939	132	15,933	15,099		31,032	1,105	0		1,105	17,038	15,099		32,137	243.5
	GAFSA	SMAIDIA	503	84	13,177			13,177	794	0		794	13,971	0		13,971	166.3
Sub-total			20,152	3,621	315,537	22,725		338,262	40,520	22,431	4,682	67,633	356,057	45,156	4,682	405,895	112.1
Total			31,201	6,028	473,512	38,512	100	512,114	55,101	36,384	7,010	98,495	528,613	74,896	7,110	610,618	101.3

Table 8.4.18a Measures against water hammer for sub-projects for 2005

No.	Governorate	Sub-project	Flow rate (L/s)	Outside dia[1]. of transmission (mm)	Length of Pipeline (m)	Measure against water hammer
2	MANOUBA	EL MAAFRINE	1.00	75	1,317	Not necessary
3	MANOUBA	TIRASSET	1.00	75	3,156	Pressure surge: PN[2]16:1,099m, PN10:2,057m
6	NABEUL	BIR BEN ZAHRA	2.00	90	756	Not necessary
7	BE JA	KEF DAROUGUI-SFAYA	1.10	75	2,600	Pressure surge: PN16:1,719m, PN10:881m
8	BE JA	MZOUGHA-ZELDOU (1st phase)	3.00	110	3,318	Pressure surge: PN16:1,700m, PN10:1,618m
8	BE JA	MZOUGHA-ZELDOU (2nd phase))	0.75	90	5,079	Pressure surge: PN16:2,400m, PN10:2,679m
11	LE KEF	EZZAGUAYA	1.00	63	1,468	Pressure surge: PN16 1,468m (Existing pipeline)
12	SILIANA	FEJ-ASSEKRA	1.00	75	2,930	Pressure surge: PN16:1,553m, PN10:1,377m
13	SILIANA	KSAR-OULED BOUHANI (A)	0.75	75	868	Not necessary
13	SILIANA	KSAR-OULED BOUHANI (B)*	1.00	75	901	Pressure surge: PN16:200m, PN10:701m
15	KAIROUAN	OULED ABBES	2.00	90	2,275	Not necessary
21	KASSERINE	SIDI SHIL	2.00	75	6,601	Not necessary
22	SIDI BOUZID	M'BARKIA	2.00	110	6,284	Pressure surge: PN16:4,648m, PN10:1,636m
23	SIDI BOUZID	OULED NAOUI	4.00	110	1,302	Not necessary
25	SOUSSE	OULED FALEH	1.00	75	1,352	Not necessary
31	SFAX	GUERGOUR-BRAHMIA-FKAYHIA	6.00	125	1,456	Pressure drop: two air valves, PN10:1,456m

1. High Density Polyethylene Pipe 2. PN: Nominal Pressure

Table 8.4.18b Measures against water hammer for sub-projects for 2006

No.	Governorate	Sub-project	Flow rate (L/s)	Diameter[1] of transmission (mm)	Length of Pipeline (m)	Measure against water hammer
1	ARIANA	EL ACHICH	1.38	HDPE 75	973	Not necessary
2	MANOUBA	SIDI ACHOUR	1.38	HDPE 75	374	Not necessary
3	BIZERTE	ETRAMIS-EDMAIN	5.00	HDPE 90	3,140	PN[2]16:3,140m
4	BIZERTE	EL KALBOUSSI (1)	5.00	HDPE 110	612	Not necessary
4	BIZERTE	EL KALBOUSSI (2)	2.50	DCIP[3] 80 HDPE 90	3,202	Pressure surege: DCIP:608m, PN16:2,594m
5	BIZERTE	SIDI HASSEN	0.50	HDPE 75	1,464	Not necessary
8	BEJA	GMARA	1.50	DCIP 80 HDPE 90	1,716	Pressure surege: DCIP:222m, PN16:647m, PN10:847m
7	BEJA	AIN DAM-NEFZA	2.50	DCIP 100 HDPE 110	2,260	Pressure surege: DCIP:426m, PN16:734m, PN10:1,100m
10	SILIANA	SIDI DAHER	2.00	HDPE 90	4,512	Pressure surege: PN16:3,915m, PN10:597m
13	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	3.00	AC[3] 100	50	Not necessary
14	KAIROUAN	GHANZOUR	3.00	HDPE 90	1,114	Pressure surege: PN16:631m, PN10:483m
15	KAIROUAN	GOUAAD	0.75	HDPE 75	2,543	Pressure surege: PN16:1,703m, PN10:840m Pressure drop: Air chamber of 300 L
16	KAIROUAN	KHOUALDIA	1.00	HDPE 75	1,427	Not necessary
18	SOUSSE	CHRAIFIA	1.00	HDPE 75	1,117	Not necessary
19	MAHDIA	OULED AMMAR	5.00	HDPE 110	41	Not necessary
22	LE KEF	EL OUENA	1.00	HDPE 75	2,394	Pressure surege: DCIP:1,193m, PN16:616m, PN10:585m
23	KASSERINE	BNANA/OULED BENAJEH	8.00	HDPE 125	3,517	Pressure surege: PN16:1,253m, PN10:2,264m
24	KASSERINE	MKIMEN	2.49	HDPE 75	7,896m	Pressure surege: PN16:3,625m, PN10:4,271m
25	KASSERINE	CHAAIBIA	5.00	HDPE 110	1,153	Not necessary
26	KASSERINE	OUED LAHTAB	3.00	HDPE 90	1,366	Not necessary
27	KASSERINE	OULED MASSOUD RIZG (1)	3.00	HDPE 90	2,695	Not necessary
27	KASSERINE	OULED MASSOUD RIZG (2)	1.00	HDPE 75	1,930	Not necessary
28	SIDI BOUZID	AIN JAFFEL (1)	6.00	DCIP 150 HDPE 160	6,764	Pressure surege: DCIP:4,682m, PN16:1,071m, PN10:1,011m
28	SIDI BOUZID	AIN JAFFEL (2)	1.00	HDPE 75 HDPE 75	2,766	Pressure surge: PN16:1,096m, PN10:1,670m Pressure drop: Air chamber 200 L
29	SIDI BOUZID	GARD HADID	8.00	HDPE 125	656	Not necessary
31	SIDI BOUZID	SLATNIA (1)	6.00	HDPE 110	29	Not necessary
31	SIDI BOUZID	SLATNIA (2A)	3.00	HDPE 90	5,503	Pressure surge: PN16:2,303m, PN10:3,200m
31	SIDI BOUZID	SLATNIA (2B)	3.00	(1) AC[4] 100 (2) HDPE 110	(1) 7,300 (2) 6,953	(1)Pressure surge: AC:4,400m, PN10:2,900m (2)Pressure surge: PN16:6,953m
33	GAFSA	SMAIDIA	3.00	HDPE 90	829	Pressure drop: Air chamber of 100 L, PN10:829m

1. HDPE: outside diameter, DCIP and AC : inside diameter
2. PN: Nominal Pressure
3. DCIP: Ductile Cast Iron Pipe
2. AC: Cement asbestos pipe

Table 8.4.19a Distribution tanks (sub-projects for 2005)

No.	Governorate	Sub-project	Ditribution tank	Capacity (m^3)	Remark	No. of relay tank	Capacity (m^3)	Automatic control of pump
1	ARIANA	CEBELAT BEN AMMAR						
2	MANOUBA	EL MAAFRINE	SEMI BURIED	15	Projected	1	10	Sensors with pilot cable
3	MANOUBA	TIRASSET	SEMI BURIED	10	Projected	1	10	Pressure gauge
4	NABEUL	BASSATINE	ELEVATED	50	Projected, H=12m			
5	NABEUL	BEN THAMEUR ET BKIR						
6	NABEUL	BIR BEN ZAHRA	ELEVATED	25	Projected, H=15m	1	20	Sensors with pilot cable
7	BE JA	KEF DAROUGUI-SFAYA	SEMI BURIED	20	Projected			
8	BE JA	MZOUGHA-ZELDOU	ELEVATED SEMI BURIED	25 40	Existing, H=9m Projected	2	40 20	Pressure gauge
9	JENDOUBA	EL ISLAH	SEMI BURIED	20	Projected	1	8	
10	JENDOUBA	SOUALHIA	SEMI BURIED	20	Projected			not necessary
11	LE KEF	EZZAGAYA	ELEVATED	25	Existing, H=12m			Pressure gauge
12	SILIANA	FEJ-ASSEKRA	SEMI BURIED SEMI BURIED	10 10	Projected Projected (Relay tanK)	1	10	Pressure gauge
13	SILIANA	KSAR-OULED BOUHANI	SEMI BURIED SEMI BURIED	10 20	Projected Projected	2	30 20	Sensors with pilot cable
14	KAIROUAN	DOUAR EL BELDI	SEMI BURIED	150	Existing			
15	KAIROUAN	OULED ABBES	ELEVATED	25	Projected, H=12m	1	50	Pressure gauge
16	KAIROUAN	OULED BOUDABOUS	ELEVATED	50	Projected, H=15m			
17	KASSERINE	AIN DEFLA	SEMI BURIED	100	Projected			
18	KASSERINE	FAKKET EL KHADEM (EL AITHA)	ELEVATED	150	Projected by an irrigation project, H=25m			
19	KASSERINE	FAKKET EL KHADEM (NASSIRIA)	ELEVATED	150	Projected by an irrigation project, H=25m			
20	KASSERINE	OULED BARKA	SEMI BURIED SEMI BURIED	100 50	Projected Projected			Pressure gauge
21	KASSERINE	SIDI SHIL	SEMI BURIED	30	Projected	1	50	Pressure gauge
22	SIDI BOUZID	M'BARKIA	SEMI BURIED	40	Projected			Pressure gauge
23	SIDI BOUZID	OULED NAOUI	SEMI BURIED	30	Projected			Sensors with pilot cable
24	SIDI BOUZID	OULED YOUSSEF GALLEL	SEMI BURIED	30	Existing			
25	SOUSSE	OULED FALEH	ELEVATED	25	Projected, H=15m	1	10	Pressure gauge
26	MAHDIA	KHIOUR						
27	MAHDIA	RMADHNIA						
28	MAHDIA	RQUIAT	SEMI BURIED	150	Existing			
29	MAHDIA	SKHAIBIA	SEMI BURIED	150	Existing			
30	MAHDIA	SLAYMIA	SEMI BURIED SEMI BURIED	100 100	Existing Existing			
31	SFAX	GUERGOUR-BRAHIMA FKAYHIA	SEMI BURIED ELEVATED	30 150	Projected Projected, H=12m	1	20	Sensors with pilot cable
32	GAFSA	HCHACHNA						
33	GAFSA	OUED ZITON	SEMI BURIED	60	Existing			

Table 8.4.19b Distribution Tanks (Sub-projects for 2006)

No.	Governorate	Sub-project	Type	Capacity (m^3)	Remark	Number. of relay tank	Capacity (m^3)	Water level control
1	ARIANA	EL ACHICH	SEMI BURIED	20	Projected	-		Sensors with pilot
2	MANOUBA	SIDI ACHOUR	SEMI BURIED	20	Projected	-		Sensors with pilot
3	BIZERTE	ETRAMIS-EDMAIN	SEMI BURIED	30	Projected	-		Pressure gauge
4	BIZERTE	EL KALBOUSSI	SEMI BURIED	20,30,30,20,10 30	Projected Projected (Relay	1	30	Sensors with pilot cable Pressure gauge
5	BIZERTE	SIDI HASSEN	SEMI BURIED	15	Projected	-		Pressure gauge
6	BEJA	AIN DAM-NEFZA	SEMI BURIED	20,30,10	Projected	1	40	Pressure gauge
7	BEJA	GMARA	SEMI BURIED	40	Projected	1	30	Pressure gauge
8	LE KEF	FORNA	ELEVATED	25	Projected	-		
9	LE KEF	EL OUENA	SEMI BURIED	10,10	Projected	1	50	Pressure gauge
10	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	SEMI BURIED	40,20	Projected	-		Sensors with pilot cable
11	SILIANA	GHANGUET ZGALASS	SEMI BURIED	10	Projected	-		
12	SILIANA	SIDI DAHER	SEMI BURIED	10,20	Projected	1	50	Sensors with pilot cable
13	SILIANA	AGBA	SEMI BURIED	30	Projected	-		
14	SILIANA	NSIRAT	SEMI BURIED	20	Projected	-		
15	KAIROUAN	GHANZOUR	SEMI BURIED	40	Projected	-		Sensors with pilot
16	KAIROUAN	GOUAAD	SEMI BURIED	30	Projected	1	30	Pressure gauge
17	KAIROUAN	KHOUALDIA	SEMI BURIED	30	Projected	1	50	Sensors with pilot cable
18	KAIROUAN	HSAINIA	TOUR	40	Existing			
19	KAIROUAN	MAAMRIA	SEMI BURIED	15,20	Projected			
20	KASSERINE	BNANA / OULED BENAJEH	ELEVATED SEMI BURIED	50 75,20	Projected Projected	1	15	2-Pressure gauges
21	KASSERINE	MKIMEN	SEMI BURIED ELEVATED	50,10,10 25	Projected Existing	1 -	10	Pressure gauge
22	KASSERINE	CHAAIBIA	SEMI BURIED	75,30	Projected	-		Sensors with pilot cable
23	KASSERINE	OUED LAHTAB	ELEVATED SEMI BURIED	50 10	Projected Projected	-		Sensors with pilot cable
24	KASSERINE	OULED MASSAOUD RIZG	SEMI BURIED	50,10	Projected	-		2-Pressure gauges
25	SIDI BOUZID	GARD HADID	SEMI BURIED	150	Projected	-		Sensors with pilot cable
26	SIDI BOUZID	AIN JAFFEL	SEMI BURIED	50,40,40,30,10,10,8	Projected	2	50,15	Sensors with radio transmission, sensors with pilot cabl, Pressure gauge
27	SIDI BOUZID	SLATNIA	SEMI BURIED	150	Projected	1	100	2-Pressure gauges
28	SIDI BOUZID	OULED MOUSSA	ELEVATED	100	Other pjt.			
29	SOUSSE	CHRAIFIA	ELEVATED	50	Projected	1	40	Sensors with pilot cable
30	MAHDIA	AMMAR	ELEVATED	100	Projected	-		Sensors with pilot cable
31	MAHDIA	ESSAAFI						
32	GAFSA	ENJAIMIA	ELEVATED	100	Projected	-		
33	GAFSA	SMAIDIA	ELEVATED	25	Projected	-		Sensors with pilot cable

Table 8.4.21 Proposed operation hours of service facilities of sub-projects for 2006

Governorate	Sub-project	Number of distribution tank	Operation hours	
			Morning	Afternoon
ARIANA	EL ACHICH	1	3(70)	3(30)
MANOUBA	SIDI ACHOUR	1	2(70)	2(30)
BIZERTE	ETRAMIS-EDMAIN	1	2(70)	2(30)
BIZERTE	EL KALBOUSSI	5	3-2(60) 3(30) 2(70)	3-2(40) 2(70) 2(30)
BIZERTE	SIDI HASSEN	1	2(70)	2(30)
SOUSSE	CHRAIFIA	1	2(70)	2(30)
MAHDIA	AMMAR	1	2(60)	2(40)
MAHDIA	ESSAAFI			
BEJA	AIN DAM-NEFZA	3	3-2(40)	3-4(60)
BEJA	GMARA	1	2(60)	2(40)
LE KEF	FORNA	1	data not available	
LE KEF	EL OUENA	2	data not available	
LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	2	2(70)	2(30)
SILIANA	GHANGUET ZGALASS	1	2(70)	2(30)
SILIANA	SIDI DAHER	2	2-3(70)	2-2(30)
SILIANA	AGBA	1	2(70)	2(30)
SILIANA	NSIRAT	1	2(60)	2(40)
GAFSA	ENJAIMIA	1	4(70)	4(30)
GAFSA	SMAIDIA	1	2(60)	2(40)
KAIROUAN	GHANZOUR	1	2(70)	2(30)
KAIROUAN	GOUAAD	1	3(60)	2(40)
KAIROUAN	KHOUALDIA	1	3(70)	2(30)
KAIROUAN	HSAINIA	1<2	2(70)	2(30)
KAIROUAN	MAAMRIA	2	2-2(30)	2-2(70)
KASSERINE	BNANA / OULED BENAJEH<1	2	data not available	
KASSERINE	MKIMEN<1	3<2	data not available	
KASSERINE	CHAAIBIA	2	data not available	
KASSERINE	OUED LAHTAB	2	data not available	
KASSERINE	OULED MASSAOUD BIZG	2	data not available	
SIDI BOUZID	GARD HADID	1	2(70)	2(30)
SIDI BOUZID	AIN JAFFEL	7	6-2(70) 2(60)	6-2(30) 2(40)
SIDI BOUZID	SLATNIA	1	2(70)	2(30)
SIDI BOUZID	OULED MOUSSA	1<3	2(70)	2(30)
Total		54		

Note: (1) 2(60) denotes that 60% of the population proposed two(2) hours of operation of the service installations in the morning (afternoon).

(2) <1 Additional tank called "RMC" (*mise en charge*) is projected with the function to stock water which is distributed directly to distribution tanks.

(3) <2 includes one (1) existing tank

(4) <3 The distribution tank is scheduled to be constructed by subproject Zoghmar in 2006.

Table 8.4.22 Comparison of tank capacity based on DGGREE Guidelines and tank behavior of sub-projects for 2006

Governorate	Delegation	Sub-project	Tank No.[1]	Tank type[2]	Status	MDWS[3] (m^3)	ADWS[4] (m^3)	50% of ADWS (m^3)	Tank capacity based on DGGREE Guidelines (m^3)	Number of potences	inflow (L/s)	Operation hours a.m.	Operation hours p.m.	Average outflow[5] (L/s)	Tank capacity based on its behaviour (m^3)	Tank capacity applied[7] (m^3)	Pump start-stop control[9]	Minimum water level to be applied (% of tank capacity)
ARIANA	MNIHLA	EL ACHICH		SE	Projected	20.9	16.7	8.4	10		1.4	2	2	1.5	10	10	Pilot cable	40
MANOUBA	MORNAGUIA	SIDI ACHOUR		SE	Projected	15.0	12.0	6.0	10		1.4	2	2	1.0	10	10	Pilot cable	60
BIZERTE	GHAZALA	EL KALBOUSSI	R1	SE	Projected	16.0	12.8	4.4	10		5	2	3	2.9	10	20	Pilot cable	35
			R2	SE	Projected	25.0	20.0	10	10		2	2	2	1.7	10	30	Float valve	
			R3	SE	Projected	17.0	13.6	6.8	10		2.5	3	2	2.9	10	30	Pressure gauge	
			R4	SE	Projected	38.3	30.7	15.4	20		2	2	2	2.7	20	20	Float valve	
			R5	SE	Projected	1.5	1.2	0.6	10		1.5	3	2	0.1	10	10	Float valve	
BIZERTE	BIZERTE SUD	ETRAMIS - EDMAIN		SE	Projected	69.6	55.7	27.9	30		5	2	2	4.8	30	30	Pressure gauge	
BIZERTE	GHAR EL MELH	SIDI HASSEN		SE	Projected	19.3	15.5	7.7	10		0.5	2	2	1.3	10	20	Pressure gauge	
SOUSSE	BOUFICHA	CHRAIFIA		SP	Projected	35.1	23.4	11.7	25	1	1	2	2	2.4	50	50	Pilot cable	
MAHDIA	SIDI ALLOUANE	OULED AMMAR ET OULED		SP	Projected	126.3	84.2	42.1	50		5	2	2	8.8	100	100	Pilot cable	40
BEJA	NEFZA	AIN DAM - NEFZA	R1	SE	Projected	48.0	38.4	19.2	20		2.5	2	2	4.3	20	20	Pressure gauge	
			R2	SE	Projected	38.3	30.6	15.3	20		1	2	2	5.4	30	30	Float valve	
			R3	SE	Projected	20.8	16.6	8.3	10		1	2	2	1.4	10	10	Float valve	
BEJA	NEFZA	GMARA		SE	Projected	69.1	55.3	27.7	30		1.5	2	2	4.8	40	40	Pressure gauge	
LE KEF	NEBEUR	EL OUENA	R1	SE	Projected	15.1	12.1	6.1	10		1					10	Pressure gauge	
			R2	SE	Projected	13.9	11.12	5.6	10		1.5					10	Float valve	
LE KEF	JERISSA, TAJEROUINE	ESBIAAT-EL ARGOUB ET SOUALHIA	R1	SE	Projected	46.0	36.8	18.4	20		3	2	2	5.2	40	40	Pilot cable	35
			R2	SE	Projected	46.3	37.0	18.5	20		2	2	2	3.2	20	20	Float valve	
LE KEF	KALAA KHASBA	FORNA		SP	Projected	22.0	17.6	8.8	25		3					25	Float valve	
SILIANA	MAKTHAR	AGBA		SE	Projected	45.8	36.6	18.3	20		0.75	2	2	3.2	30	30	Float valve	
SILIANA	ROUHIA	GHANGUET ZGALASS		SE	Projected	8.5	6.8	3.2	10		0.5	2	2	0.6	10	10	Float valve	
SILIANA	MAKTHAR,	NSIRAT[7]		SE	Projected	19.1	15.3	7.7	10		1	2	2	1.3	10	20	Float valve	
SILIANA	ROUHIA	SIDI DAHER	R1	SE	Projected	20.8	16.6	8.3	10		2	3	2	1.76	10	10	Radio	
			R2	SE	Projected	30.3	24.3	12.2	15		2	3	2	1.7	20	20	Float valve	
KAIROUAN	OUESSLATIA	GHANZOUR		SE	Projected	69.8	46.5	23.3	30		3	2	2	4.8	40	40	Pilot cable	50
KAIROUAN	OUESSLATIA	GOUAAD		SE	Projected	63.6	42.4	21.2	30		1.5	3	2	3.5	30	30	Pressure gauge	
KAIROUAN	NASRALLAH	HSAINIA		ST	Existing	62.5	41.7	21.2	30		48	2	2	4.3		40	Float valve	
KAIROUAN	HADJEB	KHOUALDIA		SE	Projected	45.6	30.4	15.2	20		1.0	3	2	2.5	30	30	Pilot cable	55
KAIROUAN	EL ALAA	MAAMRIA	R1	SE	Projected	14.0	9.4	4.7	10		2.3	3	2	0.8	10	20	Float valve	
			R2	SE	Projected	33.5	22.3	11.2	15		4.3	2	2	2.3	15	20	Float valve	
KASSERINE	FOUSSANA	BNANA/OULED BENAJEH[8]	R1	SP	Projected	189.5	126.3	63.2	100		8					50	Pressure gauge	
			R2	SE	Projected	151.8	101.2	50.6	60	1	5					60	Float valve	
			R3	SE	Projected	34.5	23.0	11.5	15	1	1.4					15	Pressure gauge	
KASSERINE	SBIBA	CHAAIBIA	R1	SE	Projected	172.4	114.9	57.5	60		5					60	Pilot cable	
			R2	SE	Projected	58.2	38.8	19.4	20		1.5					20	Float valve	
KASSERINE	HAIDRA	MKIMEN	R1	SE	Projected	64.98	43.4	21.7	30							50	Float valve	
			R2	SP	Existing	44.2	29.5	14.8	25		1.1					25	Float valve	
			R3	SE	Projected	20.8	13.9	7.0	10		1					10	Pressure gauge	
			R4	SE	Projected	24.4	16.3	8.2	10	1	5.7					10	Float valve	
KASSERINE	SBIBA	OUED LAHTAB	R1	SP	Projected	99.6	66.4	33.2	50		3					50	Pilot cable	
			R2	SE	Projected	15.8	10.5	5.3	10		1.5					10	Float valve	
KASSERINE	FOUSSANA	OULED MASSOUD RIZG	R1	SE	Projected	102.9	68.6	34.3	40		3					40	Pressure gauge	
			R2	SE	Projected	11.1	7.4	3.7	10		1					10	Pressure gauge	
SIDI BOUZID	JELMA	AIN JAFFEL	R1	SE	Projected	65.0	43.3	21.7	30		6.0	2	2	9.0	40	40	Radio	
			R2	SE	Projected	45.3	30.2	15.1	20		2.0	2	2	4.1	30	30	Float valve	
			R3	SE	Projected	48.7	32.5	16.3	20		1.0	2	2	4.4	40	40	Float valve	
			R4	SE	Projected	21.0	14.0	7.0	10		1.0	2	2	1.5	10	8	Float valve	
			R5	SE	Projected	54.7	36.5	18.3	20		1.5	2	2	4.8	40	40	Float valve	
			R6	SE	Projected	18.6	12.4	6.2	10		1.0	2	2	1.3	10	10	Float valve	
			R7	SE	Projected	12.5	8.4	4.2	10		1.0	2	2	0.9	10	10	Pressure gauge	
SIDI BOUZID	SIDI BOUZID EST	GARD HADID		SE	Projected	240.9	160.6	80.3	100	1	8	2	2	16.7	150	150	Pilot cable	55
SIDI BOUZID	JELMA	OULED MOUSSA		SP	Existing	154.2	102.8	51.4	100		3	2	2	10.7		100	Pressure gauge	
SIDI BOUZID	REGUEB	SLATNIA		SE	Projected	160.4	106.9	53.5	60		3	2	2	11.1	150	150	Pressure gauge	
GAFSA	MDHILLA	ENJAIMIA		SP	Projected	61.8	41.2	20.6	25	4	2.5	4	4	2.1	100	100	Float valve	
GAFSA	GAFSA NORD	SMAIDIA		SP	Projected	46.5	31.0	15.5	25	1	3.0	2	2	3.2	25	25	Pilot cable	30

Projects of CRDA KASSERINE and LE KEF (except ESBIAAT project) were not applied the ditribution tank behaviour analysis due to misunderstanding on the operation hours interview surve

1. Expediently applied number for projects which have several tank
2. SE: Semi-buried Tank, SP: Elevated Tank, ST: Water Service Tour
3. MDWS: Maximum Daily Water Supply, 4. ADWS: Average Daily Water Suppl
5. average outflow = MDWS/(total operation hours/3.6)+flow to other tanks
6. Capacity adopted by the resident consultant in charge of the project study regardless the DGGREE guidelines and a number of intructions by the Tear
7. Since SONEDE did not provide the project with assured minimum dynamic pressure, the project applied the capcity which is equivalent or over to the MDW
8. The elevated tank supplies water two existing tanks, 100m3 for Rtibat 1 and 70m3 for Rtibat 2, and a projected tank with 75m3 capacity for the project
9. Pump start-stop control

Pilot cable: Waer level sensors with pilot cable for signal transmissio
Float valve: Closing or opening pipe outlet in the tank according to water leve
Pressure gauge: Commanding the pump starter panel from the pressure gauge installed in the pump disch
Radio: Water level sensors with radio signal transmissio

Table 8.4.23a Number of communal taps (sub-projects for 2005)

Governorate	Sub-project	Population in 2004	Grouped population in 2004	Scattered population in 2004	Communal taps	Existing communal taps	potences	Existing potences	Particular connections	Population / (Communal taps + Potences)	Groupoed population / Commual Taps
ARIANA	CEBALET BEN AMMAR	77	77		4					25.8	25.8
MANOUBA	EL MAAFRINE	353	353		5	3			1	59.8	59.8
MANOUBA	TIRASSET	196	196		6					44.0	44.0
NABEUL	BASSATINE	927	927		13				2	87.8	87.8
NABEUL	BEN THAMEUR	174	100	74	2					107.0	61.5
NABEUL	BIR BEN ZAHRA	533	533		13				1	50.4	50.4
BE JA	KEF DAROUGUI-SFAYA	465	465		8					59.1	59.1
BE JA	MZOUGHA-ZELDOU	1794	1794		33				7	55.3	55.3
JENDOUBA	EL ISLAH	476	476		13				2	39.0	39.0
JENDOUBA	SOUALHIA	364	364		9					43.1	43.1
LE KEF	EZZAGUAYA	340	340		11					30.9	30.9
SILIANA	FEJ ASSEKRA	648	648		10				4	63.8	63.8
SILIANA	KSAR-OULED BOUHANI	1039	1039		15	2			1	60.1	60.1
KAIROUAN	DOUAR EL BELDI	355	355		6					68.2	68.2
KAIROUAN	OULED ABBES	741	741		16				2	53.3	53.3
KAIROUAN	OULED BOUDABBOUS	599	599		10					69.2	69.2
KASSERINE	AIN DEFLA	1044	925	119	18				6	73.6	65.2
KASSERINE	FAKKET EL KHADEM (EL AITHA)	803	581	222	19		2			37.6	38.7
KASSERINE	FAKKET EL KHADEM (NASSIRIA)	404	244	160	9		1		2	39.4	34.3
KASSERINE	OULED BARKA	1575	1575		39				2	51.2	51.2
KASSERINE	SIDI SHIL	727	662	65	19				1	48.5	44.2
SIDI BOUZID	M'BARKIA	848	702	146	10		3	1	1	41.5	89.3
SIDI BOUZID	OULED NAOUI	931	691	240	10		4			45.4	87.7
SIDI BOUZID	OULED YOUSSEF GALLEL	321	234	87	4		1			51.0	74.5
SOUSSE	OULED EL FALEH	179	179		4					56.5	56.5
MAHDIA	KHIOUR	1453	1453		19					92.6	92.6
MAHDIA	RMADHNIA	110	110		5					26.8	26.8
MAHDIA	RQUIAT	421	421		11					46.9	46.9
MAHDIA	SKHAIBIA	484	484		10					58.7	58.7
MAHDIA	SLAYMIA	1380	1380		24				3	69.8	69.8
SFAX	GUERGOUR-BRAHMIA-FKAYHIA	3622	2718	904	50		3		2	74.0	68.9
GAFSA	HCHACHNA	363	363		9					43.8	43.8
GAFSA	OUED ZITON	135	135		4					36.5	36.5
	Total & Average	23881	21864	2017	438	5	14	1	37	47.5	49.4

Table 8.4.23b Number of communal taps (sub-projects for 2006)

No.	Governorate	Sub-project	Population in 2005	Grouped population in 2005	Scattered population in 2005	Communal taps	Existing communal taps	Potences	Existing potences	Particular connections	Population/ (Communal taps + Potences)	Grouped population/ (Communal Taps)
1	ARIANA	EL ACHICH	290	290	0	7	0	0	0	0	41.4	41.4
2	MANOUBA	SIDI ACHOUR	162	162	0	8	0	0	0	0	20.3	20.3
3	BIZERTE	ETRAMIS-EDMAIN	622	622	0	21	0	0	0	2	27.0	29.6
4	BIZERTE	EL KALBOUSSI	1185	1185	0	41	0	0	0	3	26.9	28.9
5	BIZERTE	SIDI HASSEN	477	477	0	25	0	0	0	1	18.3	19.1
6	BEJA	AIN DAM-NEFZA	1672	1672	0	23	0	0	0	3	64.3	72.7
7	BEJA	GMARA	957	957	0	12	0	0	0	0	79.8	79.8
8	LE KEF	FORNA	410	310	100	15	0	0	0	0	27.3	20.7
9	LE KEF	EL OUENA	481	384	97	11	0	0	0	0	43.7	34.9
10	LE KEF	ESBIAAT, EL ARG]OUB ET SOUALHIA	1298	1298	0	21	0	0	0	3	54.1	61.8
11	SILIANA	GHANGUET ZGALASS	143	143	0	3	0	0	0	1	35.8	47.7
12	SILIANA	SIDI DAHER	822	822	0	13	0	0	0	1	58.7	63.2
13	SILIANA	AGBA	655	655	0	9	0	0	0	0	72.8	72.8
14	SILIANA	NSIRAT	273	273	0	8	0	0	0	0	34.1	34.1
15	KAIROUAN	GHANZOUR	723	690	33	18	0	0	0	0	40.2	38.3
16	KAIROUAN	GOUAAD	673	612	61	11	0	0	0	1	56.1	55.6
17	KAIROUAN	KHOUALDIA	477	446	31	15	0	0	0	1	29.8	29.7
18	KAIROUAN	HSAINIA	687	687	0	10	0	0	0	0	68.7	68.7
19	KAIROUAN	MAAMRIA	666	666	0	15	2	0	0	3	33.3	39.2
20	KASSERINE	BNANA / OULED	2418	1251	1167	45	0	2	0	6	45.6	35.2
21	KASSERINE	MKIMEN	1269	247	1022	15	5	1	0	5	48.8	12.4
22	KASSERINE	CHAAIBIA	2438	1829	609	52	0	0	0	0	46.9	35.2
23	KASSERINE	OUED LAHTAB	1196	896	300	31	0	0	0	1	37.4	28.9
24	KASSERINE	OULED MASSAOUD RIZG	868	651	217	25	0	0	0	4	29.9	26.0
25	SIDI BOUZID	GARD HADID	2802	2802	0	45	0	1	0	5	54.9	62.3
26	SIDI BOUZID	AIN JAFFEL	2455	2455	0	37	0	0	0	3	61.4	66.4
27	SIDI BOUZID	SLATNIA	1617	1617	0	20	0	0	0	2	73.5	80.9
28	SIDI BOUZID	OULED MOUSSA	421	421	0	12	0	0	0	0	35.1	35.1
29	SOUSSE	CHRAIFIA	342	302	40	4	0	1	0	0	68.4	75.5
30	MAHDIA	AMMAR	818	818	0	20	0	0	0	1	39.0	40.9
31	MAHDIA	ESSAAFI	442	442	0	14	0	0	0	0	31.6	31.6
32	GAFSA	ENJAIMIA	939	316	623	3	0	4	0	0	134.1	105.3
33	GAFSA	SMAIDIA	503	503	0	12	0	1	0	0	38.7	41.9
Total & Average			**31201**	**26901**	**4300**	**621**	**7**	**10**	**0**	**46**	47.8	46.5

Table 8.4.26a Number of disinfection facilities for sub-projects 2005

No.	Governorate	Sub-project	Neccesity of desinfection	Place to be installed	Dosing pump characteristics
					l/s, bar,
1	ARIANA	CEBELAT BEN AMMAR	Not necessary		
2	MANOUBA	EL MAAFRINE	Not necessary		
3	MANOUBA	TIRASSET	Not necessary		
4	NABEUL	BASSATINE	Installed	Arrival at the elavated tank	4 l/h, 10bar
5	NABEUL	BEN THAMEUR ET BKIR	Not necessary		
6	NABEUL	BIR BEN ZAHRA	Not necessary		
7	BE JA	KEF DAROUGUI-SFAYA	Installed	Arrival at the semi-burried tank	Changeable discharge type, 10bar
8	BE JA	MZOUGHA-ZELDOU	Installed	Relay pumping station	3 l/h, 16bar
9	JENDOUBA	EL ISLAH	Installed	Arrival at the semi-burried tank	3 l/h, 10bar
10	JENDOUBA	SOUALHIA	Installed	Arrival at the semi-burried tank	3 l/h, 10bar
11	LE KEF	EZZAGAYA	Installed	Relay pumping station	3 l/h, 16bar
12	SILIANA	FEJ-ASSEKRA	Installed	Arrival at semi-burried tank	3 l/h, 16bar
13	SILIANA	KSAR-OULED BOUHANI	Installed	Relay pumping station	3 l/h, 16bar
14	KAIROUAN	DOUAR EL BELDI	Not necessary		
15	KAIROUAN	OULED ABBES	Installed	Relay pumping station	3 l/h, 10bar
16	KAIROUAN	OULED BOUDABOUS	Installed	Projected chlorination station at the arrival of Elavated Tank	5 l/h, 10bar
17	KASSERINE	AIN DEFLA	Installed	Existing distribution tank	5 l/h, 10bar
18	KASSERINE	FAKKET EL KHADEM (EL AITHA)	Installed	Projected chlorination station at the upstream of elavated tank	5 l/h, 10bar
19	KASSERINE	FAKKET EL KHADEM (NASSIRIA)	Installed	Projected chlorination station at the upstream of existing elavated tank	5 l/h, 10bar
20	KASSERINE	OULED BARKA	Installed	Existing Pumping Station (Deep well)	15 l/h, 10bar
21	KASSERINE	SIDI SHIL	Installed	Relay pumping station	1.5 l/h, 10bar
22	SIDI BOUZID	M'BARKIA	Installed	Relay pumping station	3 l/h, 16bar
23	SIDI BOUZID	OULED NAOUI	Installed	Relay pumping station	5 l/h, 16bar
24	SIDI BOUZID	OULED YOUSSEF GALLEL	Not necessary		
25	SOUSSE	OULED FALEH	Installed	Relay pumping station	1.5 l/h, 10bar
26	MAHDIA	KHIOUR	Installed	Projected chlorination station on the distribution near the connection point	Changeable discharge type, 10bar
27	MAHDIA	RMADHNIA	Installed	Projected chlorination station on the distribution near the connection point	Changeable discharge type, 10bar
28	MAHDIA	RQUIAT	Installed	Projected chlorination station at the downstream of the existing tank (SONEDE)	Changeable discharge type, 16bar
29	MAHDIA	SKHAIBIA	Installed	Projected chlorination station at the upstream of the elavated tank	Changeable discharge type, 10bar
30	MAHDIA	SLAYMIA	Installed	Projected chlorination station at the connection point of SONEDE (distribution)	Changeable discharge type, 10bar (Etthouabtya) Changeable discharge type, 10bar (Ouled Slam)
31	SFAX	GUERGOUR-BRAHMIA-FKAYHIA	Installed	Relay pumping station	7 l/h, 10bar
32	GAFSA	HCHACHNA	Installed	Depature of the existing distribution tank	3 l/h, 10bar
33	GAFSA	OUED ZITON	Installed	Depature of the existing distribution tank	3 l/h, 10bar

Table 8.4.26b Number of Disinfection facilities for sub-projects 2006

No.	Governorate	Project	Neccesity of desinfection system	Place to be installed	Dosing pump characteristics
					l/s, bar,
1	ARIANA	EL ACHICH	Not necessary		
2	MANOUBA	SIDI ACHOUR	Not necessary		
3	BIZERTE	ETRAMIS-EDMAIN	Installed	Pumping station	4 l/h, 16bar
4	BIZERTE	EL KALBOUSSI	Installed	Pumping station	4 l/h, 16bar
5	BIZERTE	SIDI HASSEN	Installed	Relay pumping station only for high area	1l /h, 10bar
6	KAIROUAN	MAAMRIA	Installed	Arrival at the existing relay pumping station (for all GIC Sayaga)	3 l/h, 16bar
7	BEJA	AIN DAM-NEFZA	Installed	Relay pumping station	3 l/h, 25bar
8	BEJA	GMARA	Installed	Relay pumping station	2 l/h, 25bar
9	SILIANA	GHANGUET ZGALASS	Not necessary		
10	SILIANA	SIDI DAHER	Installed	Relay pumping station	3l/h, 16bar
11	SILIANA	AGBA	Installed	Arrival at the semi-buried tank	1.5l/h, 10bar
12	SILIANA	NSIRAT	Not necessary		
13	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	Installed	Pumping station	3l/h, 10bar
14	KAIROUAN	GHANZOUR	Installed	Pumping station	4l/h, 10bar
15	KAIROUAN	GOUAAD	Installed	Relay pumping station	3l/h, 16bar
16	KAIROUAN	KHOUALDIA	Installed	Relay pumping station	2l/h, 10bar
17	KAIROUAN	HSAINIA	Existing	Existing RSE 100m^3	10l/h, 10bar (existing)
18	SOUSSE	CHRAIFIA	Existing	Existing Relay pumping station	3.31l/h, 12bar (existing)
19	MAHDIA	OULED AMMAR	Not necessary		
20	MAHDIA	OULED ESSAAFI	Not necessary		
21	LE KEF	FORNA	Installed	Projected chlorination station on the transmission near the connection point	3l/h, 10bar
22	LE KEF	EL OUENA	Installed	Relay pumping station	2l/h, 16bar
23	KASSERINE	BNANA/OULED BENAJEH	Installed	Pumping station	6l/h, 25bar
24	KASSERINE	MKIMEN	Installed	Projected chlorination station on the transmission near the existing RSP.	2l/h, 16bar
25	KASSERINE	CHAAIBIA	Installed	Pumping station	4l/h, 10bar
26	KASSERINE	OUED LAHTAB	Installed	Pumping station	1l/h, 10bar
27	KASSERINE	OULED MASSOUD ROZG	Installed	Pumping station	3l/h, 10bar
28	SIDI BOUZID	AIN JAFFEL	Installed	Relay pumping station	3l/h, 25bar
29	SIDI BOUZID	GARD HADID	Installed	Pumping station	3l/h, 16bar
30	SIDI BOUZID	OULED MOUSSA	Not necessary		
31	SIDI BOUZID	SLATNIA	Installed	Pumping station	3l/h, 10bar
32	GAFSA	ENJAIMIA	Not necessary		
33	GAFSA	SMAIDIA	Installed	Relay pumping station	2l/h, 10bar

Table 8.4.27a Ancillary facilities of pipeline (sub-projects for 2005)

Governorate	Sub-project	Break pressure	Air valve	Washout	Sluice valve	Sluice valves at branched point	Pressure reducing valve
ARIANA	CEBALET BEN AMMAR		1	1		1	
MANOUBA	EL MAAFRINE					2	
MANOUBA	TIRASSET		5	2		2	
NABEUL	BASSATINE		12	4	3	6	
NABEUL	BEN THAMEUR		4	1		1	
NABEUL	BIR BEN ZAHRA		9	6	1	4	
BE JA	KEF DAROUGUI-SFAYA	3	9	4		3	
BE JA	MZOUGHA-ZELDOU	7	78	48	13		
JENDOUBA	EL ISLAH	2	23	3		4	
JENDOUBA	SOUALHIA	8	3	3		2	
LE KEF	EZZAGUAYA	1	9	3		4	
SILIANA	FEJ ASSEKRA	2	23	5		4	
SILIANA	KSAR-OULED BOUHANI		35	11		6	
KAIROUAN	DOUAR EL BELDI		7	1	2	2	
KAIROUAN	OULED ABBES		17	4	2	5	
KAIROUAN	OULED BOUDABBOUS		11	3	1	4	
KASSERINE	AIN DEFLA		9	2	8	4	
KASSERINE	FAKKET EL KHADEM (EL AITHA)		30	3	11	5	
KASSERINE	FAKKET EL KHADEM (NASSIRIA)		15	4	8	1	
KASSERINE	OULED BARKA		26	5	13	7	
KASSERINE	SIDI SHIL		27	6	4	8	
SIDI BOUZID	M'BARKIA		11	8		9	
SIDI BOUZID	OULED NAOUI		15	11		5	
SIDI BOUZID	OULED YOUSSEF GALLEL		5	2		4	
SOUSSE	OULED EL FALEH		2	1		1	
MAHDIA	KHIOUR		7	3	2	6	
MAHDIA	RMADHNIA		4	1	1	1	
MAHDIA	RQUIAT		7	4		5	
MAHDIA	SKHAIBIA		9	4		5	
MAHDIA	SLAYMIA		8	4	7	4	3
SFAX	GUERGOUR-BRAHMIA-FKAYHIA		36	14		21	
GAFSA	HCHACHNA		18	3	1	4	
GAFSA	OUED ZITON		3	1	2	1	
	Total	23	478	175	79	141	3

Table 8.4.27b Ancillary facilities of pipeline (sub-projects for 2006)

No.	Governorate	Subproject	Break pressure	Air valve	Washout	Sluice valve	Sluice valves at branched point	Pressure reducing Valve	Flow control valve
1	ARIANA	EL ACHICH	0	5	2	0	1	4	-
2	MANOUBA	SIDI ACHOUR(*)	0	4	1	0	3	3	-
3	BIZERTE	ETRAMIS-EDMAIN	0	11	4	1	9	18	-
4	BIZERTE	EL KALBOUSSI(*)	2	26	9	0	14	31	2 (tank)
5	BIZERTE	SIDI HASSEN	0	5	1	0	8	0	-
6	BEJA	AIN DAM-NEFZA	1	24	10	0	8	13	3 (tank and BP)
7	BEJA	GMARA(*)	1	12	10	0	5	6	1 (BP)
8	LE KEF	FORNA	0	16	2	0	11	0	-
9	LE KEF	EL OUENA(*)	1	14	3	0	10	5	2 (tank)
10	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	0	27	9	0	9	0	-
11	SILIANA	GHANGUET ZGALASS	0	12	4	0	1	0	-
12	SILIANA	SIDI DAHER(*)	1	41	7	0	4	2	1 (BP)
13	SILIANA	AGBA	1	14	3	0	3	2	-
14	SILIANA	NSIRAT	2	18	4	0	3	0	-
15	KAIROUAN	GHANZOUR(*)	1	13	7	0	7	5	-
16	KAIROUAN	GOUAAD	0	21	6	0	4	0	1 (RS)**
17	KAIROUAN	KHOUALDIA	0	15	6	0	8	0	-
18	KAIROUAN	HSAINIA	0	8	3	0	3	0	-
19	KAIROUAN	MAAMRIA(*)	0	13	2	0	5	14	3 (tank and BP)
20	KASSERINE	BNANA / OULED BENAJEH(*)	1	54	11	0	39	24	1 (BP)
21	KASSERINE	MKIMEN	0	26	5	0	13	10	-
22	KASSERINE	CHAAIBIA(*)	0	26	5	0	31	28	1 (tank)
23	KASSERINE	OUED LAHTAB	1	35	1	0	20	17	1 (tank)
24	KASSERINE	OULED MASSAOUD RIZG	0	13	3	0	20	20	-
25	SIDI BOUZID	GARD HADID(*)	0	17	7	0	26	13	-
26	SIDI BOUZID	AIN JAFFEL(*)	0	29	6	0	25	14	5 (tank)
27	SIDI BOUZID	SLATNIA(*)	0	10	5	0	8	0	-
28	SIDI BOUZID	OULED MOUSSA(*)	0	9	3	1	6	0	-
29	SOUSSE	CHRAIFIA(*)	0	9	4	0	4	0	-
30	MAHDIA	AMMAR	0	23	8	0	10	0	-
31	MAHDIA	ESSAAFI							
32	GAFSA	ENJAIMIA(*)	0	20	7	1	6	3	-
33	GAFSA	SMAIDIA	0	14	1	1	10	0	-
Total			12	584	159	4	334	232	

Note, *: pilot project, **: Flow control valve is considered in order not to disturb water distribution of the existing project.
BP: break pressure, RS: relay station

Table 8.5.1 Estimated construction cost of 33 water supply systems for 2005

Governorate	Sub-project	Present population	Projected population at the end of the project period	Projected water source	Maximum daily water supply in 2020	Construction cost								Unit construction cost	
						Facilities for water source	Pipe material	Pipeline works	Civil works	Electrification	Equipment	Contingency	Total construction cost	Per capita construction cost	Per 1m^3 water construction cost
					m^3/day	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD/m^3
ARIANA	CEBALET BEN AMMAR	77	103	SONEDE CONNECTION	6.54	1,300	10,706	25,720				5,659	43,385	421.2	6,634
MANOUBA	EL MAAFRINE	353	478	EXTENSION GR	33.98		24,979	54,412	24,000	10,000	21,000	20,159	154,550	323.3	4,548
MANOUBA	TIRASSET	196	264	SONEDE CONNECTION	16.24	1,300	26,957	50,519	29,000	12,000	8,000	19,166	146,942	556.6	9,048
NABEUL	BASSATINE	927	1,141	EXTENSION GR	78.42	1,200	75,756	147,462	80,000		3,000	46,113	353,531	309.8	4,508
NABEUL	BEN THAMEUR	174	214	SONEDE CONNECTION	11.71	1,300	10,949	27,073	10,000			7,398	56,720	265.0	4,844
NABEUL	BIR BEN ZAHRA	533	655	SONEDE CONNECTION	38.32	1,300	81,907	138,268	80,000	10,000	15,000	48,971	375,446	573.2	9,798
BE JA	KEF DAROUGUI-SFAYA	465	473	EXTENSION GR	33.62	2,000	52,549	57,335	39,000	3,200	20,500	26,187	200,771	424.5	5,972
BE JA	MZOUGHA-ZELDOU	1,794	1,824	SONEDE CONNECTION	129.66	2,000	451,527	399,004	132,000		59,500	156,605	1,200,636	658.2	9,260
JENDOUBA	EL ISLAH	476	507	SONEDE CONNECTION	29.09	1,000	43,470	117,252	36,000	5,000	8,000	31,609	242,331	478.0	8,330
JENDOUBA	SOUALHIA	364	388	SONEDE CONNECTION	27.58	1,000	28,167	77,354	76,000	5,000	8,000	29,328	224,849	579.5	8,153
LE KEF	EZZAGUAYA	340	340	SONEDE CONNECTION	24.16	1,000	74,450	123,150	8,000		8,500	32,266	247,366	727.5	10,239
SILIANA	FEJ ASSEKRA	648	638	EXTENSION GR	45.36	1,000	155,360	166,840	46,000	16,000	10,500	59,355	455,055	713.3	10,032
SILIANA	KSAR-OULED BOUHANI	1,039	1,022	SONEDE CONNECTION	72.65	1,000	223,933	227,914	78,000	19,000	40,100	88,492	678,439	663.8	9,339
KAIROUAN	DOUAR EL BELDI	355	409	EXTENSION GR	32.46		41,831	64,907	15,000			18,261	139,999	342.3	4,313
KAIROUAN	OULED ABBES	741	852	EXTENSION GR	63.27	1,500	156,794	148,967	78,000	18,500	19,000	63,414	486,175	570.6	7,684
KAIROUAN	OULED BOUDABBOUS	599	692	EXTENSION GR	48.12	1,500	63,657	89,037	65,000	3,000	25,000	37,079	284,273	410.8	5,908
KASSERINE	AIN DEFLA	1,044	1,325	EXTENSION GR	95.14	2,000	108,887	138,131	79,000	3,000	17,500	52,278	400,796	302.5	4,213
KASSERINE	FAKKET EL KHADEM (EL AITHA)	803	1,016	IRRIGATION SYSTEM	76.27		117,526	172,740	29,200	3,000	5,000	49,120	376,587	370.7	4,938
KASSERINE	FAKKET EL KHADEM (NASSIRIA)	404	512	IRRIGATION SYSTEM	36.17		57,325	92,407	6,800	5,000	5,000	24,980	191,512	374.0	5,295
KASSERINE	OULED BARKA	1,575	1,998	EXTENSION GR	136.74	2,000	187,553	274,281	115,000		6,500	87,800	673,134	336.9	4,923
KASSERINE	SIDI SHIL	727	922	IRRIGATION SYSTEM	75.37	1,500	236,741	259,598	58,000	6,000	22,500	87,651	671,990	728.8	8,916
SIDI BOUZID	M'BARKIA	848	1,078	EXTENSION GR	109.68		272,354	166,819	39,500		28,000	76,001	582,674	540.5	5,313
SIDI BOUZID	OULED NAOUI	931	1,181	EXTENSION GR	80.14		249,743	184,246	29,500		32,500	74,398	570,387	483.0	7,117
SIDI BOUZID	OULED YOUSSEF GALLEL	321	408	EXTENSION GR	28.22		71,874	43,767	8,500		4,500	19,296	147,937	362.6	5,242
SOUSSE	OULED EL FALEH	179	226	SONEDE CONNECTION	19.27	2,000	13,925	33,847	54,000	19,000	8,000	19,616	150,388	665.4	7,804
MAHDIA	KHIOUR	1,453	1,760	SONEDE CONNECTION	124.37	5,000	82,518	145,824	30,000		5,000	40,251	308,593	175.3	2,481
MAHDIA	RMADHNIA	110	134	SONEDE CONNECTION	9.08	2,500	24,244	42,414	7,500		2,500	11,874	91,032	679.3	10,026
MAHDIA	RQUIAT	421	516	EXTENSION GR	38.5		67,628	102,599				25,534	195,761	379.4	5,085
MAHDIA	SKHAIBIA	484	587	EXTENSION GR	50.07	2,000	103,337	131,942	22,500		2,500	39,342	301,621	513.8	6,024
MAHDIA	SLAYMIA	1,380	1,674	SONEDE CONNECTION	111.41	4,000	159,448	238,303	30,000		5,000	65,513	502,264	300.0	4,508
SFAX	GUERGOUR-BRAHMIA-FKAYHIA	3,622	4,591	SONEDE CONNECTION	314.58	2,500	756,270	472,875	143,000	62,500	78,000	227,272	1,742,417	379.5	5,539
GAFSA	HCHACHNA	363	394	EXTENSION GR	33.62	2,000	93,010	114,205	24,000	3,000	5,000	36,182	277,397	704.1	8,251
GAFSA	OUED ZITON	135	146	EXTENSION GR	12.45	2,000	30,625	41,621	3,600	3,000	5,000	12,877	98,723	676.2	7,930
		23,881	28,468		2,042.26	45,900	4,155,999	4,570,834	1,476,100	206,200	478,600	1,640,046	12,573,680	442.0	6,157

Table 8.5.2 Estimated construction cost of 32 water supply systems for 2006

Governorate	Sub-project	Present population	Projected population at the end of the project period	Projected water source	Maximum daily water supply in 2021	Construction cost								Unit construction cost	
						Facilities for water source	Pipe material	Pipeline works	Civil works	Electrification	Equipment	Contingency	Total construction cost	Per capita construction cost	Per $1m^3$ water consruction cost
					m^3/day	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD/m^3
ARIANA	EL ACHICH	290	392	SONEDE CONNECTION	20.88	1,500	32,513	38,460	25,500	5,000	25,000	19,196	147,169	375.4	7,048
MANOUBA	SIDI ACHOUR	162	220	SONEDE CONNECTION	15.01	1,500	39,830	40,751	25,550	5,000	18,500	19,670	150,801	685.5	10,047
BIZERTE	EL KALBOUSSI	1,185	1,414	DEEP WELL	100.52		309,508	239,640	184,850	68,000	67,200	130,381	999,579	706.9	9,944
BIZERTE	ETRAMIS - EDMAIN	622	743	DEEP WELL	69.76		130,868	104,024	63,300	20,000	35,000	52,979	406,171	546.7	5,822
BIZERTE	SIDI HASSEN	477	569	SONEDE CONNECTION	40.45	1,500	86,090	90,464	30,150	5,000	5,000	32,731	250,935	441.0	6,204
SOUSSE	CHRAIFIA	342	435	EXTENSION GR	35.22		36,506	33,900	60,000		38,400	25,321	194,127	446.3	5,512
MAHDIA	OULED AMMAR ET OULED ESSAAFI	1,260	1,526	SONEDE CONNECTION	126.33		538,132	189,730	129,000	40,000	12,000	136,330	1,045,192	684.9	8,274
BEJA	AIN DAM - NEFZA	1,672	1,699	SONEDE CONNECTION	109.42	2,000	154,326	165,886	109,000	25,500	11,900	70,292	538,904	317.2	4,925
BEJA	GMARA	957	970	SONEDE CONNECTION	68.96		93,250	101,850	78,000	15,500	13,400	45,300	347,300	358.0	5,036
LE KEF	EL OUENA	481	481	EXTENSION GR	29.02	1,500	83,302	94,808	85,450	30,000	8,500	45,534	349,094	725.8	12,029
LE KEF	ESBIAAT-EL ARGOUB ET SOUALHIA	1,298	1,298	DEEP WELL	92.27		162,611	254,223	92,500	56,000	22,500	88,175	676,009	520.8	7,326
LE KEF	FORNA	410	410	SONEDE CONNECTION	23.56	1,300	74,114	117,894	61,350		2,500	38,574	295,732	721.3	12,552
SILIANA	AGBA	655	645	SPRING	45.85	1,000	30,914	59,021	47,000	5,000	8,000	22,640	173,575	269.1	3,786
SILIANA	GHANGUET ZGALASS	143	140	EXTENSION GR	8.5	1,000	25,995	46,584	19,500			13,961	107,040	764.6	12,593
SILIANA	NSIRAT	273	268	SONEDE CONNECTION	19.06	1,000	31,583	67,762	41,500			21,277	163,122	608.7	8,558
SILIANA	SIDI DAHER	822	809	EXTENSION GR	51.21	1,000	112,147	148,396	96,000	9,250	36,500	60,493	463,786	573.3	9,057
KAIROUAN	GHANZOUR	723	835	DEEP WELL	69.74		145,158	91,683	58,500	78,000	23,000	59,451	455,792	545.9	6,536
KAIROUAN	GOUAAD	673	775	EXTENSION GR	63.49		121,063	111,324	92,900	10,000	14,500	52,468	402,255	519.0	6,336
KAIROUAN	HSAINIA	687	793	EXTENSION GR	62.48		54,430	50,192	8,500			16,968	130,090	164.0	2,082
KAIROUAN	KHOUALDIA	477	552	EXTENSION GR	45.76		79,241	90,660	69,500	6,000	18,000	39,510	302,911	548.8	6,620
KAIROUAN	MAAMRIA	666	685	EXTENSION GR	58.27		91,392	87,605	53,900		17,000	37,484	287,381	419.5	4,932
KASSERINE	BNANA/OULED BENAJEH	2,418	3,062	DEEP WELL	191.15		433,477	433,996	231,300	12,000	51,500	174,341	1,336,613	436.5	6,993
KASSERINE	CHAAIBIA	2,438	3,091	DEEP WELL	230.57		314,262	321,773	132,300	42,000	53,400	129,560	993,295	321.4	4,308
KASSERINE	MKIMEN	1,269	1,611	DEEP WELL	89.43		379,458	374,669	114,100	40,000	22,500	139,609	1,070,336	664.4	11,968
KASSERINE	OUED LAHTAB	1,196	1,518	DEEP WELL	115.44		177,262	248,819	154,400	57,000	56,400	104,082	797,963	525.7	6,912
KASSERINE	OULED MASSOUD RIZG	868	1,101	DEEP WELL	113.93		226,773	203,572	94,500	57,000	49,500	94,702	726,046	457.8	6,373
SIDI BOUZID	AIN JAFFEL	2,455	3,116	DEEP WELL	265.82		475,367	398,960	296,200	230,000	96,000	224,479	1,721,006	552.3	6,474
SIDI BOUZID	GARD HADID	2,802	3,554	DEEP WELL	240.75		275,250	355,725	100,000	52,500	46,000	124,421	953,896	268.4	3,962
SIDI BOUZID	OULED MOUSSA	421	534	EXTENSION GR	45.56	1,400	104,907	114,453	21,000			36,264	278,024	520.6	6,102
SIDI BOUZID	SLATNIA	1,617	2,050	EXTENSION GR	160.23		146,795	174,684	95,000	20,000	61,000	74,522	572,001	279.0	3,570
GAFSA	ENJAIMIA	939	1,018	SONEDE CONNECTION	61.83	1,300	366,268	166,038	78,000			91,741	703,347	690.9	11,376
GAFSA	SMAIDIA	503	543	DEEP WELL	46.32		71,172	92,156	72,800		22,000	38,719	296,847	546.7	6,409
		31,201	36,857		2,716.79	16,000	5,403,964	5,109,700	2,821,550	888,750	835,200	2,261,175	17,336,339	470.0	6,381

Table 8.5.5 Operation and maintenance cost of water supply systems for 2005

(TD)

Governorate	Sub-project	Projected water source	Construction cost	Maintenance	Management cost of GIC	Personnel	Subscription to STEG	Subscription to SONEDE	Others	Payment for water	Electricity	Disinfection
ARIANA	CEBALET BEN AMMAR	SONEDE CONNECTION	43,385	412	190			18		0.159		
MANOUBA	EL MAAFRINE	EXTENSION GR	154,550	1,145	190	1,080	57.6	18		0.159	0.034	
MANOUBA	TIRASSET	SONEDE CONNECTION	146,942	1,006		720	57.6	18		0.159	0.052	
NABEUL	BASSATINE	EXTENSION GR	353,531	2,871	190	600				0.360		0.010
NABEUL	BEN THAMEUR	SONEDE CONNECTION	56,720	443	190			18		0.159		
NABEUL	BIR BEN ZAHRA	SONEDE CONNECTION	375,446	2,895	190	1,080	57.6	18		0.159	0.015	
BE JA	KEF DAROUGUI-SFAYA	EXTENSION GR	200,771	1,073	190	1,440	36.0			0.272	0.009	0.010
BE JA	MZOUGHA-ZELDOU	SONEDE CONNECTION	1,200,636	6,997	190	4,800	144.0	18		0.159	0.84	0.010
JENDOUBA	EL ISLAH	SONEDE CONNECTION	242,331	2,364	190	600	36.0	18		0.159	0.005	0.010
JENDOUBA	SOUALHIA	SONEDE CONNECTION	224,849	2,493	190	600	36.0	18		0.159	0.005	0.010
LE KEF	EZZAGUAYA	SONEDE CONNECTION	247,366	2,623	190	600	36.0	18		0.159	0.052	0.010
SILIANA	FEJ ASSEKRA	EXTENSION GR	455,055	2,635	190	720	58.0			0.026	0.038	0.010
SILIANA	KSAR-OULED BOUHANI	SONEDE CONNECTION	678,439	4,879	190	1,440	72.0	18		0.159	0.084	0.010
KAIROUAN	DOUAR EL BELDI	EXTENSION GR	139,999	3,512	300	6,600	226.8				0.053	0.010
KAIROUAN	OULED ABBES	EXTENSION GR	486,175	3,977	300	2,880	57.6	18		0.159	0.019	0.010
KAIROUAN	OULED BOUDABBOUS	EXTENSION GR	284,273	5,079	300	6,600	262.8				0.036	0.010
KASSERINE	AIN DEFLA	EXTENSION GR	400,796	2,559	300	1,200	36.0			0.227		0.010
KASSERINE	FAKKET EL KHADEM (EL AITHA)	IRRIGATION SYSTEM	376,587	2,895	190	1,080	57.6	18		0.159		0.026
KASSERINE	FAKKET EL KHADEM (NASSIRIA)	IRRIGATION SYSTEM	191,512	1,251		600	36.0			0.108		0.010
KASSERINE	OULED BARKA	EXTENSION GR	673,134	3,549	300	1,200				0.211		
KASSERINE	SIDI SHIL	IRRIGATION SYSTEM	671,990	2,498	300	1,200	57.6			0.040	0.029	0.010
SIDI BOUZID	M'BARKIA	EXTENSION GR	582,674	2,800	190	400	120.0			0.080	0.044	0.010
SIDI BOUZID	OULED NAOUI	EXTENSION GR	570,387	6,214	190	1,200	180.0				0.095	0.010
SIDI BOUZID	OULED YOUSSEF GALLEL	EXTENSION GR	147,937	4,169	190	1,200					0.148	0.010
SOUSSE	OULED EL FALEH	SONEDE CONNECTION	150,388	1,244	190	600	58.0	18		0.159	0.021	0.010
MAHDIA	KHIOUR	SONEDE CONNECTION	308,593	2,627	190	1,200	72.0	18		0.159		0.010
MAHDIA	RMADHNIA	SONEDE CONNECTION	91,032	1,598	190	1,200	36.0	18		0.159		0.010
MAHDIA	RQUIAT	EXTENSION GR	195,761	2,584	190	1,200				0.159		0.010
MAHDIA	SKHAIBIA	EXTENSION GR	301,621	3,972	190	1,200	36.0	18		0.159		0.010
MAHDIA	SLAYMIA	SONEDE CONNECTION	502,264	3,590	190	1,200	36.0	18		0.159		0.010
SFAX	GUERGOUR-BRAHMIA-FKAYHIA	SONEDE CONNECTION	1,742,417	7,797	200	2,400	58.0	18	830*	0.159	0.013	0.010
GAFSA	HCHACHNA	EXTENSION GR	277,397	5,749	300	1,800	36.0				0.177	0.010
GAFSA	OUED ZITON	EXTENSION GR	98,723	3,620	300	4,200	36.0			0.200		0.010
	Total		12,573,680	103,121	6,780	52,840	1,993	324	830			

* Expenses for motor bicycle to watch the systen

Table 8.5.6 Operation and maintenance cost of water supply systems for 2006

(TD)

Governorate	Sub-project	Projected water source	Construction cost	Maintenance	Management cost of GIC	Personnel	Subscription to STEG	Subscription to SONEDE	Payment for water	Electricity	Disinfection
ARIANA	EL ACHICH	SONEDE CONNECTION	147,169	1,171	190	400	58.0	18.000	0.159	0.040	
MANOUBA	SIDI ACHOUR	SONEDE CONNECTION	150,801	1,215	190		36.0	18.000	0.159	0.027	
BIZERTE	EL KALBOUSSI	DEEP WELL	999,579	6,723	190	2,400	234.0			0.140	0.010
BIZERTE	ETRAMIS - EDMAIN	DEEP WELL	406,171	3,004	190	1,800	144.0			0.065	0.010
BIZERTE	SIDI HASSEN	SONEDE CONNECTION	250,935	1,725	190	1,200	36.0	18.000	0.159	0.019	0.010
SOUSSE	CHRAIFIA	EXTENSION GR	194,127	1,835			36.0		0.283	0.034	
MAHDIA	OULED AMMAR ET OULED ESSAAFI	SONEDE CONNECTION	1,045,192	4,850	190	1,800	36.0	18.000	0.159	0.013	
BEJA	AIN DAM - NEFZA	SONEDE CONNECTION	538,904	3,896	190	1,800	144.0	18.000	0.159	0.110	
BEJA	GMARA	SONEDE CONNECTION	347,300	2,630	190	1,800	90.0	18.000	0.159	0.107	
LE KEF	EL OUENA	EXTENSION GR	349,094	4,245	190	720	57.6		0.38	0.188	0.010
LE KEF	ESBIAAT-EL ARGOUB ET SOUALHIA	DEEP WELL	676,009	4,472	190	1,800	90.0			0.012	0.010
LE KEF	FORNA	SONEDE CONNECTION	295,732	2,787	190		36.0	18.000	0.159	0.010	
SILIANA	AGBA	SPRING	173,575	1,569	190	1,200	36.0			0.007	0.010
SILIANA	GHANGUET ZGALASS	EXTENSION GR	107,040	734	190				0.185		
SILIANA	NSIRAT	SONEDE CONNECTION	163,122	1,379	190			18.000	0.159		
SILIANA	SIDI DAHER	EXTENSION GR	463,786	3,915	190	720	90.0		0.165	0.052	0.010
KAIROUAN	GHANZOUR	DEEP WELL	455,792	4,867	190	1,200	90.0			0.068	0.010
KAIROUAN	GOUAAD	EXTENSION GR	402,255	2,985	190	1,200	36.0		0.110	0.079	0.010
KAIROUAN	HSAINIA	EXTENSION GR	130,090	796		1,200			0.122		
KAIROUAN	KHOUALDIA	EXTENSION GR	302,911	2,590	190	1,200	36.0		0.136	0.032	0.010
KAIROUAN	MAAMRIA	EXTENSION GR	287,381	2,104	190				0.466		
KASSERINE	BNANA/OULED BENAJEH	DEEP WELL	1,336,613	8,030	300	2,880	36.0		0.205	0.055	
KASSERINE	CHAAIBIA	DEEP WELL	993,295	6,930	300	8,880	144.0			0.065	0.010
KASSERINE	MKIMEN	DEEP WELL	1,070,336	5,907	190	1,440	57.6		0.215	0.100	0.010
KASSERINE	OUED LAHTAB	DEEP WELL	797,963	6,350	190	1,440	144.0			0.075	0.010
KASSERINE	OULED MASSOUD RIZG	DEEP WELL	726,046	5,044	190	1,440	180.0			0.070	0.010
SIDI BOUZID	AIN JAFFEL	DEEP WELL	1,721,006	9,932	190	2,400	396.0			0.164	0.010
SIDI BOUZID	GARD HADID	DEEP WELL	953,896	6,660	190	2,400	144.0			0.047	0.010
SIDI BOUZID	OULED MOUSSA	EXTENSION GR	278,024	1,415	190				0.173		
SIDI BOUZID	SLATNIA	EXTENSION GR	572,001	3,667	190	600			0.130	0.058	
GAFSA	ENJAIMIA	SONEDE CONNECTION	703,347	2,748	190	720		18.000	0.159		
GAFSA	SMAIDIA	DEEP WELL	296,847	2,581					0.055	0.009	0.010
	Total		17,336,339	118,757	5,730	42,640	2,387	162			

Table 8.5.7 Average O/M costs by with and without pumping and personnel, and by water source

(The variable cost in the table is calculated on the basis of 80% of the projected average daily water supply in the first year of water supply service) (TD/m^3)

	No. of Subprojects	Fixed Cost*	Variable Cost	O&M Cost	Maintenance Cost	Maintenance Cost / O&M Cost (%)	Average Water Supply in the 1st Year (m3/day)
with pump	42	0.463	0.168	0.631	0.323	51	43.3
without pump**	23	0.428	0.199	0.627	0.301	48	24.9
Deep Well	9	0.405	0.095	0.500	0.291	58	70.6
Spring	1	0.280	0.017	0.297	0.147	49	29.3
Extension GR	28	0.536	0.222	0.758	0.370	49	30.9
SONEDE Connection	23	0.416	0.203	0.619	0.290	47	32.5
Irrigation***	4	0.384	0.118	0.502	0.278	55	28.4
with personnel	55	0.365	0.171	0.536	0.252	47	40.9
without personnel****	10	0.395	0.238	0.633	0.354	56	14.4

* The salary for the technical director is excluded.
** The dosing pump is not considered
*** SMAIDIA sub-project of CRDA GAFSA is classified into this category
**** pump operator and/or system care taker

Breakdown of Fixed Cost (TD/m^3)

	maintenance	management of GIC	personnel	subscription of STEG	subscription of SONEDE	total
with pump	0.323	0.016	0.116	0.007	0.001	0.463
without pump	0.301	0.026	0.097	0.003	0.001	0.428
Deep Well	0.291	0.010	0.096	0.008	0.000	0.405
Extension GR	0.370	0.023	0.136	0.006	0.000	0.536
SONEDE Connection	0.290	0.021	0.098	0.005	0.002	0.416
with personnel	0.252	0.014	0.094	0.005	0.000	0.365
without personnel	0.354	0.036	0.000	0.003	0.002	0.395

Breakdown of Variable Cost (TD/m^3)

	energy	purchase of water	disinfection	total
with pump	0.067	0.093	0.008	0.168
without pump	0.000	0.191	0.008	0.199
Deep Well	0.085	0.000	0.010	0.095
Extension GR	0.044	0.172	0.006	0.222
SONEDE Connection	0.038	0.159	0.006	0.203
with personnel	0.054	0.109	0.008	0.171
without personnel	0.008	0.227	0.003	0.238

Table 8.5.8 Rate of maintenance cost to total construction cost

Sub-projects for 2005					Sub-projects for 2006					Sub-projects for 2001				
Governorate	Sub-project	A TD	B TD	B/A %	Governorate	Sub-project	A TD	B TD	B/A %	Governorate	Sub-project	A TD	B TD	B/A %
ARIANA	CEBALET BEN AMMAR	43,385	412	0.95	ARIANA	EL ACHICH	147,169	1,171	0.80	ARIANA	FAIDH EL AMRINE-SIDI GHRIB	118,623	617	0.52
MANOUBA	EL MAAFRINE	154,550	1,145	0.74	MANOUBA	SIDI ACHOUR	150,801	1,215	0.81	ARIANA	HMAIEM ESSOUFLA	32,921	170	0.52
MANOUBA	TIRASSET	146,942	1,006	0.68	BIZERTE	EL KALBOUSSI	999,579	6,723	0.67	ARIANA	TYAYRA	106,059	813	0.77
NABEUL	BASSATINE	353,531	2,871	0.81	BIZERTE	ETRAMIS - EDMAIN	406,171	3,004	0.74	BEN AROUS	OULED BEN MILED and OULED SAAD	363,802	2353	0.65
NABEUL	BEN THAMEUR	56,720	443	0.78	BIZERTE	SIDI HASSEN	250,935	1,725	0.69	BEN AROUS	SIDI FREDJ	234,204	1822	0.78
NABEUL	BIR BEN ZAHRA	375,446	2,895	0.77	SOUSSE	CHRAIFIA	194,127	1,548	0.8	NABEUL	SIDI HAMMED	550,525	3001	0.55
BE JA	KEF DAROUGUI-SFAYA	200,771	1,073	0.53	MAHDIA	OULED AMMAR ET OULED ESSAAFI	1,045,192	3,700	0.35	ZAGHOUAN	JIMLA	144,641	787	0.54
BE JA	MZOUGHA-ZELDOU	1,200,636	6,997	0.58	BEJA	AIN DAM - NEFZA	538,904	3,896	0.72	ZAGHOUAN	ROUISSAT	377,762	1978	0.52
JENDOUBA	EL ISLAH	242,331	2,364	0.98	BEJA	GMARA	347,300	2,630	0.76	BIZERTE	SMADAH	369,329	3086	0.84
JENDOUBA	SOUALHIA	224,849	2,493	1.11	LE KEF	EL OUENA	349,094	4,245	1.22	BIZERTE	TERGULECH	704,403	3450	0.49
LE KEF	EZZAGUAYA	247,366	1,645	0.67	LE KEF	ESBIAAT-EL ARGOUB ET SOUALHIA	676,009	4,472	0.66	BEJA	EL GARIA	136,352	1066	0.78
SILIANA	FEJ ASSEKRA	455,055	2,635	0.58	LE KEF	FORNA	295,732	2,787	0.94	BEJA	EL GARRAG	359,396	2922	0.81
SILIANA	KSAR-OULED BOUHANI	678,439	4,485	0.66	SILIANA	AGBA	173,575	1,569	0.90	BEJA	FATNASSA	492,527	4850	0.98
KAIROUAN	DOUAR EL BELDI	139,999	924	0.66	SILIANA	GHANGUET ZGALASS	107,040	734	0.69	JENDOUBA	CHOUAOULA	990,557	7226	0.73
KAIROUAN	OULED ABBES	486,175	3,327	0.68	SILIANA	NSIRAT	163,122	1,379	0.85	LE KEF	CHAAMBA - O.EI ASSEL - HMAIDIA	328,314	2310.942	0.70
KAIROUAN	OULED BOUDABBOUS	284,273	2,657	0.93	SILIANA	SIDI DAHER	463,786	3,915	0.84	LE KEF	M'HAFDHIA -	258,533	2005.336	0.78
KASSERINE	AIN DEFLA	400,796	2,559	0.64	KAIROUAN	GHANZOUR	455,792	2,625	0.58	KAIROUAN	CHELALGA	736,174	4811.321	0.65
KASSERINE	FAKKET EL KHADEM (EL AITHA)	376,587	2,298	0.61	KAIROUAN	GOUAAD	402,255	2,698	0.67	KAIROUAN	GUDIFETT	282,956	1913.878	0.68
KASSERINE	FAKKET EL KHADEM (NASSIRIA)	191,512	1,251	0.65	KAIROUAN	HSAINIA	130,090	796	0.61	KAIROUAN	HMIDET	312,841	2526	0.81
KASSERINE	OULED BARKA	673,134	3,549	0.53	KAIROUAN	KHOUALDIA	302,911	2,418	0.8	KASSERINE	HENCHIR TOUNSI	368,161	3047	0.83
KASSERINE	SIDI SHIL	671,990	3,228	0.48	KAIROUAN	MAAMRIA	287,381	2,104	0.73	KASSERINE	OUED LAGSAB	246,721	3100	1.26
SIDI BOUZID	M'BARKIA	582,674	2,754	0.47	KASSERINE	BNANA/OULED BENAJEH	1,336,613	8,030	0.60	SIDI BOUZID	AMAIRIA	198,772	1541.817	0.78
SIDI BOUZID	OULED NAOUI	570,387	2,910	0.51	KASSERINE	CHAAIBIA	993,295	6,930	0.70	SIDI BOUZID	BLAHDIA	427,327	2246.491	0.53
SIDI BOUZID	OULED YOUSSEF	147,937	626	0.42	KASSERINE	MKIMEN	1,070,336	5,907	0.55	SIDI BOUZID	BOUCHIHA	603,143	2710.705	0.45
SOUSSE	OULED EL FALEH	150,388	1,244	0.83	KASSERINE	OUED LAHTAB	797,963	6,350	0.80	SIDI BOUZID	MAHROUGA	378,040	999.994	0.26
MAHDIA	KHIOUR	308,593	2,627	0.85	KASSERINE	OULED MASSOUD RIZG	726,046	5,044	0.69	MAHDIA	COMPLEXE BOUSSLIM	2,010,477	5192.781	0.26
MAHDIA	RMADHNIA	91,032	768	0.84	SIDI BOUZID	AIN JAFFEL	1,721,006	9,932	0.58	MAHDIA	COMPLEXE EL AITHA	234,455	362.809	0.15
MAHDIA	RQUIAT	195,761	1,267	0.65	SIDI BOUZID	GARD HADID	953,896	6,660	0.70	GAFSA	KHANGUET ZAMMOUR	447,545	2953.256	0.66
MAHDIA	SKHAIBIA	301,621	1,827	0.61	SIDI BOUZID	OULED MOUSSA	278,024	1,415	0.51	GAFSA	THLEIJIA	472,005	2913.384	0.62
MAHDIA	SLAYMIA	502,264	3,590	0.71	SIDI BOUZID	SLATNIA	572,001	3,667	0.64	GABES	BATEN TRAJMA	528,490	3887.026	0.74
SFAX	GUERGOUR-BRAHMIA-FKAYHIA	1,742,417	7,797	0.45	GAFSA	ENJAIMIA	703,347	2,748	0.39	GABES	CHAABET EJJAYER	87,849	607.897	0.69
GAFSA	HCHACHNA	277,397	1,495	0.54	GAFSA	SMAIDIA	296,847	2,581	0.87	GABES	EZZAHRA	70,241	213.396	0.30
GAFSA	OUED ZITON	98,723	540	0.55						MEDENINE	BOUGUEDDIMA	122,325	782.642	0.64
										MEDENINE	CHOUAMEKH - R. ENNAGUEB	589,248	3184.164	0.54
										MEDENINE	ECHGIUIGUIA	222,122	804.46	0.36
										MEDENINE	TARF ELLIL	287,443	1986.87	0.69
	Total & Average	12,573,680	77,704	0.62		Total & Average	17,336,339	114,617	0.66		Total & Average	14,194,285	84,243	0.59
A	Construction Cost										**Total 101 WSSs**	**44,104,304**	**276,564**	**0.63**
B	Maintenance Cost													

Table 8.5.9 FIRR of total 65 projected water supply systems under the Study

	Population growth rate																					
	Grouped population		48765	lpcd	25	2.5	; annual consumption growth rate (%)															
	Scattered population		6317	lpcd	20																	
	Sheep and goats		122535	lpcd	5																	
	Cows, horses and donkeys		9776	lpcd	30																	
	Cost for 1m^3 water		**5.174**																			
	Cost for 1m^3 water without Investment		0.643																			
	Year		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	
	Grouped population			21667	49494	49995	50515	51032	51562	52096	52637	53182	53744	54311	54882	55456	56048	56647	57254	32192		
	Scattered population			2047	6433	6518	6607	6694	6784	6876	6967	7062	7160	7256	7353	7454	7557	7658	7761	5275		
	Water demand of domestic animal				330	827	827	827	827	827	827	827	827	827	827	827	827	827	827	497		
	Water demand of population				589	1394	1441	1490	1539	1592	1645	1700	1758	1818	1879	1943	2009	2079	2151	1242		
	Water demand without loss				919	2220	2268	2316	2365	2418	2472	2527	2585	2645	2706	2770	2836	2906	2978	1739		
	Net water demand				570	1395	1471	1548	1629	1713	1801	1891	1987	2086	2188	2295	2407	2524	2646	1565		
	Net water demand (year)				207937	509288	536743	565151	594421	625362	657318	690321	725175	761313	798463	837730	878420	921238	965702	571141		10845723.15
	Net water supply (with 15% loss)				239127	585681	617255	649924	683584	719166	755915	793869	833951	875510	918233	963389	1010183	1059424	1110558	656812		12472581.63
	Revenue				1075838	2634991	2777041	2924020	3075456	3235540	3400875	3571630	3751959	3938936	4131144	4334305	4544830	4766366	4996418	2955009		56114358.73
Construction cost	Construction and renewal costs			12377920	17340939	0	0	0	0	3450	296675	503700	5750	0	0	0	0	306875	1731096	1937425		34503828.83
	Present value			12377920	16515180	0	0	0	0	2574	210841	340924	3707	0	0	0	0	154993	832687	887556	30438825.41	4.530
Variable cost	Payment to SONEDE or GR				49620	83696	88366	93128	98121	103368	108774	114373	120357	126432	132870	139502	146347	153645	161083	61071		
	Energy				4829	25246	26608	28047	29499	31051	32657	34311	36039	37874	39719	41688	43726	45855	48106	40587		
	Disinfection				1841	3847	4061	4281	4510	4751	5001	5259	5533	5815	6108	6416	6736	7075	7424	3856		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Subtotal				56291	112788	119035	125456	132130	139170	146432	153943	161929	170121	178696	187606	196809	206575	216614	105514	2303593.57	
	Present value				53610	102302	102827	103213	103527	103851	104066	104194	104381	104439	104480	104466	104372	104335	104195	48337	1508258.431	0.224
Fixed cost	Maintenance cost	197113.5			77089	197114	197114	197114	197114	197114	197114	197114	197114	197114	197114	197114	197114	197114	197114	120024		
	Management of GIC	10250			4520	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	5730		
	Personnel (Pump operator)	74960			32320	74960	74960	74960	74960	74960	74960	74960	74960	74960	74960	74960	74960	74960	74960	42640		
	Subscription to STEG	3481.6			1100	3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	3482	2381		
	Subscription to SONEDE	450			288	450	450	450	450	450	450	450	450	450	450	450	450	450	450	162		
		830			830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	0		
		0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Subtotal				116148	287085	287085	287085	287085	287085	287085	287085	287085	287085	287085	287085	287085	287085	287085	170937	4135339	
	Present value				110617	260395	247995	236186	224939	214227	204026	194310	185058	176245	167853	159860	152247	144997	138093	78308	2817048	0.419
	Passed year			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
	Direct cost				172438	399874	406120	412541	419215	426256	433517	441028	449014	457206	465781	474691	483894	493660	503699	276451		
	Cost			12377920	17513377	399874	406120	412541	419215	429706	730192	944728	454764	457206	465781	474691	483894	800535	2234794	2213876		
	Present value of cost			12377920	16679407	362697	350822	339399	328466	320653	518934	639429	293145	280685	272332	264326	256620	404325	1074974	1014202	34764131.57	
	Sales revenue				1075838	2634991	2777041	2924020	3075456	3235540	3400875	3571630	3751959	3938936	4131144	4334305	4544830	4766366	4996418	2955009		
	Present value of revenue				1024608	2390014	2398912	2405598	2409700	2414410	2416939	2417420	2418547	2418165	2415394	2413503	2410221	2407339	2403363	1353724	34764131.57	
																					0.0	
	O&M cost				172438	399874	406120	412541	419215	426256	433517	441028	449014	457206	465781	474691	483894	493660	503699	276451		
	Present value of O&M cost				164227	362697	350822	339399	328466	318078	308092	298505	289438	280685	272332	264326	256620	249332	242288	126646		
	Net sales revenue				153759	376593	396895	417901	439544	462424	486053	510458	536230	562953	590424	619459	649548	681210	714089	422330		
	Present value of net sales revenue				146437	341581	342853	343808	344395	345068	345429	345498	345659	345604	345208	344938	344469	344057	343489	193474		
	Net cash flow				-17790	-21116	-7969	4410	15929	26989	37337	46993	56221	64920	72876	80612	87849	94725	101201	66829		
	IRR(%)	5																				
	Composition on the cost of 1 m^3 water (TD)																					
	Construction cost (TD)	4.53																				
	Variable cost (TD)	0.224																				
	Fixed cost (TD)	0.419																				
	Cost of 1m3 water without construction cost portion (TD)	**0.643**																				
	Commission for tap keeper (25% of above) (TD)	0.161																				
	Applied 1 m^3 water charge (TD)	**0.804**																				

Table 8.5.10 FIRR of Total 32 projected water supply systems for 2006 (with revolving funds)

	Population growth rate																			
	Grouped population		26901	lpcd	25	2.5	; annual consumption growth rate (%													
	Scattered population		4300	lpcd	20															
	Sheep and goats		81123	lpcd	5															
	Cows, hoses and donkeys		5543	lpcd	30															
	Cost for 1m^3 water		**5.199**																	
	Cost for 1m^3 water without Investment		0.608																	
	Number of households		6028																	
	Year		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
	Grouped population			27170	27440	27721	27998	28283	28568	28862	29153	29456	29763	30070	30378	30695	31020	31345	31676		
	Scattered population			4355	4410	4467	4522	4580	4639	4698	4758	4821	4882	4944	5009	5074	5138	5205	5275		
	lpcd for Grouped population				25.0	25.6	26.3	26.9	27.6	28.3	29.0	29.7	30.5	31.2	32.0	32.8	33.6	34.5	35.3		
	Water demand of domestic anima				489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47		
	Water demand of population				774.20	799.00	826.79	852.41	881.26	910.75	940.60	971.26	1005.41	1037.06	1072.28	1108.28	1145.03	1185.50	1223.66		
	Water demand without loss				1263.67	1288.47	1316.26	1341.88	1370.73	1400.22	1430.07	1460.73	1494.88	1526.53	1561.75	1597.75	1634.50	1674.97	1713.13		
	Consumption rate	Average Revolving			62	64	66	68	70	72	74	76	78	80	82	84	86	88	90		
	Net water demand				783.48	824.62	868.73	912.48	959.51	1008.16	1058.25	1110.15	1166.01	1221.22	1280.64	1342.11	1405.67	1473.97	1541.82		
	Net water demand (year)				285970.2	300986.3	317086.45	333055.2	350221.15	367978.4	386261.25	405204.75	425593.65	445745.3	467433.6	489870.15	513069.55	537999.05	562764.3		6189239
	Net water supply (with 15% loss				328865.73	346134.25	364649.42	383013.48	402754.32	423175.16	444200.44	465985.46	489432.7	512607.1	537548.64	563350.67	590029.98	618698.91	647178.95		7117625
	Revenue including Revolving Fun	447	**11.2**	67256	1486880.2	1564955.27	1648666.77	1731695.06	1820948.11	1913275.57	2008335.86	2106831.14	2212841.67	2317618.63	2430385.29	2547042.4	2667665.92	2797284.95	2926049.98		32180477
Construction cost	Construction and renewal costs			17336339	0	0	0	0	0	0	503700	0	0	0	0	0	0	503700	1937424.5		20281163
	Present value			17336339	0	0	0	0	0	0	357970.186	0	0	0	0	0	0	254402.728	931934.3108	18880646	4.591
Variable cost	Payment to SONEDE or GR				29459.08	30996.83	32650.03	34280.62	36032.53	37841.58	39706.49	41633.22	43700.52	45749.74	47942.38	50206.64	52552.75	55068.85	57556.18		
	Energy				20168.34	21260.32	22436.05	23602.15	24859.81	26164.24	27508.33	28901.35	30407.06	31896.98	33501.53	35164.53	36888.39	38742.61	40587.25		
	Disinfection				1904.96	2008.93	2120.73	2231.98	2352.01	2476.35	2604.48	2737.69	2881.62	3023.92	3177.37	3336.55	3501.48	3679.18	3855.99		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Subtotal				51532.38	54266.08	57206.81	60114.75	63244.35	66482.17	69819.3	73272.26	76989.2	80670.64	84621.28	88707.72	92942.62	97490.64	101999.42	1119359.6	
	Present value				49078.45714	49220.9342	49417.3934	49456.5536	49553.6031	49610.0189	49619.273	49593.5497	49627.92477	49524.77507	49476.3098	49395.778	49289.4558	49239.398	49063.46502	741166.89	0.18
Fixed cost	Maintenance cost	118756.86			118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86		
	Management of GIC	5730			5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730		
	Personnel (Pump operator)	42640			42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640		
	Subscription to STEG	2381.2			2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2		
	Subscription to SONEDE	162			162	162	162	162	162	162	162	162	162	162	162	162	162	162	162		
		0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Subtotal				169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	2545050.9	
	Present value				161590.5333	153895.746	146567.377	139587.978	132940.932	126610.411	120581.344	114839.375	109370.8335	104162.6986	99202.5701	94478.638	89979.6554	85694.9099	81614.19989	1761117.2	0.428
	Passed year			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
	Direct cost				221202.44	223936.14	226876.87	229784.81	232914.41	236152.23	239489.36	242942.32	246659.26	250340.7	254291.34	258377.78	262612.68	267160.7	271669.48		
	Cost			17336339	221202.44	223936.14	226876.87	229784.81	232914.41	236152.23	743189.36	242942.32	246659.26	250340.7	254291.34	258377.78	262612.68	770860.7	2209093.98		
	Present value of cost			17336339	210668.9905	203116.68	195984.771	189044.532	182494.535	176220.43	528170.803	164432.925	158998.7583	153687.4736	148678.88	143874.42	139269.111	389337.036	1062611.976	21382930	
	Sales revenue			67256	1486880.2	1564955.27	1648666.77	1731695.06	1820948.11	1913275.57	2008335.86	2106831.14	2212841.67	2317618.63	2430385.29	2547042.4	2667665.92	2797284.95	2926049.98		
	Present value of revenue			67256	1416076.381	1419460.56	1424180.34	1424669.81	1426760.49	1427715.69	1427286.8	1425986.24	1426417.471	1422816.794	1420995.94	1418288.5	1414720.19	1412818.98	1407480.07	21382930	
																				0.0	
	O&M cost				221202.44	223936.14	226876.87	229784.81	232914.41	236152.23	239489.36	242942.32	246659.26	250340.7	254291.34	258377.78	262612.68	267160.7	271669.48		
	Present value of O&M cos				210668.990	203116.680	195984.771	189044.532	182494.535	176220.430	170200.617	164432.925	158998.758	153687.474	148678.880	143874.416	139269.111	134934.308	130677.665		
	Net Sales Revenue			67256	199950.3638	210449.624	221706.847	232872.196	244874.627	257290.497	270073.868	283319.16	297575.0816	311665.1168	326829.573	342517.21	358738.228	376168.937	393484.802		
	Present value of net sales revenue			67256	190428.9179	190884.013	191518.711	191584.532	191865.677	191994.13	191936.455	191761.559	191819.5508	191335.3459	191090.482	190726.4	190246.542	189990.875	189272.9174		
	Net cash flow			67256	-20240.073	-12232.668	-4466.060	2540.000	9371.143	15773.701	21735.838	27328.634	32820.793	37647.872	42411.603	46851.981	50977.430	55056.567	58595.252		
	Cumulative net cash flow			67256	47015.92747	34783.2599	30317.2	32857.1999	42228.3426	58002.0431	79737.8815	107066.516	139887.3085	177535.1808	219946.783	266798.76	317776.195	372832.762	431428.015		
	IRR(%)	5																			
	Composition on the cost of 1 m^3 water (TD)																				
	Investment cost (TD)	4.591																			
	Variable cost (TD)	0.18																			
	Fixed cost (TD)	0.428																			
	Cost of 1m3 water without investment cost portion (TD	0.608																			
	Commission for tap keeper (25% of above) (TD	0.152																			
	Applied 1 m^3 water charge (TD)	**0.760**																			

Table 8.5.11 FIRR of total 32 projected water supply systems for 2006 (with revolving funds and adjusted water charge)

	Population growth rate																				
	Grouped population		26901	lpcd	25	2.5	; annual consumption growth rate (%														
	Scattered population		4300	lpcd	20																
	Sheep and goats		81123	lpcd	5																
	Cows, horses and donkeys		5543	lpcd	30																
	Cost for 1m^3 water		**5.275**	5.199	190.96																
	Cost for 1m^3 water without Investment		**0.684**	0.608	24.01																
	Number of households		6028																		
	Year		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
	Grouped population			27170	27440	27721	27998	28283	28568	28862	29153	29456	29763	30070	30378	30695	31020	31345	31676		
	Scattered population			4355	4410	4467	4522	4580	4639	4698	4758	4821	4882	4944	5009	5074	5138	5205	5275		
	lpcd for Grouped population				25.0	25.6	26.3	26.9	27.6	28.3	29.0	29.7	30.5	31.2	32.0	32.8	33.6	34.5	35.3		
	Water demand of domestic animals				489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47	489.47		
	Water demand of population				774.20	799.00	826.79	852.41	881.26	910.75	940.60	971.26	1005.41	1037.06	1072.28	1108.28	1145.03	1185.50	1223.66		
	Water demand without loss				1263.67	1288.47	1316.26	1341.88	1370.73	1400.22	1430.07	1460.73	1494.88	1526.53	1561.75	1597.75	1634.50	1674.97	1713.13		
	Consumption rate				62	64	66	68	70	72	74	76	78	80	82	84	86	88	90		
	Net water demand				783.48	824.62	868.73	912.48	959.51	1008.16	1058.25	1110.15	1166.01	1221.22	1280.64	1342.11	1405.67	1473.97	1541.82		
	Net water demand (year)				285970.2	300986.3	317086.45	333055.2	350221.15	367978.4	386261.25	405204.75	425593.65	445745.3	467433.6	489870.15	513069.55	537999.05	562764.3		6189239
	Net water supply (with 15% loss)				328865.73	346134.25	364649.42	383013.48	402754.32	423175.16	444200.44	465985.46	489432.7	512607.1	537548.64	563350.67	590029.98	618698.91	647178.95		7117625
	Revenue including Revolving Fun	447		67256	1500606.23	1580507.49	1666334.05	1751443.82	1843033.5	1937795.14	2035399.03	2136694.78	2245717.08	2353542.13	2469362.52	2589409.2	2713745.44	2847299.32	2979998.41		32650888
Construction cost	Investment & Renewal costs			17336339	0	0	0	0	0	0	503700	0	0	0	0	0	0	503700	1937424.5		20281163
	Present value			17336339	0	0	0	0	0	0	352381.687	0	0	0	0	0	0	246521.448	901035.7654	18836278	4.666
Variable cost	Payment to SONEDE or GR				29459.08	30996.83	32650.03	34280.62	36032.53	37841.58	39706.49	41633.22	43700.52	45749.74	47942.38	50206.64	52552.75	55068.85	57556.18		
	Energy				20168.34	21260.32	22436.05	23602.15	24859.81	26164.24	27508.33	28901.35	30407.06	31896.98	33501.53	35164.53	36888.39	38742.61	40587.25		
	Disinfection				1904.96	2008.93	2120.73	2231.98	2352.01	2476.35	2604.48	2737.69	2881.62	3023.92	3177.37	3336.55	3501.48	3679.18	3855.99		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Subtotal				51532.38	54266.08	57206.81	60114.75	63244.35	66482.17	69819.3	73272.26	76989.2	80670.64	84621.28	88707.72	92942.62	97490.64	101999.42	1119359.6	
	Present value				48968.26125	49000.15078	49085.2695	49013.868	48999.782	48945.4227	48844.6352	48709.6994	48634.01815	48423.9632	48267.9553	48081.19	47869.9736	47713.9841	47436.75197	727994.93	0.18
Fixed cost	Maintenance cost	118756.86			118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86	118756.86		
	Management of GIC	5730			5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730	5730		
	Personnel (Pump operator)	42640			42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640	42640		
	Subscription to STEG	2381.2			2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2	2381.2		
	Subscription to SONEDE	162			162	162	162	162	162	162	162	162	162	162	162	162	162	162	162		
		0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Subtotal				169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	169670.06	2545050.9	
	Present value				161227.714	153205.4374	145582.329	138338.526	131455.157	124914.286	118698.872	112792.722	107180.4458	101847.4223	96779.7564	91964.245	87388.3401	83040.121	78908.25804	1733323.6	0.429
	Passed year			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
	Direct cost				221202.44	223936.14	226876.87	229784.81	232914.41	236152.23	239489.36	242942.32	246659.26	250340.7	254291.34	258377.78	262612.68	267160.7	271669.48		
	Cost			17336339	221202.44	223936.14	226876.87	229784.81	232914.41	236152.23	743189.36	242942.32	246659.26	250340.7	254291.34	258377.78	262612.68	770860.7	2209093.98		
	Present value of cost			17336339	210195.9752	202205.5882	194667.598	187352.394	180454.939	173859.709	519925.195	161502.421	155814.4639	150271.3855	145047.712	140045.43	135258.314	377275.553	1027380.775	21297596	
	Sales revenue			67256	1500606.23	1580507.49	1666334.05	1751443.82	1843033.5	1937795.14	2035399.03	2136694.78	2245717.08	2353542.13	2469362.52	2589409.2	2713745.44	2847299.32	2979998.41		
	Present value of revenue			67256	1425939.922	1427136.534	1429767.82	1428019.52	1427925.81	1426641.19	1423937.55	1420425.15	1418617.744	1412754.845	1408523.71	1403506.7	1397711	1393528.59	1385904.405	21297596	
																				0.0	
	O&M cost				221202.44	223936.14	226876.87	229784.81	232914.41	236152.23	239489.36	242942.32	246659.26	250340.7	254291.34	258377.78	262612.68	267160.7	271669.48		
	Present value of O&M cost				210195.975	202205.588	194667.598	187352.394	180454.939	173859.709	167543.508	161502.421	155814.464	150271.386	145047.712	140045.435	135258.314	130754.105	126345.010		
	Net sales revenue			67256	224945.705	236757.4538	249421.917	261983.02	275485.848	289453.798	303835.189	318736.245	334774.2671	350625.6656	367685.796	385334.51	403583.279	423192.962	442673.444		
	Present value of net sales revenue			67256	213752.985	213782.7338	214011.968	213604.834	213437.983	213101.325	212558.976	211888.465	211476.6458	210469.1909	209727.879	208858.28	207865.035	207119.599	205873.625		
	Net cash flow			67256	3557.010	11577.146	19344.370	26252.440	32983.044	39241.616	45015.469	50386.044	55662.182	60197.805	64680.167	68812.844	72606.721	76365.494	79528.615		
	Cumulative net cash flow			67256	70813.00974	82390.15536	101734.526	127986.965	160970.009	200211.625	245227.094	295613.138	351275.3197	411473.125	476153.292	544966.14	617572.857	693938.351	773466.9663		
	IRR(%)	**5.2**																			
	Composition on the cost of 1 m^3 water (TD)																				
	Investment cost (TD)	4.666																			
	Variable cost (TD)	0.18																			
	Fixed cost (TD)	0.429																			
	Cost of 1m^3 water without Investment cost portion (TD)	0.609																			
	Commission for tap keeper (25% of above) (TD)	0.152																			
	Applied 1 m^3 water charge (TD)	0.761																			

Table 8.5.12 Applied water charge and revolving fund to the water supply systems for 2005

Governorate	Sub-project	Cost of 1m^3 water	Proposed water charge[1]		Flat rate	Proposed revolving fund amount[3] per family	Revolving fund amount after consultation with AGR
		TD	TD	Remark[2]	TD	TD	TD
ARIANA	CEBALET BEN AMMAR	0.817	0.90	volunteer	4.734	19.000	19.000
MANOUBA	MAAFRINE	0.697	0.70	volunteer	5.562	22.000	15.000
MANOUBA	TIRASSET	1.072	1.10	volunteer	6.758	27.000	18.000
NABEUL	BASSATINE	0.725	0.80	volunteer	5.025	20.000	20.000
NABEUL	BEN THAMEUR	0.528	0.60	volunteer	3.636	14.000	14.000
NABEUL	BIR BEN ZAHRA	0.925	1.00	volunteer	4.963	20.000	20.000
BE JA	KEF DAROUGUI-SFAYA	0.827	1.00	20%	6.169	25.000	25.000
BE JA	MZOUGHA-ZELDOU	0.861	1.00	volunteer	5.978	25.000	25.000
JENDOUBA	EL ISLAH	0.899	1.00	volunteer	4.741	20.000	10.000
JENDOUBA	SOUALHIA	0.939	1.00	volunteer	6.718	25.000	15.000
LE KEF	EZZAGUAYA	1.116	1.25	20%	8.283	30.000	15.000
SILIANA	FEJ ASSEKRA	0.828	1.00	20%	5.528	20.000	20.000
SILIANA	KSAR-OULED BOUHANI	0.829	1.00	20%	6.814	25.000	25.000
KAIROUAN	DOUAR EL BELDI	0.372	0.60	Existing GIC	4.132	10.015	11.000
KAIROUAN	OULED ABBES	0.538	0.80	Existing GIC	5.689	12.163	12.000
KAIROUAN	OULED BOUDABBOUS	0.273	0.70	Existing GIC	4.542	7.999	10.000
KASSERINE	AIN DEFLA	0.610	0.75	Existing GIC	4.709	10.015	11.000
KASSERINE	FAKKET EL KHADEM (EL AITHA)	0.488	0.60	20%	4.706	11.682	11.000
KASSERINE	FAKKET EL KHADEM (NASSIRIA)	0.525	0.65	25%	5.078	11.682	11.000
KASSERINE	OULED BARKA	0.542	0.65	20%	3.709	8.581	10.000
KASSERINE	SIDI SHIL	0.504	0.60	20%	5.35	15.183	12.000
SIDI BOUZID	M'BARKIA	0.445	0.60	Existing GIC	2.991	11.964	12.000
SIDI BOUZID	OULED NAOUI	0.429	0.60	Existing GIC	3.542	14.168	14.000
SIDI BOUZID	OULED YOUSSEF GALLEL	0.408	0.60	Existing GIC	2.547	10.188	10.000
SOUSSE	OULED EL FALEH	1.058	1.10	volunteer	10.494	42.000	21.000
MAHDIA	KHIOUR	0.447	0.65	40%	2.895	12.000	12.000
MAHDIA	RMADHNIA	0.383	0.55	40%	2.62	11.000	11.000
MAHDIA	RQUIAT	0.344	0.50	Existing GIC	1.518	6.072	6.000
MAHDIA	SKHAIBIA	0.384	0.55	40%	3.163	13.000	13.000
MAHDIA	SLAYMIA	0.542	0.75	40%	3.146	13.000	13.000
SFAX	GUERGOUR-BRAHMIA-FKAYHIA	0.576	0.75	30%	4.087	17.000	17.000
GAFSA	HCHACHNA	0.506	0.60	Existing GIC	5.018	12.307	12.000
GAFSA	OUED ZITON	0.404	0.50	Existing GIC	3.991	9.576	10.000

note: 1. It is determined based on the cost of 1m^3 considering the commission for tap keepers or the water charge applied to a neighboring GIC
2. volunteer; a tap keeper will work without commission, figure in %; proposed commission rate to the calculated water charge
Existing GIC; the water charge applied to neighboring existing GIC
3. Four (4) months flat rate is generally applied

Table 8.5.13 Applied water charge and revolving fund to the water supply systems for 2006

Governorate	Sub-project	Cost of 1m^3 water	Proposed water charge[1]		Flat rate	Proposed revolving fund amount[3] per family	Revolving fund amount after consultation with AGR
		TD	TD	Remark[2]	TD	TD	TD
ARIANA	EL ACHICH	0.848	1.00	volunteer		20.000	20.000
BIZERTE	EL KALBOUSSI	0.734			5.5	15.000	15.000
BIZERTE	ETRAMIS - EDMAIN	0.743			5	15.000	15.000
BIZERTE	SIDI HASSEN	0.694	0.80	volunteer		15.000	15.000
MAHDIA	OULED AMMAR ET OULED ESSAAFI	0.618	0.80	20%		15.000	15.000
SOUSSE	CHRAIFIA	0.555	0.60	Existing GIC		15.000	15.000
BEJA	AIN DAM - NEFZA	0.645	0.65	volunteer		15.000	15.000
BEJA	GMARA	0.718	0.75	volunteer		15.000	15.000
LE KEF	EL OUENA	1.414	1.00	Existing GIC		16.000	16.000
LE KEF	ESBIAAT-EL ARGOUB ET SOUALHIA	0.451	0.70	27%		10.000	10.000
LE KEF	FORNA	0.960	1.25	21%		16.000	16.000
MANOUBA	SIDI ACHOUR	0.858	1.00	volunteer		15.000	15.000
SILIANA	AGBA	0.410	0.55	22%		10.000	10.000
SILIANA	GHANGUET ZGALASS	0.880	1.00	volunteer		12.000	12.000
SILIANA	NSIRAT	0.679	0.75	volunteer		15.000	15.000
SILIANA	SIDI DAHER	0.843	0.95	volunteer		15.000	15.000
GAFSA	ENJAIMIA	0.594	0.80	23%		15.000	10.000
GAFSA	SMAIDIA	0.494	0.75	25%		15.000	15.000
KAIROUAN	GHANZOUR	0.774	1.00	volunteer		15.000	12.000
KAIROUAN	GOUAAD	0.750	1.00	21%		15.000	12.000
KAIROUAN	HSAINIA	0.385	0.60	Existing GIC		10.000	10.000
KAIROUAN	KHOUALDIA	0.866	1.00	volunteer		15.000	12.000
KAIROUAN	MAAMRIA	0.604	1.00	Existing GIC		16.000	16.000
KASSERINE	BNANA/OULED BENAJEH	0.688	1.11	24%		16.000	16.000
KASSERINE	CHAAIBIA	0.621	0.85	20%		16.000	16.000
KASSERINE	MKIMEN	0.785	1.00	21%		16.000	16.000
KASSERINE	OUED LAHTAB	0.630	0.90	25%		18.000	16.000
KASSERINE	OULED MASSOUD RIZG	0.765	1.10	22%		15.000	16.000
SIDI BOUZID	AIN JAFFEL	0.584	0.80	23%		8.000	10.000
SIDI BOUZID	GARD HADID	0.384	0.60	25%		10.000	15.000
SIDI BOUZID	OULED MOUSSA	0.473	0.60	20%		11.000	11.000
SIDI BOUZID	SLATNIA	0.435	0.60	25%		5.000	10.000

note: 1. It is determined based on the cost of 1m^3 considering the commission for tap keepers or the water charge applied to a neighboring GIC
2. volunteer; a tap keeper will work without commission, figure in %; proposed commission rate to the calculated water charge
Existing GIC; the water charge of neighboring GIC is applied
3. Four (4) months portion of GIC's expenses in the first year of operation
4. If the prospective beneficiaries selected the commodity water charge, the flat rate is not calculated.

Table 8.6.3a Tender lots for sub-projects 2005

No	Governorate	Sub-project	Lot 1		Lot 2		Remarks
			Construction	Contract period (days)	Equipment	Contract period (days)	
1	NABEUL	BASSATINE	PP, AW, CW	180	EM, EL, DS	90	
2	NABEUL	BEN THAMEUR ET BKIR	PP, AW, CW	150			
3	NABEUL	BIR BEN ZAHRA	PP, AW, CW	180	EM, EL		
4	BEJA	MZOUGHA-ZELDOU (1ST)	PP, AW, CW	450	EM, EL, DS	120	
5	BEJA	MZOUGHA-ZELDOU (2ND)	PP, AW, CW	450	EM, EL		
6	BEJA	KEF DAROUGUI-SFAYA	PP, AW, CW	180	EM, EL, DS		
7	SFAX	GARGOUR-BRAHMA FKAHIA	PP, AW, CW	360	EM, EL, DS	90	
8	SOUSSE	OULED FALEH	PP, AW, CW	180	EM, EL, DS	90	
9	KAIROUAN	DOUAR EL BELDI	PP, AW, CW	150		150	
10	KAIROUAN	OULED ABBES	PP, AW, CW	300	EM, EL, DS		
11	KAIROUAN	OULED BOUDABOUS	PP, AW, CW	240	EM, EL, DS		
12	MANOUBA	EL MAAFRINE	PP, AW, CW	180	EM, EL	120	
13	MANOUBA	TIRASSET	PP, AW, CW	180	EM, EL		
14	SILIANA	FEJ-ASSEKRA	PP, AW, CW	300	EM, EL, DS	120	
15	SILIANA	KSAR-OULED BOUHANI	PP, AW, CW	240	EM, EL, DS		
16	ARIANA	CEBALET BEN AMMAR	PP, AW	150	-		
17	MAHDIA	SLAYMIA	PP, AW, CW, DS	240	-	-	
18	MAHDIA	SKHAIBIA	PP, AW, CW, DS	120	-	-	
19	MAHDIA	KHIOUR	PP, AW, CW, DS	240	-	-	
20	MAHDIA	RQUIAT	PP, AW	150	-	-	
21	MAHDIA	RMADHNIA	PP, AW, CW, DS	90	-	-	
22	JENDOUBA	SOUALHIA	PP, AW, CW, DS	240	-	-	
23	JENDOUBA	EL ISLAH	PP, AW, CW, DS	240	-	-	
24	LE KEF	EZZAGUAYA	PP, AW, CW	180	EM, DS	30	
25	GAFSA	HCHACHNA	PP, AW, CW	240	EM, EL, DS	60	Lot 2 will be executed in consultation with CRDA
26	GAFSA	OUED ZITON	PP, AW, CW	120	EM, EL, DS		
27	KASSERINE	AIN DEFLA	PP, AW, CW	240	EM, EL, DS	150	
28	KASSERINE	FAKET EL KHADEM	PP, AW, CW	300	EM, EL, DS		
29	KASSERINE	OULED BARKA	PP, AW, CW	300	DS		
30	KASSERINE	SIDI SHIL	PP, AW, CW	300	EM, EL, DS		
31	SIDI BOUZID	M'BARKIA	PP, AW, CW	300	EM, EL, DS	120	
32	SIDI BOUZID	OULED NAOUI	PP, AW, CW	300	EM, EL, DS		
33	SIDI BOUZID	OULED YOUSSEF GALLEL	PP, AW, CW	180			

Legend: PP: Pipeline, AW: Ancillary works, CW: Civil works,
EM: Electro-mechanical equipment
EL: Electric equipment
DS: Disinfection facilities

Table 8.6.3b Tender lots for subprojects 2006

No	Governorate	Sub-project	Lot 1		Lot 2		Remarks
			Construction	Contract period (days)	Equipment	Contract period (days)	
1	ARIANA	EL ACHICH	PP, AW, CW	150	EM, EL	90	
2	MANOUBA	SIDI ACHOUR	PP, AW, CW	150	EM, EL	90	
3	BIZERTE	ETRAMIS-EDMAIN	PP, AW, CW	240	EM, EL, DS	90	
4	BIZERTE	EL KALBOUSSI	PP, AW, CW	360	EM, EL, DS		
5	BIZERTE	SIDI HASSEN	PP, AW, CW	180	EM, EL, DS		
6	BEJA	AIN DAM-NEFZA	PP, AW, CW	360	EM, EL, DS	120	
7	BEJA	GMARA	PP, AW, CW	300	EM, EL, DS		
8	LE KEF	FORNA	PP, AW, CW	240	DS	150	
9	LE KEF	EL OUENA	PP, AW, CW	240	EM, EL, DS		
10	LE KEF	ESBIAAT, EL ARGOUB ET SOUALHIA	PP, AW, CW	270	EM, EL, DS	120	
11	SILIANA	GHANGUET ZGALASS	PP, AW, CW	180	-	-	
12	SILIANA	SIDI DAHER	PP, AW, CW	360	EM, EL, DS	120	
13	SILIANA	AGBA	PP, AW, CW	240	DS		
14	SILIANA	NSIRAT	PP, AW, CW	240	-	-	
15	KAIROUAN	GHANZOUR	PP, AW, CW	300	EM, EL, DS	150	
16	KAIROUAN	GOUAAD	PP, AW, CW	240	EM, EL, DS		
17	KAIROUAN	KHOUALDIA	PP, AW, CW	240	EM, EL, DS		
18	KAIROUAN	HSAINIA	PP, AW, CW	120	-	-	
19	KAIROUAN	MAAMRIA	PP, AW, CW	240	-	-	
20	KASSERINE	BNANA / OULED BENAJEH	PP, AW, CW	365	EM, EL, DS	150	
21	KASSERINE	MKIMEN	PP, AW, CW	300	EM, EL, DS		
22	KASSERINE	CHAAIBIA	PP, AW, CW	300	EM, EL, DS		
23	KASSERINE	OUED LAHTAB	PP, AW, CW	300	EM, EL, DS		
24	KASSERINE	OULED MASSAOUD RIZG	PP, AW, CW	240	EM, EL, DS		
25	SIDI BOUZID	GARD HADID	PP, AW, CW				
26	SIDI BOUZID	AIN JAFFEL	PP, AW, CW				
27	SIDI BOUZID	SLATNIA	PP, AW, CW				
28	SIDI BOUZID	OULED MOUSSA	PP, AW, CW				
29	SOUSSE	CHRAIFIA	PP, AW, CW	120	EM, EL	90	
30	MAHDIA	AMMAR	PP, AW, CW	360	EM, EL	90	
31	MAHDIA	ESSAAFI	PP, AW, CW	240	-	-	
32	GAFSA	ENJAIMIA	PP, AW, CW	240	-	-	
33	GAFSA	SMAIDIA	PP, AW, CW	210	EM, EL, DS	90	

Legend: PP: Pipeline, AW: Ancillary works, CW: Civil works, EM: Electro-mechanical equipment, EL: Electric equipment, DS: Disinfection facilities

Table 11.2.1 Comparison between Sub-project Identification Card and the result of Study in 2004

No	Governorate	Delegation	Sub-project	Water source	Centerline survey		No. of localities		Remark
					ID card	Execution	ID card	Identified	
1	NABEUL	MENZEL TEMIME	BASSATINE	EXTENSION GR	6.5	11.1	5	14	
2	NABEUL	KORBA	BEN THAMEUR	SONEDE CONNECTION	3.8	2.0	2	2	
3	NABEUL	HAMMAMET	BIR BEN ZAHRA	SONEDE CONNECTION	10.0	9.5	6	14	
4	SOUSSE	SIDI EL HANI	OULED FALEH	SONEDE CONNECTION	3.3	3.7	3	4	
5	MANOUBA	MORNAGUIA	EL MAAFRINE	EXTENSION GR	2.7	5.3	1	9	
6	MANOUBA	TEBOURBA	TIRASSET	SONEDE CONNECTION	1.5	5.2	1	6	
7	ARIANA	SIDI THABET	CEBALET BEN AMMAR	SONEDE CONNECTION	1.0	1.8	1	4	
8	BEJA	TESTOUR	MZOUGHA-ZELDOU (1ST PHASE)	SONEDE CONNECTION	13.0	20.0	5	22	
9	BEJA	TESTOUR	MZOUGHA-ZELDOU (2ND PHASE)	EXTENSION GR	6.5	24.0	3		
10	BEJA	BEJA NORD	KEF DAROUGUI-SFAYA	EXTENSION GR	3.5	5.5	1	5	
11	SILIANA	SILIANA SUD-SILIANA NORD	FEJ-ASSEKRA	EXTENSION GR	17.5	17.0	3	10	
12	SILIANA	BOU ARADA	KSAR-OULED BOUHANI	SONEDE CONNECTION	13.0	26.0	3	17	
13	JENDOUBA	AIN DRAHAM	SOUALHIA	SONEDE CONNECTION	4.5	7	5	8	
14	JENDOUBA	AIN DRAHAM	EL ISLAH	SONEDE CONNECTION	4.5	5.0	3	9	
15	LE KEF	KALAAT SENAN	EZZAGUAYA	SONEDE CONNECTION	12.5	14.5	6	11	
16	KAIROUAN	NASRALLAH	DOUAR EL BELDI	EXTENSION GR	3.8	6.0	3	6	
17	KAIROUAN	BOUHAJLA	OULED ABBES	EXTENSION GR	5.5	18.0	4	17	
18	KAIROUAN	BOUHAJLA	OULED BOUDABOUS	EXTENSION GR	2.7	9.0	2	10	
19	GAFSA	EL GUETAR	HCHACHNA	EXTENSION GR	5.5	10.5	2	9	
20	GAFSA	SNED	OUED ZITON	EXTENSION GR	3.3	3.5	1	4	
21	KASSERINE	HAIDRA	AIN DEFLA	EXTENSION GR	13	14.0	3	22	
22	KASSERINE	MAJEL BEL ABBES	FAKET EL KHADEM	IRRIGATION SYSTEM	11	25.0	2	32	
23	KASSERINE	FOUSSANA	OULED BARKA	EXTENSION GR	8.5	22.0	2	40	
24	KASSERINE	THALA	SIDI SHIL	IRRIGATION SYSTEM	16.5	22.0	6	20	
25	MAHDIA	SIDI ALOUANE	RQUIAT	EXTENSION GR	14	9.0	1	11	
26	SIDI BOUZID	SIDI ALI BEN AOUN	M'BARKIA	EXTENSION GR	5.5	22.0	1	13	
27	SIDI BOUZID	OULED HAFFOUZ	OULED NAOUI	EXTENSION GR	5.5	19.0	4	14	
28	SIDI BOUZID	MENZEL BOUZAIENE	OULED YOUSSEF GALLEL	EXTENSION GR	4.5	7.5	1	5	
29	SFAX	AGAREB	GUERGOUR-BRAHIMA FKAYHIA	SONEDE CONNECTION	11	60	15	47	
30	MAHDIA	ESSOUASSI	SLAYMIA	SONEDE CONNECTION	24	19.1	1	18	
31	MAHDIA	ESSOUASSI	SKHAIBIA	EXTENSION GR	6.5	10	1	8	
32	MAHDIA	SIDI ALOUANE	KHIOUR	SONEDE CONNECTION	19.5	10	1	18	
33	MAHDIA	BOU MERDES	RMADHNIA	SONEDE CONNECTION	3.3	2.8	1	5	
				Total	267.4	447.0	99	434	

Table 11.2.2 Comparison between Sub-project Identification Card and the result of Study in 2005

No	Governorate	Delegation	Sub-project	Water source	Centerline survey (km)		No of localities		Remark
					ID card	Execution	ID card	Identified	
1	ARIANA	EL MNIHLA	EL ACHICH	SONEDE CONNECTION	1.2	4.7	1	7	
2	MANOUBA	MORNAGUIA	SIDI ACHOUR	SONEDE CONNECTION	1.5	6.0	1	8	
3	BIZERTE	BIZERTE SUD	ETRAMIS-EDMAIN	DEEP WELL	12.0	12.3	6	21	
4	BIZERTE	GHAZALA	EL KALBOUSSI	DEEP WELL	20.0	35.7	6	41	
5	BIZERTE	GHAR EL MELEH	SIDI HASSEN	SONEDE CONNECTION	8.8	11.7	4	25	
6	BEJA	NEFZA	AIN DAM-NEFZA	SONEDE CONNECTION	8.5	12.1	1	23	
7	BEJA	NEFZA	GMARA	SONEDE CONNECTION	8.0	8.0	5	12	
8	LE KEF	KALAAT KHASBA	FORNA	SONEDE CONNECTION	10.0	11.8	5	15	
9	LE KEF	NEBEUR	EL OUENA	EXTENSION GR	5.0	8.3	6	11	
10	LE KEF	JRISSA ET KHEOBA	ESBIAAT, EL AGROUB ET SOUALHIA	DEEP WELL	17.0	20.7	3	17	
11	SILIANA	ER-ROUHIA	GHANGUET ZGALASS	EXTENSION GR	5.0	6.7	1	3	
12	SILIANA	ER-ROUHIA	SIDI DAHER	EXTENSION GR	13.0	15.8	5	13	
13	SILIANA	MAKTHAR	AGBA	SPRING	7.0	5.2	4	7	
14	SILIANA	MAKTHAR	NSIRAT	SONEDE CONNECTION	7.0	7.1	4	8	
15	KAIROUAN	EL OUESLATIA	GHANZOUR	DEEP WELL	17.2	12.4	6	18	
16	KAIROUAN	EL OUESLATIA	GOUAAD	EXTENSION GR	13.0	14.3	5	11	
17	KAIROUAN	HADJEB	KHOUALDIA	EXTENSION GR	7.0	15.0	7	15	
18	KAIROUAN	NASRALLAH	HSAINIA	EXTENSION GR	7.0	6.0	3	10	
19	KAIROUAN	EL ALAA	MAAMRIA	EXTENSION GR	13.0	10.9	6	18	
20	KASSERINE	FOUSSANA	BNANA / OULED BENAJEH	DEEP WELL	15.0	48.8	8	47	
21	KASSERINE	HAIDRA	MKIMEN	DEEP WELL	30.0	49.1	7	20	
22	KASSERINE	SBIBA	CHAAIBIA	DEEP WELL	15.0	30.1	2	52	
23	KASSERINE	SBIBA	OUED LAHTAB	DEEP WELL	15.0	24.9	2	31	
24	KASSERINE	FOUSSANA	OULED MASSOUD RIZG	DEEP WELL	20.0	26.7	2	26	
25	SIDI BOUZID	SIDI BOUZID EST	GARD HADID	DEEP WELL	12.0	36.4	2	45	
26	SIDI BOUZID	JELMA	AIN JAFFEL	DEEP WELL	12.0	42.5	3	37	
27	SIDI BOUZID	REGUEB	SLATNIA	EXTENSION GR	10.0	20.6	6	20	
28	SIDI BOUZID	JELMA	OULED MOUSSA	EXTENSION GR	8.0	13.4	4	11	
29	SOUSSE	BOUFICHA	CHRAIFIA	EXTENSION GR	3.0	6.8	1	5	
30	MAHDIA	SIDI ALOUANE	AMMAR	SONEDE CONNECTION	32.0	28.1	2	34	
31	MAHDIA	SIDI ALOUANE	ESSAAFI	SONEDE CONNECTION					
32	GAFSA	MDHILA	ENJAIMIA	SONEDE CONNECTION	17.0	32.1	1	7	
33	GAFSA	GAFSA NORD	SMAIDIA	DEEP WELL	6.0	13.1	4	12	
				Total	376	597	123	630	

Table 11.3.1 Consideration of the sensitization

Phase	Applied to the study	Manual of sensitization		Generally applied		Remarks
		described	Not described	yes	no	
Identification	Selection of intermediary people	X			X	Only the contacts with the sector chief and sometimes chiefs of "Cellule Destourienne (Cell of the primary political party) "
socio economic survey	Preparatory meeting		X		X	
	Households survey	X			X	Important to define the specific topics of sensitization. (see exploration phase)
	Community card		X		X	PRA tools are not integrated
	Needs Priorisation		X		X	
	Semi structured conversation	X			X	Described in the exploratory phase
First visit	Preparatory meeting		X		X	
	Data analysis	X			X	Data must be collected during the exploration stage and analyzed before the start of the sensitization
	Specific sensitization program	X			X	Must be defined from the preparatory stage
	Restoration of the survey data to the population		X		X	
	Presentation of preliminary design		X		X	
Second visit	Preparatory meeting		X		X	
	Designation of managing tapkeepers	X		X		This task is assigned by the manual at the 3rd and not 2nd passage
	Designation of temporary GIC's committee	X		X		This task is not clearly defined : who is responsible for the designation of temporary committee members
	Implementation of distribution points	X			X	Summary description : whether the study cabinet really gathers the population when implementing the points is not checked
	Presentation of the optimal design	X			X	The description in the manual is brief and indistinct
Third visit	Preparatory meeting		X		X	
	Presentation of study results	X		X		

Appendices

Appendix 6.1 Screening form

Name of Project：the Rural Water Supply Project (Phase II) in the Republic of Tunisia

Name of Sub-Project：

Name of Governorate：

Name of Delegation：

Please provide the name, department, job title, and contact details for the person who is responsible for filling out this form.

Name：

Department and title：

Name of Company or Organization：

Telephone number：

Fax number：

E-Mail address：

Date：

Signature：

Questions

Q1. Please provide the address of the project site.

Address of the project site:

Q2. Please provide brief explanation of the project.

Q3. Will JBIC loan be applied to a new project or an executing project? In case of executing project, please inform the presence of strong claims by local residents.

☐ New Project ☐ Executing Project (with Claim)
☐ Executing Project (without Claim) ☐ Others（Please specify ）

Q4. In case of this project, is it necessary to execute Environmental Impact Assessment (EIA) based on the laws or regulations? If necessary, please inform the progress of EIA.

☐ Required (Completed) ☐ Required (Under execution or under planning)
☐ Not Required ☐ Others (Please specify)

Q5. In case that EIA is already completed, pleases inform whether EIA report is already approved based on the environmental assessment system or not. If EIA report is already approved, please provide the date and name of authorities of the approval.

☐ Approved (without condition) ☐ Approved (conditional)
☐ Under approval process ☐ Others (Please specify)

Date of Approval：_____
Name of Authorities：_____

Q6. If environmental permit(s) other than EIA is required, please provide the name of required permit(s). Have you obtained required permit(s)?

☐ Obtained ☐ Required, but not obtained yet
☐ Not required ☐ Others (Please specify)

Name(s) of required permit(s)：_____

Q7. Will the loan be used for the undertaking that cannot specify the project at this stage (e.g. export or lease of machinery that has no relation with specific project, or Two Step Loan that cannot specify the project at the time of loan agreement)?

(Yes / No)

If you answered “Yes”, it is not necessary to reply to the following questions.
If you answered “No”, please reply to the following questions.

Q8. Are there any environmentally sensitive area shown below in and around project site?

(Yes / No)

If you answered "Yes", please select applicable items by marking, and reply to following questions.
If you answered "No", please reply to questions 9 and after.

- ☐ (1) National parks, protected areas designated by government (coastal areas, wetlands, habitats of minorities or indigenous populations, heritage sites, etc.)
- ☐ (2) Primeval forests, tropical natural forests
- ☐ (3) Ecologically important habitats (coral reefs, mangrove, tidal flats, etc.)
- ☐ (4) Habitats of endangered species of which protection is required under local laws and international agreements.
- ☐ (5) Areas that have risks of large scale increase in soil salinity or soil erosion
- ☐ (6) Desertification areas
- ☐ (7) Areas with special values from archaeological, historical and/or cultural viewpoints
- ☐ (8) Habitats of minorities, indigenous populations, nomadic people with traditional life style, or areas with special social value

Q9. Does the project involve following elements?

(Yes / No)

If you answered "Yes", please describe the scale of applicable elements, and reply to the questions 10 and after.
If you answered "No", please reply to questions 11 and after.

- ☐ （1）Involuntary resettlement (Number of resettlers:)
- ☐ （2）Pumping of groundwater (Scale: ton/year)
- ☐ （3）Land reclamation and/or development (Scale: ha)
- ☐ （4）Deforestation (Scale: ha)

Q10. Please reply to this question only in case that the project involves some of the above (1) to (4) elements. In the country where the project is planned, are there any regulations on a scale of the elements asked in question 9? If the country has such regulation, please answer whether the project satisfies the regulation or not.

- ☐ Regulation is applicable (☐ satisfied ☐ not satisfied)
- ☐ No regulation
- ☐ Others (Please specify)

Please reply to questions 11 and after.

Q11. Will JBIC share in the project be equal or less than 5% of the total project cost, or the total amount of JBIC loan equal or less than SDR 10 million?

(Yes / No)

If you answered "Yes", it is not necessary to reply to the following questions.
If you answered "No", please reply to questions 12 and after.

Q12. Does the project belong to either of the sectors that impact on the environment is deemed immaterial or is not anticipated under normal conditions (e.g. maintenance of the existing facilities, non-expansionary renovation project, acquisition of rights or interest without additional plant investment)?

(Yes / No)

If you answered “Yes”, it is not necessary to reply to following questions.
If you answered “No”, please reply to the questions 13 and after.

Q13. Does the project belong to the following sectors?

(Yes / No)

If you answered “Yes”, please specify the sector by marking, and reply to questions 14 and after.
If you answered “No”, it is not necessary to reply to the following questions.

- ☐ (1) Hydro power plant, Dam or water reservoir
- ☐ (2) Thermal power plant
- ☐ (3) Mines
- ☐ (4) Development of oil and gas
- ☐ (5) Pipeline
- ☐ (6) Steel industry (with large scale furnace)
- ☐ (7) No-ferrous metal refining
- ☐ (8) Petrochemical (including manufacturing of raw materials and petrochemical complex)
- ☐ (9) Terminal of oil, gas and chemicals
- ☐ (10) Petroleum refining
- ☐ (11) Paper and pulp
- ☐ (12) Manufacturing and/or transportation of hazardous substances (specified by international agreement)
- ☐ (13) Road, railway or bride
- ☐ (14) Airport
- ☐ (15) Port
- ☐ (16) Waste material processing or treatment
- ☐ (17) Treatment of sewage and/or waste water that includes hazardous substances or executed at environmentally sensitive area
- ☐ (18) Power transmission and/or distribution lines (including large scale involuntary resettlement, large scale deforestation or submarine cable)
- ☐ (19) Tourism (Construction of hotel, etc.)
- ☐ (20) Forestry or tree planting
- ☐ (21) Agriculture (large scale project and/or project including irrigation)

Q14. Please provide information on the scale of the project (project area, area of plants and buildings, production capacity, amounts of power generation, etc.) Further, pleased explain whether an execution of EIA is required on account of the large scale of the project in the country where the project is implemented.

Appendix 7.4.1 Background data for the detailed study and the socio-economic survey

In order to check and complete the preliminary information mentioned in the identification cards, elaborated by the Regional Directorate for Agricultural Development, the consultant company has to check the provided information concerning the population, livestock, and public institutions. Additionally, the consultant company has to collect background data that will serve as basis for evaluating the efficiency and the good functioning of the sub-projects.

The following data represents the background data:

1) Community needs and priorities
2) Infrastructure conditions
3) Main industries and revenue sources
4) Households' revenue
5) Men and women daily activities
6) Actual water sources and the existing water supply system
7) Water consumption
8) Appreciation of the existing sources (quality and quantity)
9) Persons in charge of water fetching
10) Distance, required time, used means for water collection
11) Time spent per day in water fetching
12) Waiting time to have water
13) If water place are considered as communication place
14) Diseases onset
15) Women's and men's roles in hygienic issues
16) Importance given to hygiene
17) Installation of pit system
18) Organisations in charge of hygienic issues.

Appendix 7.4.2 Summary of the socio-economic survey

The socio-economic survey applied to the Study is summed-up as follows:

1 OBJECTIVE

Objectives of the socio-economic survey applied in the study:

(1) Understand the actual situation of the target population through collecting background data. The following have to be collected as background data

1) Socio-economic activities, living standard
   - Main industries
   - Revenues and family expenses
   - Women and men daily activities
2) Actual water supply
   - Water sources and actual water supply system
   - Water consumption
   - Appreciation of the existing sources (quantity and quality)
   - Persons in charge of water fetching
   - Distance, time and means used in transporting water
   - Time spent in water fetching
   - Waiting time to have water
3) hygiene condition
   - Impact of water born diseases
   - Home Sanitary equipments
4) Needs and priorities

(2) Understanding the social specificity of the target area

   - Social specificity (existence of conflicts, feeling of belonging to the community, relation between gender)

(3) Determining the specific themes of sensitization according to the analysis of the socio-economic survey in order to focus on the points that need improvement.

2 METHOD

The socio-economic study is carried out through the following methods

(1) Household survey

This method is applied in order to collect quantitative data, based on the sample number determined according to the household number in the project area. The sample selection has to be proportional to the family number per locality.

Household Number	Sample
<60	20
60-100	30
101-200	40
201-500	50
>500	60

(2) MARP

The MARP aims also at collecting information, but this method allows information exchange between the sociologist and the target population (participants) through the

participants 'initiative taking. The following MARP tools are applied in the socio-economic survey:

(1) Community Map

1) Objectives:
   - Allow to the target population to identify the important problems of their community
   - Collect information and the different view points concerning the community
   - Help the target population to understand that groups in their community can have different perception

2) Method

The map is made by the beneficiaries themselves with the help of sociologists. The following details have to be included in the map:

- Roads, access
- Existing water sources
- Public institutions (mosque, dispensary, school, post office, etc...)
- The community meeting place (grocer, café, mosque, house, etc.)
- Elements that makes the community proud.
- Elements that the community want to improve

The map drawing is followed by a discussion concerning the points that were set up and those that were discovered.

The community map made by the beneficiary is used in the following steps of the sensitization program, as mentioned in chapter 8.

(2) Needs Ranking

1) Objective
   - Check the population interest and its priority in the development planning
   - To know about water rank comparing to the other needs and
   - To predict the sub-project sustainability

2) Method

Sociologists asked the participants to mention the needs necessary to the community development, afterward these needs will be ranked according to their priority, asking them which one they prefer and why.

(3) Semi-structured interview

1) Objective
   - To guarantee the quality of the collected information through the designed questionnaire
   - Complete the collected data through other means such as household survey and other PRA tools

2) Method

The following list of questions and topics, determined in advance is given to participants (beneficiaries' representatives).

- Existing localities and their relationships
- Frontiers (surface and borders, meeting place, places of which the inhabitants are proud)
- Basic infrastructure (road, electricity, schooling, health, telecommunications, etc)
- Specificity (customs, habits)
- Soico-economic activities (work sharing by gender, resources access and control)

- Actual water supply (source, quality, person in charge, distance, utensil, means of transport, time spent, inconvenience)
- Existing organization (non-official, official, traditional, and recent organizations) and their objectives, activities, experience, level (members, participants, clients, etc.)
- Participation of the community in the operation and maintenance of the RWS by the GIC (perception of the preceding experiences, aptitude of informing an participation population, management aptitude)
- Others

Appendix 7.5.1 Summary of the preliminary phase of the sensitization program

Sensitization program is made up of three phases: (1) preliminary phase of sensitization, (2) phase of sensitization consolidation (3) phase of sensitization maintenance, as mentioned in Figure 7.1. The following is a summary of the preliminary phase of sensitization to be fulfilled during the feasibility study.

1 OBJECTIVE

(1) Adaptation of the sub-project to the beneficiaries' needs and justifiable desires
(2) Beneficiaries commitment to ensure their responsibilities (contribution to the revolving fund of the GIC, payment of the consumed water, and their adhesion to the GIC)
(3) Preliminary preparation of the future system by selecting the person in charge of the operation and maintenance of the RWS.

2 PROCEDURE

The preliminary sensitization is made up of three visits. In each visit, several meetings with the beneficiaries are held, depending on the number and the place of the projected localities. In each meeting the following tasks have to be completed in due time, according to the progress of the technical work.

3 VISITS

3.1 First Visit

The first visit aims at drawing the beneficiaries' attention and at motivating them to participate in the O/M and in the management of the projected RWS through the following activities:

- Presentation of the summary of the socio-economic survey
- Reconfiguration of the actual water supply system and the difficulties encountered by the future beneficiaries.
- Presentation of the new WRS
  - Drawing and arrangement (Water source, piping, placement and types of facilities (tank, pumping station, pressure tank, etc.))
  - Type of distribution point that may be introduced by the project
  - Beneficiaries preference (communal tap or potences)
  - Impossibility of including the individual connection and watering places in the sub-project.
- Advantages of the new RWS (quantity, quality, distance, access and durability)
- Principal of O/M, management, and importance of the GIC management by the community members.
- Beneficiaries responsibilities (adhesion, payment of the consumption, contribution in the GIC revolving fund)

3.2 SECOND VISIT

The second visit aims at confirming the population desires and ensuring the comprehension of topics tackled during the first visit. The following are meant to reach such objectives:

- Presentation of the optimum design selected for the projected RWS
- Choice of the placement of the distribution points with the concerned beneficiaries
- Selection of the payment mode of the consumed water: i) flat rate, ii) commodity charge, iii) properly sharing the cost with the members concerned with the BF, and iv) Mixed
- Selection of tap keepers and the type of their tasks (voluntary or commission)
- Discussion about the operation hours
- Explanation of the content of the different contracts made during the feasibility study
  - Contract of land acquisition for the facilities to be executed
  - Contract of land acquisition for the distribution points
  - Contract for BF keepers
- Explanation of the commitment to the GIC revolving fund
  - Objective and content
  - Time for the collection
- Initiation to submitting an application concerning the GIC creation that will be followed up during the phase of sensitization consolidation

3.3 THIRD VISIT

- Presentation of the feasibility studies results
  - Final network drawing and the type, the placement and the number of the distribution points
  - Total investment cost and per capita investment cost
  - Functioning cost of the projected RWS system
  - Cost price and water charge of the proposed water
  - Recovery mode
  - Amount of the contribution to the GIC revolving fund
- Reconfiguration of the projected RWS functioning: tap keeper selected during the second visit and the type of their mission
- Distribution and collection of the contribution to the GIC revolving fund commitments
- Information concerning the operation hours opted for through the feasibility study
- Explanation concerning the un-accounted water and water saving

The presentation model of three visits are shown in Annex 7.5.1.1 –3.

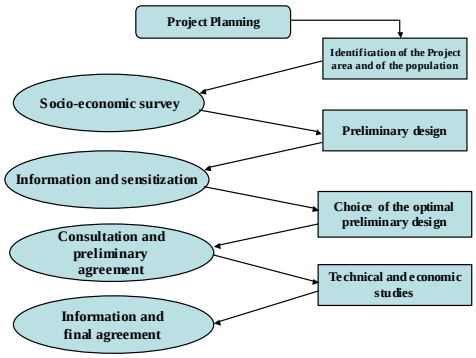
Appendix 7.5.1.1 Presentation model for the 1st visit of sensitization

Collective drinking water supply project:

Main Stages of the Project

	Stages	Responsible	Period	Year
1	Project delimitation	CRDA	1 Week	2002
2	Project Study	Consultant companies	9 months	2005
3	Project Execution	Supplier and contractor	6-12 months	2006
4	Project operation	Users Group	15 Years	2006-2021

Recall of the study stages



Result of the socio-economic survey

- Project area
- Groups/ localities
- Households Number
- Inhabitants Number
- Livestock
- Public Institutions
- Users Group (GIC) (in case it exists)
- Other

Indicators of the actual situation

	Information	Result	Observations
1	Water Sources		
2	Water quality		
3	Continuity		
4	Distance		
5	Time		
6	Average quantity consumed per family		
7	Cost		
8	Other (GIC)		

Components of the projected WSS

- Water Source and its quality
- Pumping (if necessary)
- Storage (if necessary)
- Distribution network
- Collective service points
- Public Institutions
- Users groups (GIC) (in case it exists)

(The components have to be presented in a big size flip-chart)

Expected advantages

	Information	Actual Situation	Future Situation
1	Water Source (Water quality)		
2	Continuity		
3	Distance		
4	Time		
5	Quantity		
6	Cost		
7	Other (GIC)		

Commitments

- Operation network by users group (Existing GIC or will be created or other)
- Land acquisition on the voluntary basis for the construction of the hydraulic facilities (pumping station, tank, service installations)
- Permission for the pipelines' route
- To agree about the placement of the service installations and the respective tap keepers
- Commitment to the revolving fund

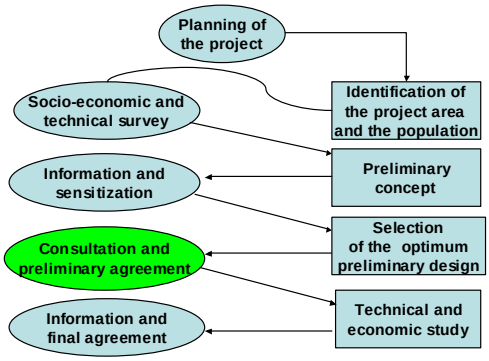
Observations

Appendix 7.5.1.2 Presentation model for the 2nd visit of sensitization

Collective drinking water supply project in (name of sub-project)

The phase of the preliminary consultation and agreement

Reminding of the Study Steps



Optimum preliminary design of the water supply system

Roles of GIC

- Distribution of drinking water
- Cost recovery
- Protection of water system
- Representation of beneficiaries toward the authorities, administration and others

Who is the GIC in charge?

Provisional committee or the Board of Directors of GIC

	Name	Living Place	Year of Birth	Education Level	Occupation
1					
2					
3					
4					
5					
6					

Water charge methods

- Flat rate
- Commodity charge (payment according to the water consumed)
- Properly sharing the cost among users according to the water meter by BF
- Mixed method: payment of flat rate by each family (based on the fixed costs) + payment for the water consumed (based on the variable costs)

Flat rate

+	-
• Easy management of the service points • Low Cost for payments collection • Stable income for the GIC during the whole year	• The cost does not reflect the volume of water consumed • The rate may not reflect the affordability of the beneficiaries • May cause problems especially regarding the watering the livestock

Commodity Charge

+	-
• Charges reflect volume of water consumed • Encourages efficient use of water	• High cost of payments collection •Maintenance and replacement cost of water meters • Risk of illegal connection

Mixed method of payment

+	-
• Encourages efficient use of water •Encourages to use safe water •The income of the GIC is guaranteed during the whole year	• High cost of payments collection •Maintenance and replacement cost of water meters • It is possible that rate is not suitable for small consumers

Operation hours

■ The operation hours

The time of opening and closing the service points

✓ To avoid the discontinuity of water during the peak hours

✓ To have an idea about the workload of tap keepers and pump operator

Tasks of the tap keeper

- Guarantee the use of service point during the time agreed
- Practice the payment method and the costs agreed
- Preserving the tap and guaranteeing its maintenance and the hygiene of its surrounding
- Informing the GIC when noticing a change in the functioning the system of the service point (pressure, flow, breakdown of water meter, etc.)

Service points

	Locality	Type	Respon -sible	Gender		Operation hours	Num ber fami- lies	Payment method	Obser vation
				M	F				
1						Morning:			
						Afternoon:			
2						Morning:			
						Afternoon:			
3						Morning:			
						Afternoon:			

Commitments

- To provide necessary lands without compensation
- To allow pipelines to cross under the ground
- Contracts of supervision and management management (this contract is signed between the committee of GIC and tap keeper)

Reminding of beneficiaries' commitments

The beneficiaries are requested to sign a commitment to:

- Contribute in the revolving fund
- Support the treasury of the GIC
- Pay for the volume of water consumed

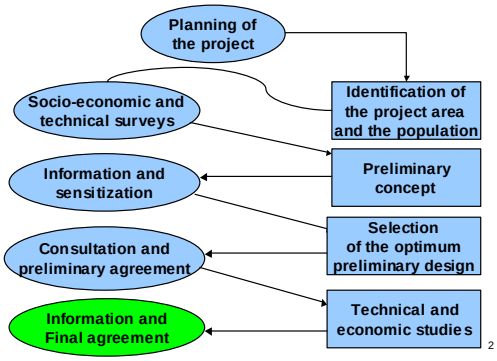
Appendix 7.5.1.3 Presentation model for the third visit of sensitization

Collective Water Supply Project in:

for the final agreement
(3rd Visit)

1

Reminding of the Study Steps



2

Community Map

3

Projected water supply system

4

Total Construction Cost of the projected WSS

◆ ***How much does your WSS cost?***

Equipment	Amount
1. Water sources	
2. Pipeline	
3. Ancillary facilities and their installation	
4. Civil works	
5. Electrification and Equipment	
Total Cost	
Cost per capita	

5

Water Charge

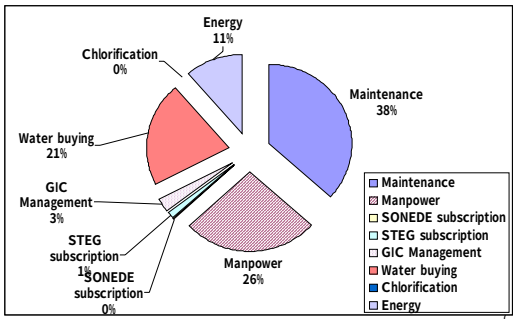
◆ **Water Charge (w/commission for tap keeper):** **DT/m³**
◆ **Water Charge (w/out commission for tap keeper):** **DT/m³**
◆ **Water charge in case of flat rate:** **DT/**
(monthly, bi-monthly, etc.)

After the exploitation of WSS, you will pay;

- for plastic tank of 20L: millimes
- for tank de 0.5m³: millimes
- for tank of 3m³: DT
- For tank of 5m³: DT

6

Components of 1m^3 water



7

Payment Methods

◆ ***How do we pay for water after starting exploitation of WSS ?***

Options	Number of localities opting for	Result
• Flat Rate		
• Commodity Charge (based on each consumption)		
• Metered charge by service point		
• Mixed Method: Flat Rate + Commodity Charge		

8

Utilization of service installations (1)

◆ ***Proposed operation hours :***

A.M.:

P.M.:

Why do we need to respect these operations hours?

9

Utilization of service installations (2)

◆ ***Who is responsible of your service point?***
(Remind tap keepers selected → see the table summarizing)

◆ ***Role of tap keepers: What are the tasks of the tap keeper?***

- Guarantee the use of service point during the time agreed
- Practice the payment method and the costs agreed
- Preserving the tap and guaranteeing its maintenance and the hygiene of its surrounding
- Informing the GIC when noticing a change in the functioning the system of the service point (pressure, flow, breakdown of water meter, etc.)

10

Service points

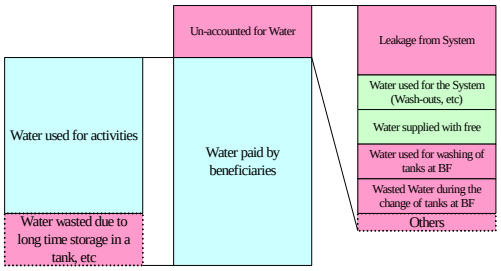
	Locality	Type	Respon -sible	Gender M	Gender F	Operation hrs	Num ber fami-lies	Payment method	Obser vation
1						Morning:			
						Afternoon:			
2						Morning:			
						Afternoon:			
3						Morning:			
						Afternoon:			

11

Utilization of service Installations (3)

Water economy

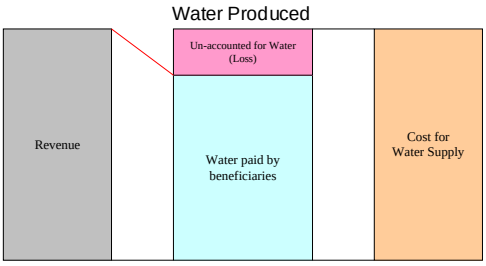
◆ **Un-Accounted for water (UFW), *what is it?***



12

Cost and revenue of GIC

◆ **Why do we have to avoid UFW?**



13

How can we avoid the waste of water?

- ✓ Connect the horse to the tap
- ✓ Keep containers always clean
- ✓ Inform the network keeper or tap keeper when noticing water leak at the tap

14

Provisional committee or the Board of Directors of GIC

	Name	Living Place	Year of Birth	Education Level	Occupation
1					
2					
3					
4					
5					
6					

15

Commitment of beneficiaries

◆ ***In order to realize the project, we commit ourselves to (Contents of the commitment)***

1. Use the water and pay attention not to waste it nor to commercialize it.
2. Keep the equipment of the WSS and to protect them from the vandalism.
3. Join the GIC.
4. Pay for an amount corresponding to the water consumed of ___millimes/m3 including a commission of _____ millimes for the tap keeper,
   or pay a flat rate of ____DT including a commission of _____DT for the tap keeper by every _____, by the deadline fixed by the GIC.
5. Participate and contribute to the revolving fund for the GIC with an amount of ____DT during the project execution by the deadline fixed by the GIC

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Appendix 7.9.1 Water consumption and its evolution during the project period

1 Water consumers and their specific demands

Water consumers during the project period are:

1) The population: It is divided into gathered and dispersed population.
2) The livestock: sheep, goats, cattle and horses.
3) Public institution: schools, dispensaries, mosques, etc.

The projects' water demands are determined from the inhabitants and the livestock demands. It is important to underline that public institutions are accounted for only in dimensioning the pipeline.

1.1 domestic water demands

In order to calculate the domestic demands, the uniform consumption corresponding to 25 l/day/ inhabitant for the project starting up year (2007 for the present project) is adopted in case of a gathered population that has an annual growth rate of 2.5%. The aim behind this is to take into account the limited evolution of their standard living. This growth will last until the due date which is fifteen years counting from the project's starting year.

The specific consumption of the dispersed population remains fixed at 20 L/ day/ inhabitant.

Specific Consumption l/day/ inhabitant	2007	2011	2016	2021
Gathered Population	25	27.6	31.2	35.3
Dispersed Population	20	20	20	20

1.2 Livestock

The specific consumptions that will be adopted are the following:

a) sheep or goats = 5 l/ day/ head
b) Cattle or horses = 30 l/ day/ head

These consumptions will not undergo any change in the future.

The livestock water demands will be limited to 40% of the population total consumption relative to the last year of the project term, that is to say the due date.

2 Projected water demand

Water demands was calculated until the sub-project due date, that is 2001. Therefore, in addition to the specific consumption growth, it was also accounted for the demographic growth. As far as the livestock is concerned, it was considered that the number remains unchanged until the project due date. Thus, the calculation of the future population accounted for the annual growth rate, which differs from one area to another.

The daily water consumption is calculated on the basis of numbers and specific consumptions. This volume has to be increased of 15% in order to take into consideration the unaccounted water. The consumed volume is then determined considering the unaccounted for water:

Vjm = Average daily water supply with unaccounted for water = 1.15 x (Vj: daily supply)

This calculation presupposes that consumption is regular during all the day, for that reason it is necessary to account for the maximum daily water consumptions in order to ensure a good dimensioning of the network. This explains why the above-calculated consumption has to be increased by an extra volume. In order to consider the different areas specificity, peak factors were determined for each area. The calculated volume is named: the daily maximum water consumption (Vjp) = Cp x Vjm. Cp refers to the peak daily factor.

The peak factor Cp is equal to 1.25 in case of Northern areas and 1.5 in case of Central and Western areas.

It is worth pointing that within the peak day there is also a peak hour. Referring back to DGGR guidelines, the adopted hourly peak factor is equal to 1.8. In case of pilot studies, the JICA Study team has suggested an hourly peak factor. Further details about this factor are presented in Appendix 7.9.2.

The flow at the level of the distribution points for the projects which has an hourly peak factor equal to 1.8, (0.5 l/s in case of communal taps and 2l/s in case of potences: according to the DGGR guidelines) is generally largely higher than maximum hour demand. Hence, the dimensioning of the distribution network is carried out on the bases of the flows des points de distribution. As far as the pilot studied are concerned, the dimensioning of the distribution network is done on the basis of the population demands (peak hourly flow). The following step consists in checking the network dimensioning through free discharge as detailed in Appendix 7.9.3.

Appendix 7.9.2 Determination of hourly peak factor

Similar to what was mentioned in annex 7.9.1 (water consumption and its evolution during project period); average daily water supply (Vj) is calculated on the basis of specific beneficiaries numbers and consumptions. This volume should be increased by 15% in order to take into consideration losses, that is Vjm= average daily water supply with unaccounted for water = 1.15 × (VJ)

Peak factors were defined for each region independently in order to take account of regions' specificities. The calculated volume is called: maximum daily water consumption (Vjp) = Cp × Vjm with Cp is the daily peak factor. The peak factor Cp is equal to 1.25 for the North and 1.5 for the centre and the south

In addition, during daily peak an hourly peak is produced. The hourly peak factor fixed by DGGR methodology is 1.8. This peak factor (of 1.8), which appears in specifications is not used neither to dimension nor to check RWS systems. The JICA study team thought of introducing hourly peak consumption for the dimensioning of distribution networks of RWS systems. In view of the absence of reliable data concerning peak consumption, the study team fixed a peak factor based on the number of beneficiary population and livestock in each locality as well as on DGGR data that concern flows at the level of service points. Calculation of this hourly peak factor can apply the following steps:

- Calculation of maximum daily water supply (or consumption) (Vjp) : It is obvious that network dimensioning should be done on the basis of peak water demand, so our basis for calculation is the maximum daily water demand (Vjp) which is defined above and which is expressed through the units Litre/ Day
- Determination of hourly average water demand: Starting always from Vjp we can determine the average water demand per hour which = (Vjp)/ 24 and is expressed in litre per hour
- Calculation of continuous fictitious water demand = hourly average water demand/ 3600 expressed in litre/s
- Definition of the capacity of distribution points: For the calculation of the capacity of distribution points, the JICA study team took into consideration time lost during water supply especially when beneficiaries wash or change their recipients. At this end the study team estimates that out of 60 seconds there are 20 seconds that are lost so the capacity of a distribution point = (60/40) × hourly peak water demand. Similarly, as indicated, the capacity is calculated independently for each distribution point in each locality because the number of population and livestock differs from one locality to another

Similar to what is indicated above; the hourly peak factor Cph that is included in the calculation of hourly peak water demand has remained unknown. The JICA study team adopted a total flow distributed by all service points and based on DGGR norms (flow of communal tap= 0.5L/s and flow of potence= 2L/s) in order to determine the hourly peak factor and not to oversize distribution networks. Thus, only one value will remain unknown which is the value of the hourly peak factor (Cph) that can be determined by applying the following formula:

$$\Sigma \text{ Flow rate of a tap (DGGREE Method)} = \Sigma \text{ Average water demand x Cph x 1.5}$$

$$\text{Cph} = \frac{\Sigma \text{ Flow rate of a tap (DGGREE Method)}}{\Sigma \text{ Average water demand x 1.5}}$$

Appendix 7.9.3 Flow rate of tap when it fully opens

Once the optimum design is selected and consulted with the population, the consultant company starts topographic surveys. Based on these topographic surveys, the engineer who is responsible for technical study of the report will have the basic document of hydraulic calculation which consists of network drawing where altitudes and distances should be mentioned (knot levels and distances between knots). Similar to what is mentioned in the text in chapter 7.9.2 the engineer starts to determine peak flows at the level of each locality and thereafter necessary flows at the level of each distribution point . These necessary flows of service points will be used as a basis for the preliminary dimensioning of the distribution network. This dimensioning which is made with fixed flows (necessary flow of service points) applies the same DGGR methodology with flows varying from one distribution point to another. Under this method the only factor to be controlled is the residual pressure which is defined at the level of branching saddles (at the start of the service network) The JICA study team propose to guarantee a residual pressure of at least 2 bars at the level of junction points between distribution and service networks, these junction points are also designated by branching saddles. Once the distribution network is dimensioned on this basis, we proceed with hydraulic calculation of flow rate of tap which is simply aimed at calculating real flows in relation to network conditions (diameters and lengths of pipes, location of the tank, type of distribution points etc…….), indeed, pressures at the level of branching saddles depend also on the conditions of the distribution network, so they are variable.

Although distribution network and all project components are already determined through this preliminary dimensioning, another part of the network remains unknown so it must be tackled in order to determine the flow rate of tap when it fully opens. Specifications as well as standard designs prepared by DGGR do not present the characteristics of the service network which supplies water to distribution points such as communal tap, Potence and individual connection. Because of the absence of this data the JICA study team simulated an equivalent length for service facilities based on data fixed by specifications of the DGGR that are presented in chapter 7.9.4. and which stipulates that in order to obtain a flow of 0.5L/s at the level of communal taps and 2L/s at the level of potencies, we should guarantee a residual pressure of at least 1bar at the level of the branching saddle (junction point between distribution and service points) . By knowing pipeline diameters of each type of service point, which are exterior diameters (DE) 25 mm for communal taps and individual connection and DE 32 for potencies we determined an equivalent length of almost 35 meters. If we take the example of a communal tap whose pipeline diameter in PEHD is DE 25mm which corresponds to an interior diameter of 19mm; the length that can dissipate a pressure of 10m with a flow of 0.5L/s is 35 meters

By determining diameters, lengths, distribution tank level and also pressure at the outlet in the open air at the level of each distribution facility which equals V2 / 2g, we can determine flows at the level of service points. These flows can be calculated by using ordinate hydraulic software such as Loop, EPANET, etc……

Appendix 7.10.1 Fixed costs and variable costs

1) Fixed costs

Fixed costs are the sub-project expenses which do not depend on the produced water. These expenses are essentially made up of:

1) Network and equipment maintenance
2) The pump operator wage and/ or the system care taker and the technical director.
3) The STEG and the SONEDE standing charge
4) GIC management costs

(1) Maintenance

A maintenance rate, expressed in percentage (%), is affected to each project component. The DGGR has a document that predetermines the duration and the maintenance rate of these components. The maintenance costs are determined by applying the maintenance rate on the cost of each component during the observation period. The maintenance costs are necessary in order to better guarantee the equipments' production. Maintenance costs constitute an important element in the calculation of operation costs.

Maintenance costs are determined

$$F.E = \sum Ci\ Ti$$

Ci = Cost of Component i
Ti = Maintenance rate of component i

(2) Standing charges costs

A part from the costs of electricity power consumption or that of the SONEDE water, the GIC has to pay a specific amount relative to the SONEDE or the STEG standing charges. As for the SONEDE, these fixed costs, which are of 1.5TD/month, are essentially meant to ensure the water meter maintenance. The STEG network also requires these fixed costs in order to carry out the maintenances of the electric cables. The costs relative to the STEG maintenance, which are of 0.300 TD/kVA/ month, are determined according to the transformer capacity.

(3) The GIC management costs

These costs will be spent by the GIC and they are essentially made up of:

1) Office costs
2) Meetings costs
3) Insurance costs
4) Contingencies

The management costs of a new GIC are estimated to 190 TD/ year.

Consequently, the heaviest fixed costs are the maintenance and the pump operator costs which can reach 80 to 90% of the total expenses. In case of small networks which require a pumping system and which supply population that does not exceed 100 families, the pump operator costs can increase the cubic meter cost. Actually, in such cases the cubic meter cost can be more than 1TD exceeding thus the population affordability.

2) Variable Costs

The variable costs are costs proportional to water production, they can include the following expenses:

1) commodity charge system
2) Disinfection costs
3) Energy costs

(1) Commodity charge system

Water can be bought either from the SONEDE, from an existing GIC or from the irrigation area. Indeed, all the subprojects of the present project rest on the commodity charge system. Out of the 32 systems, 16 sub-projects designed on the bases commodity charge from the SONEDE, 14 designed on the bases of commodity charge from existing RWS projects (GR extension), finally two of the subprojects are designed on the bases of commodity charge from the irrigation area.

In case of commodity charge from the SONEDE, the price is fixed at 0.159 TD/m^3 inclusive of tax.

In case of commodity charge from an existing GIC (either of drinking water or irrigation), the price is calculated taking into consideration the common operation costs as well as the total produced quantity. The costs of the common operation correspond to the expenses (fixed and variable costs) that will lead to the production of water quantity necessary to supply the drinking water and the irrigation projects.

(2) Chlorination costs

These costs include the expenses required in disinfecting a cubic mete of water. Javel water of 12°, which is sold in all the grocers, rural areas included, is generally used in the disinfection operation. The quantity of chlorine included in one litter of 12° javel water is equal to 32g/l. Besides, the chlorine necessary in a one m^3 of water is 0.8g/l (according to the DGGR guidelines). This means that 1litter of Javel allows the chlorination of 32/0.8, that is to say 40 m^3. The price of one litter of javel water is 0.330 TD, so the chlorination of one cubic meter of water costs: 330/40, that is 8.25 millimes. In the present project, it was opted for a chlorination price of 10 millimes.

(3) Energy Costs

The calculation of the energy costs is carried out according to the following steps:

Considering

P : Motor output $P = (\rho.g.Q.H)/(r_p.r_m)$
P : Output expressed in Watt
ρ : Water density ($\rho = 1000 Kg/m^3$)
g : Gravity acceleration
Q : Flow expressed in m^3/s
H : Total head expressed in m
r_p : Pump efficiency
r_m : Motor efficiency

The energy expressed in kWh per m^3 of produced water is:

$E = P/Q$; P expressed in Kw and Q in m^3/h

The energy costs per m^3 of produced water is

Energy costs = $E. T_f$

T_f: the Kwh price (The price actually applied by the STEG) or the cost of kWh for an engine generator, taking into consideration gas, oil and grease.

The STEG applies a uniform tariff which is equal to 0.090 TD/ kWh including VAT and local taxes.

Appendix 7.10.2 The cost of one cubic meter

Water cost price for the sub-projects 2005 was carried out over all the observation period 2006-2020. 2006 corresponds to the project starting up year and 2020 correspond to the project due date. The cost of one cubic meter is expressed in constant Tunisian dinar.

The intervening elements in the determination of the cubic meter cost are the following:

(1) The annual evaluation of the production and consumption taking into account unaccounted for water, which are estimated to 15% of the consumption (refer to 4.10.2).
(2) The investment: It is the basis of the calculation of the maintenance costs, the residual value and the renewal costs as well. In order to make the financial analysis and the determination of the cubic meter cost representative and close to economic realities, it is necessary to give importance to the determination of unit prices. That is why, it is recommended form the consultants company to refer back to the last contract with the enterprises in the project area. Prices will be updated during the year of the projects realisation accounting for the observed inflation.
(3) The fixed and variable operation costs.
(4) The "increase" in the water production output of the network which is set up with the following hypotheses:

In 2006, date of the project starting up year, consumption reaches 62% of the potential water demand. It will then develop linearly to reach 70% in 2010, and will continue to evolve keeping the same rhythm to reach 90% in 2020.

The cost price of different updating rates was calculated: 0, 3, 5, 8, 10, 12 and 15. The updating is applied on the consumption volume as follows:

$$Vupdated = \sum_{i=1}^{n} \frac{Vi}{(1+t)^{i}}$$

V_i : Consumption of year i
n : due date of the project
t : Updating rate

The total cost price (PR_t) of a cubic meter is determined by the following formula:

$$PR_t = PR_{inv} + PR_{fixe} + PR_{variable}$$

PR_{inv} = Cost price relative to investment = (inv cost – residual value)/ updated volume of consumption
PR_{fixe} = Cost price relative to fixed costs= (total fixed costs)/ updated volume of consumption
$PR_{variable}$ = Cost price relative to variable costs = (total variable costs)/ updated volume of consumption.

Appendix 7.10.3: Amount of the revolving fund and analysis of the family cash flow

When the planned RWSP starts up, the managing GIC might not receive any revenue during the first month, despite the fixed and variable costs necessary to water production. The beneficiary population is asked to contribute to the revolving fund in order to compensate for the deficit during that period.

Initially, the notion of the revolving fund was not mentioned in the DGGR methodology of financial analysis. The JICA study team has integrated this factor and has simplified the analysis method.

The revolving fund amount was determined of the basis of the cash flow balance. In fact, the cash flow balance is defined by the cumulative balance during the observation period to avoid that the GIC budget shows a deficit all over the functioning period; this would allow the GIC to avoid any recourse to loans and subsidy. Since the cash flow balance depends on two important factors namely the selling price and revolving fund amount, two cases are studied:

1) Case1: The proposed selling price is equal to the water cost price

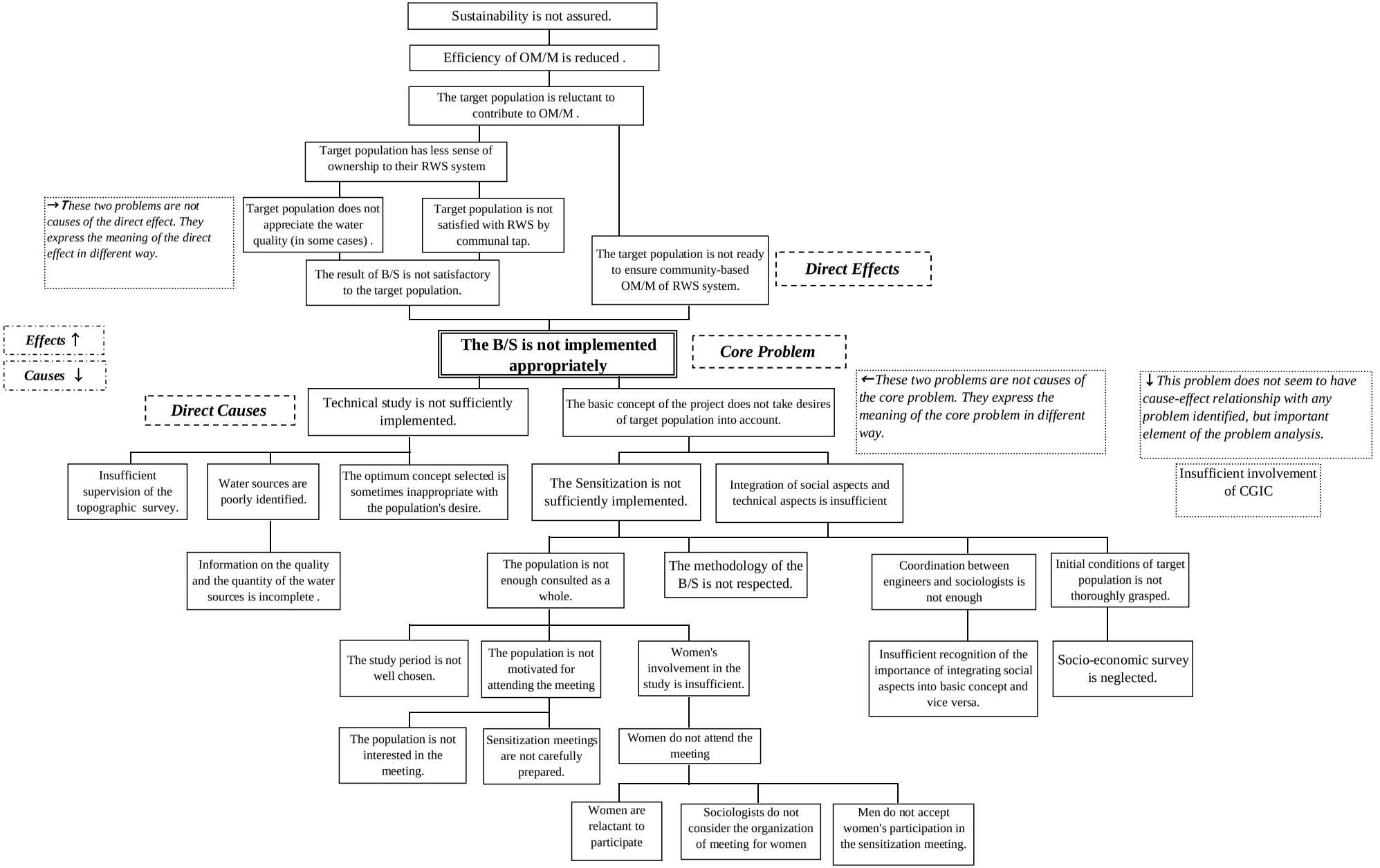
In case the selling price is equal to the cost price of one cubic meter of water, the amount of the revolving fund is determined in a way it ensures the GIC cash flow balance during the whole observation period. Then, the analysis of the amount of participation in the revolving fund per family is carried out. If the amount exceeds the population affordability, it is necessary then to opt for the second alternative.

2) Case 2: Revolving fund amount that covers all the expenses of the four first months of the starting up year.

As indicated above, the main objective of the revolving fund is to cover the GIC first months expanses during which it is likely to have a lack of revenue necessary for water production that necessitates fixed as well as variable costs. In case the family contribution in the revolving fund is judged inaccessible and it exceeds the population affordability, it is then necessary to limit the revolving fund to an amount that covers the expenses of the four first months of the starting up year and to determine the cost price that realises the cash flow balance.

The above-analysed cases rest on the hypothesis that all the adherent families will pay the required contribution. It is therefore worth noting, although it is a symbolic contribution and the total collected amount is quiet insignificant (it is equal to 1DT/family /year); the adhesion amount was integrated in the analysis of the cash flow balance in both cases.

Appendix 8.1.1 Problem tree



Appendix 8.2.1 FAQ (Frequently Asked Questions) for the sensitization

list of questions for sensitization

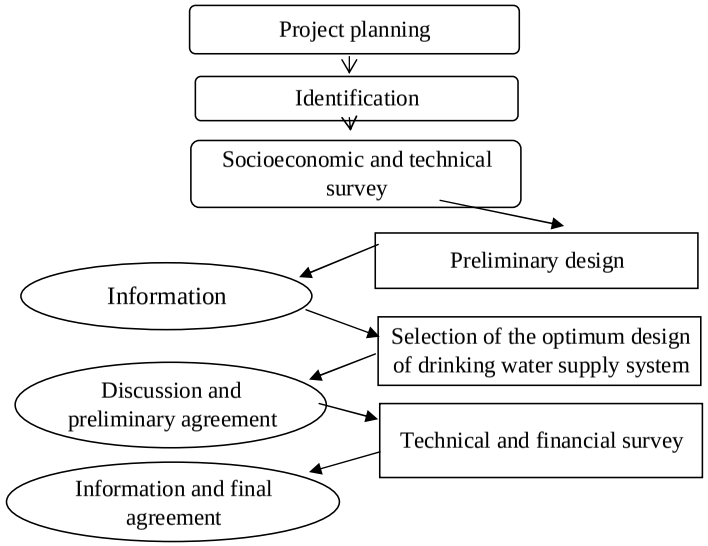
No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
1	detailed survey, all the three sensitization visits	project area	A	There is a locality near the project area but it is not included	**REACTION IN SUCH A CASE:** **The *sociologists should not give positive answers before clarifying the following points:*** 1. Check with the administration if the concerned localities do not belong to another project 2. The sociologists and the engineers should check the geographical setting of these localities with the OMDA and the administration. Then they should situate them on the Ordnance Survey Map 3. The engineers should check whether the flow is sufficient or not and if the cost of the project permits to include them. **Attention!**
2	all the sensitization visits	service mode	A	We want individual connections instead of collective supply. We want individual flow meters	**ANSWER TO SUCH A QUESTION"** "Because of budgetary constraints, the objective of this project is to supply the maximum of the population with water through collective supply (a communal tap (B.F) within a 500m radius).
3	first visit	land acquisition	A	if the land owner refuses to provide his land ,will the project be canceled?	**REACTION IN SUCH A CASE:** 1. The sociologists should convince the beneficiaries to provide a portion of their private lands for the implementation of the project hydraulic facilities. The responsible of CRDA can interfere when necessary. They can ask the support of local authorities such as Omda and delegate. ANSWER TO SUCH A QUESTION : "if land can not be acquired, the project will be canceled "
4	first visit	service mode	A	one communal tap (B.F) is not sufficient for our locality.	**ANSWER TO SUCH A CASE:** 1. "There are norms of the administration: a communal tap (B.F) within the radius of 500 m and one B.F for around 20 families. 2. "If it is necessary we can increase the number of the communal taps (B.F) provided that the eligibility of the project (cost per capita) permits this. 3. "The conception of the project is made on the basis of "collective supply" and not "individual supply". REACTION IN SUCH A CASE : 1. Check the total number of households in the concerned locality 2. Check the project cost because if the cost ceiling per capita does not permit such increase it is not possible to make it . 3. At the social level, check the social relationships. In case the relationship between the inhabitants of the same locality is not good, more than one communal tap (B.F) should be implemented.

Appendix 8.2.1 FAQ (Frequently Asked Questions) for the sensitization

No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
5	third visit	revolving fund	A	When and to whom will the contribution to the revolving fund be paid?	**ANSWER TO SUCH A QUESTION:** Contribution to the revolving fund should be submitted to GIC before the end of the construction works of the drinking water supply project
6	1-3 visit	women participation	A	Why do you like women to attend meetings? Men are the ones in charge.	**ANSWER TO SUCH A QUESTION:** "Because they are the users of water just like men. Generally, fetching water constitues a shore for women. They have to give their points of view and they should be informed just like men; and this in order to reinforce men's as well as women's appropriation of the project". **REACTION IN SUCH A CASE:** Hence, it is important to talk to men (local leaders and men beneficiaries) from the beginning, in order to make them conscious about the importance of women's participation.
7	first visit	service mode	B	We want animal watering facilities besides the tap (Beja/Sfaya, Siliana /Sfina)	**ANSWER TO SUCH A QUESTION :** "In principle, the implementation of animal watering facilities are not recommended because their management is difficult especially when commodity charge, which is now a widespread recovery method, is applied. ". And "livestock pollutes the service point". **REACTION IN SUCH A CASE :** We must take into consideration that the potence is the first alternative for the population and check if there is a critical condition (unavoidable necessity) that requires the implementation of animal watering facilities. If the majority of the population asks for such facilities and the administration approves this condition, it is possible to implement animal watering facilities. So conditions for which future users need animal watering facilities should be well identified.
8	second visit	service mode	B	We want a potence instead of a communal tap (BF)	**REACTION TO SUCH A CASE:** 1. First of all we must check the possibility: we must review the hydraulic calculation (because 1potence = 4 communal taps (B.F) and also the eligibility of the project **ANSWER TO SUCH A QUESTION :** 1. Sociologists should examine this request by asking : "Why do you want a potence? (potences are not necessary especially if the localities are not dispersed. Generally in such case the population wants water for irrigation) 2. Sociologists should explain the conditions to implement potences: "potences necessitate that you own big cisterns and that the ground is uneven" 3. Sociologists should discuss hygienic matters:. "When you are supplied with water from potences, you risk to store water in cisterns for a long time and given that chlorine looses its effect with time so storing water in this manner is not hygienic because it can cause health problems.

Appendix 8.2.1 FAQ (Frequently Asked Questions) for the sensitization

No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
9	first visit	adhesion to the GIC	B	What are the advantages of adhesion to the GIC?	ANSWER TO SUCH A QUESTION : Sociologists can explain the following advantages: "Only the beneficiaries who are members of the GIC have the right to vote and can become members of board of directors. Membership permits to you to attend the General Assembly and to audit GIC work."
10	first and second visit	creation of GIC	B	When will the GIC be created?	**ANSWER TO SUCH A QUESTION:** "before starting the construction works ("before the order of construction unit) so that GIC can supervise the construction works with the administration .
11	second visit	payment of water	B	Is the water bill sent to each locality or is it sent at the level of the network (Beja, Mzouga, Zeldou).	ANSWER TO SUCH A QUESTION :."Each communal tap (B.F) is equipped with a flow meter. Organized GICs have flow meters and bills at the level of each communal tap (B.F)".
12	first visit	tap keeping	B	We (women) would not like to have a man tap keeper here.	**ANSWER TO SUCH A QUESTION :** Sociologists ask first about the reasons why women prefer a woman tap keeper "Why do you want the tap keeper of your service point (B.F) to be a woman ?" Afterwards, sociologists should suggest to women : "to consult with men .You (women) can you also become tap keepers if everybody agrees. **REACTION IN SUCH A CASE :** 1. Sociologists should lead the beneficiaries to take a collective decision by participating women as well as men . 2. The specificities of the region such as relationship between men and women (habitual contact) must be taken into consideration.
13	1-3 visit	participation in meetings	B	our attendance at the meetings is always difficult due to our commitment to do many activities.	**ANSWER IN SUCH A CASE :** 1. When we talk to the population, first we explain: "This project is yours; your participation in the meetings is essential so as to include your opinions in the design and in the operation and exploitation plan of your drinking water supply system... 2. Afterwards, sociologists should insist on the importance of the participation of the beneficiaries. "We try to sarisfy your desires. These requests should be discussed by the majority of the beneficiaries and for this reason they should organize themselves and make sacrifices to attend the meetings. Otherwise, the number of the participants in the meetings may not be representative in comparison with the beneficiaries of the project". 3. Ideally, the beneficiaries should attend the meetings of the three visits to understand better the project and obligations of users but to reassure people who are very busy, we can mention the role of relay persons by saying, "Relay persons will be in charge of the task of inform you when you are absent. The essential thing is that you commit yourselves as beneficiaries to take in charge the costs of the O/M of the drinking water supply system ."

No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
13	1-3 visit	participation in meetings	B	our attendance at the meetings is always difficult due to our commitment to do many activities.	**REACTION IN SUCH A CASE:** 1. We must take into consideration the specific aspects of the region. If men work in other regions or other countries and are always far from their houses, the sociologists should organize meetings with women by discussing the date, hour and place that is suitable for them. 2. The sociologists should avoid market days (souk) (market days should be checked during the identification). 3. Relay persons play an important role in the organization of meetings. Sociologists should contact the Omda and the relay persons in advance so that they take sufficient time to inform the others.
14	1-3 visit	participation in meetings	B	why does your study necessitate many visits?	**ANSWER TO SUCH A QUESTION:** "The Study is composed of several steps. Each step has a different objective and it is an exchange with you to present data and to reflect your opinions in the project conception. For example, the sociologists and the engineers can say: we visit your project zone and we collect information. Then, we come back to the office to analyze them, discuss them and to make the necessary calculation. After that, we get back to the project zone to present data and and to reflect your opinions in the design of the project. We get back again to the office and we proceed to the making of a more detailed design and we come back here to inform you about the progress of work and to discuss with you the project conception and the exploitation and operation plan of the system. Because of this procedure, we need to contact you many times". 

Appendix 8.2.1 FAQ (Frequently Asked Questions) for the sensitization

No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
15	1-3 visits	participation in meetings	B	when we are not sufficiently informed in advance, it is difficult for us to attend meetings.	**ANSWER TO SUCH A QUESTION :** "We will try to inform you in advance through the Omda and the relay persons. Certainly, we will avoid market days and we will try to come according to the days and hours that are suitable for you. So we hope that you arrange and organize yourselves to attend the meetings and discuss with us and between yourselves."
16	identification /SE	list of beneficiaries	B	Our neighbors come back here only during the holidays do you consider them as beneficiaries in your study?	**ANSWER TO SUCH A QUESTION :** All those who own a house or a land in the project area, whether permanent or seasonal inhabitants, are considered as beneficiaries of the project and are included in the list of beneficiaries. In other words, even seasonal inhabitants have to pay the revolving fund and accept the responsibilities and the obligations of the GIC adherents even if they are absent. **REACTION IN SUCH A CASE :** The consultant companies have to take into account the seasonal inhabitants from the beginning (from the identification stage) and have to consider how to collect commitments from them.
17	second visit	GIC	B	is it possible to create our own GIC and not to be merged with the existent GIC?	**ANSWER TO SUCH A QUESTION :** 1. "There is no objection. A new GIC can be created". 2. "But why do you want a new GIC ? (Sociologists should discuss with the population to know whether this request is caused by the existence of a conflict between the existing GIC and the new population or because of other social reasons". **REACTION IN SUCH A CASE:** 1. The consultant companies discuss with the future population by comparing to them the cost of m3 in the two cases: A) when adhering to the existing GIC, B) when creating a new independent GIC, taking into account fixed expenses (e.g. salary of the pump operator). For instance, if the existing GIC have a water source, the cost of m3 of water will increase. Sociologists should inform the population about the disadvantages of the creation of an independent GIC. Especially when the number of the population is small, it will be difficult to undertake them independently. 2. But if the population accepts the higher cost of water, the creation of an independent GIC is acceptable. 3. At the same time, the socio-economic situation of the existing GIC must be analysed and which option is the best should be studied well. 4. Consultant company should also confirm that the existing GIC accepts to include the new population.

Appendix 8.2.1 FAQ (Frequently Asked Questions) for the sensitization

No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
18	second visit	GIC	B	we have a bad impression on the role of GIC because the GIC we know are always not functioning . We fear that the same problem happens to us.	**REACTION IN SUCH A CASE :** 1. The consultant companies should ask the population to express their points of view and give their arguments. They should ask for the reason of this disfunction (so that they understand that this disfunction of the GIC is not only caused by GIC. The disfunction of the existing GIC may be due to the problems of management, the method of payment or due to technical problems). 2. The consultant companies should try to find out what are the reasons of the disfunction or the success of the GIC. They must give examples of functioning GIC. Members of the board of directors should have a good training and they must be provided with a model to follow. 3. Then, try to make them understand that it is a matter of shared responsibility and that to insure the maintenance and the management of the communal infrastructures, there must be a communal organization in charge of daily operation and maintenance.
19	third visit	commitment to the revolving fund	B	When my husband is absent, I cannot sign the engagement of the revolving fund without his permission.	**REACTION IN SUCH A CASE :** 1. Sociologists should explain to the population that in order to collect a big number of commitments, the signature of commitments is necessary. 2. The possibility for women to sign the commitments should be discussed since the first visit. It will be efficient to show a modal of commitment to the revolving fund and the deadline for the signature should be indicated to the population so that women can discuss with their husbands the possible signature of the commitment.
20	first visit	project	B	we live near the city why don't we have SONEDE service?	**ANSWER TO SUCH A QUESTION :** 1. "The nature of the project is the collective supply and the government takes in charge all the expenses to execute them in rural areas." 2. "SONEDE can not intervene in zones where the localities are very dispersed and it needs to find a sufficient number of population so that it guarantees its profits."
21	first visit	water quality	B	The water quality of our spring is good, so why should we change it?	ANSWER TO SUCH A QUESTION: 1. "To the naked eye, we can not know if the water quality is good or not, but this water is not controlled . The water source presently used is not disinfected; it can be used for other matters such as washing, watering animals or plants but not for drinking." 2. "there are other advantages such as ; - Getting the water source nearer to the population - Easier access

Appendix 8.2.1 FAQ (Frequently Asked Questions) for the sensitization

No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
22	socioeconomic study	objective	C	what is the objective of the socio-economic survey?	**ANSWER TO SUCH A QUESTION :** 1. "The socio-economic survey is done to determine present living conditions in order to justify the project". 2. "Also we will learn from you and know your perceptions". 3. "All these surveys are aimed to make the project durable".
23	first visit	cost of water	C	how do you determine the cost of one cubic meter of water?	ANSWER TO SUCH A QUESTION: "The cost of water production is divided by the total produced volume."
24	first visit	water quality	C	what is the water quality of this project? I think that SONEDE water is well controlled and its quality is the best (Beja /Mzouga, Zeldou).	**ANSWER TO SUCH QUESTION:** "Even the water of this project is analyzed in a national laboratory based on the norms of the quality of drinking water in Tunisia otherwise, the drinking water supply project will not be implemented. "The quality of water for your project is already ensured "
25	first visit	Technique	C	to which depth are you going to dig to implement the pipelines (Kef /Ezagaya)	**ANSWER TO SUCH A QUESTION :** "The norm is of 80 cm at least, but engineers leave always 1m so that users can plow their lands without any problems."
26	first visit	tap keeping	C	Is it possible for the tap keeper to stay the whole day near the tap? (Kef /Ezagaya)	**ANSWER TO SUCH A QUESTION :** "You (users of the communal tap (B.F)) can you organize yourselves and can you agree about the operating hours?"
27	first visit	land acquisition	C	Concerning the land transfer, what is the seize of the surfaces necessary for the implementation of the taps and the other facilities?	ANSWER TO SUCH A QUESTION : "5mx5m for one communal tap (B.F). For other hydraulic facilities, the necessary surface is of 25m x 25m at most"
28	first visit	Technique	C	what is the pipeline material? (Beja/Sfaya)	**ANSWER TO SUCH QUESTION :** "Normally, the material of the pipeline is polyethylene. Very rarely, the pipeline is in cust iron for areas where pressure is very high. "
29	first visit	Techniques	C	what is a pumping station? (Siliana/Sfina)	ANSWER TO SUCH A QUESTION: "It is a facility that transmits water from bottom to the top."

Appendix 8.2.1 FAQ (Frequently Asked Questions) for the sensitization

No.	Phase	Subject	Frequency	Questions proposed by beneficiaries	Desired reactions
30	first visit	tap keeping	C	can illiterate women be tap keepers (Siliana /Sfina)?	**ANSWER TO SUCH QUESTION :** "Yes. The essential thing, is that she is helped by members of her family, if she can not count."
31	first visit	land acquisition	C	will the transferred land be refunded? Why doesn't the government buy the land? (Siliana /Fejj Asokra)	**ANSWER TO SUCH A QUESTION :** Because it is a project for the rural development, land transfer should be a part of the participation of the population .
32	1-3visit	hygiene	C	why don't you talk with men about hygiene?	**ANSWER TO SUCH A QUESTION:** There is no reason to differentiate this theme. It is an important matter for all users, because women are not the only ones who fetch water and it is beneficial to raise the awareness of everybody to maintain the system carefully.
33	Identification/ SE	list of beneficiaries	C	in what terms will the number of livestock we own be useful for you?	**ANSWER TO SUCH QUESTION :** to calculate well the dimensions of the hydraulic facilities and to study the quantity of water sufficient for human beings and also for livestock.
34	second visit	payment of water	C	if I become a member of GIC's board of directors , do I need to pay for water ?	**ANSWER TO SUCH A QUESTION :** GIC work is voluntary. Paying water is obligatory for all users independently from the position towards the GIC .

Appendix 8.3.1 Gender approach in the Feasibility Study

Stage	Sensitization Activities	Gender approach	Expected results	Source of Cheking
project identification	**Idetification of the socio-ecnomique conditions** * Present water collection * Socio-economic data (Demography, livestock, public institutions)	**Identification of Relay Persons**: - Idetification of men and women relay persons women by locality to ensure sufficient mobilization - Support from local leaders on women participaton	Women and men relay persons identified	List of relay persons
	Identify			
Étude de Faisabilité	**Socio-economic survey** * Determination of the beneficiaries list * General socio-economic conditions, including * Verification of needs of the target population	Social and gender analysis: - Roles and responsabilites, Access and control, influential factors, Identified demands	- Difference of roles, responsabilities and ideas clarified per gender	Socio-economic report
	Review and anlysis			
	Raising awareness Plannification * Specific themes to be focused on	**Equitable acess to meetings (inforamation about the projct)** - To ensure a suitable setting: time and space to the traget beneficiaries (Seperate meetings if necesary) - Allow women to express theriselves like men	- Women's participation is ensured	Participation List
	Preliminary Sensitization			
	Frist passage * Promoting the understanding on the project * Raising awareness of the target population on its obligations relative to operation and maintenance.			
	Themes to be dealt: * Difficulty related to the present water supply * Advantages of the new project * Opreation and maintenance System (Role of GIC)			
	2nd Visit * Understanding and adoption of the OM&M system * Integration of expectations and opinions of the	**<u>Access to the decision of service points placement</u>** - Women mobilisation, even if they are not present in the raising awareness meetings - Lead women toward takng decisions	- Women participation is assured	Paricipation list
	Themes to be dealt : * Mainatined optimal design * Palcement of service points * Operation hours * Recovery method Mode de recouvrement d'eau * Tap keepers selection * Conditions of the project's approval (committment in the prticipatio in the revolving fund)	**<u>Equitable access in selectingkeepers of service points</u>** - Select women tap keepers independently from the land owner	Women tap keepers as much as possible	List of tap keepers
	3rd visit * Validation of project by prospective beneficiaries	**<u>Equitable access in selecting memebers of the GIC provisional committee</u>** - Select men and women (with men approval)	Women membres of the provisional committee	List of the provisional committee of the GIC
	Themes * Design of the final system * Construction cost, charge d'eau/m3 *Montant du fonds de roulement * Heures d'Opération retenues * Unaccounted water	**<u>Access to information concerning the projet</u>** - To ensure the equitability for the two genders		
	Committment of more than of 80% of the target households			
	Social feasability	***<u>Access to the signing of the committment</u>*** *- In case the husband is absent, try to make his wife sign istead of him*	Number of women who signed the committment to the revolving fund	List of beneficiaries who signed the committement
	Approval of the project implimentation by the DGGREE and CRDA			

Appendix 8.3.2 Outline of the interview survey on the relay persons

A survey on relay persons was conducted by the JICA Study Team during the third visit of the sensitization in the Study in 2005.

(1) Objectives

1) To observe impacts on women given by their participation in the sensitization activities through a case of relay persons
2) To see different impacts such change in men's point of view on women's, impact at community level and so on.

(2) Methodology

The survey was conducted based on individual interviews with a questionnaire. Woman interviewers were assigned for it so that woman relay persons felt at ease to answer questions since they were relatively less experienced in contact with those coming from the outside the community especially with men.

(3) Sampling

The sampling was determined based on the summarized attendant list of the socio-economic survey to the second visit of the sensitization, namely three contacts. In line with the objectives of the survey mentioned above, the survey targeted relay persons having attended above mentioned activities at least twice 2. It targeted at least 2 - 3 men and woman relay persons by sub-project among those satisfying such criteria so as to compare various point of view and impacts by gender.

(4) Background of the sample

1) Proportion by sub-project

The sample consists of 225 relay persons; 139 men and 86 women (see a table below).

Table No. 1: Distribution of respondents by gender and by sub-project

Sub-project	Men (Number)	Men (%)	Women (Number)	Women (%)	Total (Number)	Total (%)
EL ACHICH	2	1.4	2	2.3	4	1.8
SIDI ACHOUR	2	1.4	1	1.2	3	1.3
ETRAMIS-EDMAIN	2	1.4	1	1.2	3	1.3
EL KALBOUSSI*1	4	2.9	0	0.0	4	1.8
SIDI HASSEN	5	3.6	1	1.2	6	2.7
MAMMRIA	2	1.4	2	2.3	4	1.8
AIN DAM-NEFZA	2	1.4	2	2.3	4	1.8
GMARA	1	0.7	3	3.5	4	1.8
GHANGUET ZGALASS	2	1.4	1	1.2	3	1.3
SIDI DAHER	5	3.6	4	4.7	9	4.0
AGBA	4	2.9	1	1.2	5	2.2
NSIRAT	4	2.9	1	1.2	5	2.2
ESBIAAT ET AGROUG ET SOUALHIA	4	2.9	1	1.2	5	2.2
GHANZOUR	4	2.9	4	4.7	8	3.6
GOUAAD	1	0.7	1	1.2	2	0.9
KHOUALDIA	3	2.2	2	2.3	5	2.2
HSAINIA	3	2.2	3	3.5	6	2.7
CHRAIFIA	4	2.9	1	1.2	5	2.2
AMMAR	2	1.4	2	2.3	4	1.8
ESSAAFI	4	2.9	5	5.8	9	4.0
FORNA	6	4.3	5	5.8	11	4.9
EL OUENA	3	2.2	2	2.3	5	2.2
BNANA/OULED BENAJEH*2	14	10.1	7	8.1	21	9.3
MKIMEN*2	10	7.2	2	2.3	12	5.3
CHAAIBIA	5	3.6	5	5.8	10	4.4
OUED LAHTAB	5	3.6	2	2.3	7	3.1
O. MASSOUD RIZG	4	2.9	3	3.5	7	3.1
AIN JAFFEL*2	11	7.9	6	7.0	17	7.6
GARD HADID	3	2.2	3	3.5	6	2.7
O. MOUSSA	4	2.9	2	2.3	6	2.7
SLATNIA	6	4.3	1	1.2	7	3.1
ENJAIMIA	5	3.6	7	8.1	12	5.3
SMAIDIA	3	2.2	3	3.5	6	2.7
Total	139	100	86	100	225	100

*1: No woman relay persons having worked as relay person

* The Study Team accepted all the relay persons motivated to collaborate with the interview.

2) Age

The majority of woman relay persons surveyed (approximately 60%) are aged between 20- 39 years and the men aged 40-59 years.

Table No. 2: Distribution of respondents by Age

Ranges	Men (Number)	Men (%)	Women (Number)	Women (%)	Total (Number)	Total (%)
10-19 yrs	0	0.0	1	1.2	1	0.4
20-29 yrs	8	5.8	35	40.7	43	19.1
30-39 yrs	26	18.7	15	17.4	41	18.2
40-49 yrs	34	24.5	20	23.3	54	24.0
50-59 yrs	44	31.7	12	14.0	56	24.9
60-69 yrs	16	11.5	1	1.2	17	7.6
70 yrs -	10	7.2	2	2.3	12	5.3
No answer	1	0.7	0	0.0	1	0.4
Total	139	100	86	100	225	100

3) Status in the family

Table No. 3 : Status in the family

Position	Men (Number)	Men (%)	Women (Number)	Women (%)	Total (Number)	Total (%)
Married	126	90.6	55	64.0	126	87.5
Single	12	8.6	26	30.2	12	8.3
Others	1	0.7	5	5.8	6	4.2
Total	139	100	86	100	144	100

4) Educational background

The educational background of woman relay persons is classified into two levels: illiterate (41.9%) and primary school (39.5%). As for man relay persons, a major part is primary school (41.0%) followed by secondary school (23.7%).

Table No. 4: Educational Background

Educational Background	Men (Number)	Men (%)	Women (Number)	Women (%)	Total (Number)	Total (%)
Illiterate	22	15.8	36	41.9	58	25.8
Koranic	17	12.2	2	2.3	19	8.4
Primary school	57	41.0	34	39.5	91	40.4
Secondary school	33	23.7	13	15.1	46	20.4
University	8	5.8	1	1.2	9	4.0
No answer	2	1.4	0	0.0	2	0.9
Total	139	100	86	100	225	100

5) Occupation

Housewife consists of a major occupation of woman relay persons interviewed. Agriculture represents 47.5% of man respondents followed by labors (23.7%). The economic activities of man respondents are diversified.

Table No. 5: Principal Occupations

Occupation	Men (Number)	Men (%)	Women (Number)	Women (%)	Total (Number)	Total (%)
Housewife	0	0.0	78	90.7	78	34.7
Agriculture	66	47.5	9	10.5	75	33.3
Worker	33	23.7	1	1.2	34	15.1
Breeder	19	13.7	10	11.6	29	12.9
Government official	16	11.5	1	1.2	17	7.6
Merchant	8	5.8	0	0.0	8	3.6
Unemployed	8	5.8	0	0.0	8	3.6
Others (driver, private company, school teacher, retired, etc.)	16	11.5	2	2.3	18	8.0
N (No. of respondents)	139		86		225	

* Multiple responses

6) Number of meetings attended by respondents

The majority of man respondents attended all the three meetings relative to the sensitization (socio-economic survey, the first and the second visit of the sensitization).

Due to the difficulty to find woman relay persons who attended all and the errors observed in the list during the interview survey, the Study Team was obliged to accept relay persons who attended only once. Nevertheless, the majority of women respondents attended twice or three times.

Table No. 6: Number of respondents according to the attendance

Time	Men (Number)	Men (%)	Women (Number)	Women (%)	Total (Number)	Total (%)
Once	2	1.4	11	12.8	13	5.8
Twice	24	17.3	32	37.2	56	24.9
Three times	113	81.3	43	50.0	156	69.3
Total	139	100	86	100	225	100

Appendix 8.4.1 Characteristics of existing system

(1) The “SONEDE Connection” is to connect the projected RWS system to nearby SONEDE water supply system and purchase water under the agreement of SONEDE. The connecting point is under the control of SONEDE. The discharge and minimum residual pressure at the connection point are guaranteed in writing by SONEDE.

It is mandatory for SONDED to supply urban area with safe water and accordingly control the quality of water supplied.

(2) The “GR Extension” is to extend an existing rural water supply system which is developed by the AGR and is managed by GIC. CRDA is the proprietor. Withdrawal of water is made by purchase of water from the existing GIC in case that a new GIC will be created. However, in case that the new project will be fused into the management of the existing GIC, the cost of water will be determined based on the O/M cost of the whole WSS. The sub-project study shall confirm that the capacity of water source satisfies the water demand of the whole system.

(3) “Irrigation system” is similar to “GR Extension”. The system is developed by AGR and managed by Irrigation GIC. The CRDA is the proprietor of it. However the water from the Irrigation system is not disinfected unlike the “GR Extension”. In case of the sub-projects under the Study, the irrigation GIC manages main hydraulic installations such as pumping facilities, distribution tank, etc. The investment cost as well as the fixed costs; management cost, cost for personnel, cost to purchase water, etc. are accordingly quite low.

Appendix 8.4.2 Characteristics of High Density Polyethylene (HDPE) Pipe

The PEHD pipe is preferable for the RWS project comparing with others such as cast-iron pipe, cement-asbestos pipe, etc., as it presents several advantages such as:

(1) The polyethylene product does not contain cancer-causing substances different from the cement-asbestos pipe.
(2) The pipes are easy to handle and to lay down as they are flexible.
(3) The number of connections is less than other kinds of pipe as the pipe is supplied in rolls 100 meters long, while nominal laying lengths of ductile cast iron pipe, for example, are 4 meters, 5 meters and 6 meters.
(4) The material is flexible which makes it possible to absorb shock.
(5) The pipe is much less costly than the cast iron pipe. In fact, the price of one (1) meter cast iron pipe of 100 mm in diameter is about 80 DT while that of PEHD pipe of similar diameter is about 15 DT.
(6) High water tightness due to electro-fusion jointing system.
(7) Smooth pipe inner wall surface reduces friction loss head.

However, the PEHD pipe has the following disadvantages:

(8) PEHD pipe is soft but easy to be damaged. The transportation and handling should consequently be made with great care.
(9) Erosion by some organic solvents such as toluene, benzene, etc..
(10) Deterioration due to gas, kerosene, etc.
(11) Deterioration by the sun (ultraviolet rays)

Appendix 8.4.3 Modified method for distribution system modeling

- This method is established based on the assumption that the standard flow rate of 0.5L/s applied to the communal tap by DGGREE can be the basis of the maximum hourly peak flow rate.
- Namely, it can be considered that the hourly peak factor is given by the following mathematical expression

$$\text{Hourly peak factor} = \frac{\text{Total number of the planned communal taps x 0.5 L/s}}{\text{Average hourly water demand / 3600}}$$

- 50% of time to fill a tank is considered as the time to be used to wash and change the tank, etc.
- Necessary flow rate of each service installation is expressed as following:

  Necessary flow rate = Average hourly water demand x Hourly peak factor x 150%

- However, the flow rate of potence is fixed at 2.0 L/s according to the guidelines of DGGREE
- Flow rate in the distribution pipe is calculated based on the necessary flow of service installations.
- The distribution system should be designed based on the flow rates to each service installations
- Hydraulic simulation under the condition that all the service installations open full follows
- In case the flow rate of service installations got mentioned above is short of the necessary flow, appropriate measures are taken from below:

  * If it is possible, the change of pipeline route should be considered.
  * Increase of the diameter of distribution main can be considered if the future expansion plan is clear
  * Dividing the distribution system into two or more sub-systems according the planned elevation range
  * Sub-distribution tanks or break pressures are considered to supply unfavorable communal taps with water. In most cases, said tank is filled during out of peak period of time.
  * If there is a possibility, the looped network system can be considered
  * Though this method is not applied to the sub-projects under the Study due to practical problem, controlling the excessive flow rate by arranging the service pipe length is the most practical way.

* Installing the pressure reducing valve should be the last resort

- In case the distribution pipe is connected to a tank or a break pressure and it discharges above the water surface, it might cause shortage of flow rate at neighboring service installations due to the pressure drop at the tank inlet, a flow control valve is installed in it.
- The Study Team proposed that as a general rule, the maximum flow rate is limited to 0.9 to 1.0 l/s for communal taps and 2.5 l/s for potences.

Appendix 8.4.4 Mode of pump start/stop control

The automatic pump start/stop control is made:

- On the water level of the tank and the pumping station. (Pilot cable and Radio), or
- By a throttle, for example, float valve, placed in the tank and a relay by the transmission pipeline to the pumping station (Pressure gauge).

1 Control by "Pilot cable"

The control by the pilot cable is based on the fact that the start/stop of the pump depends on the water level in the distribution tank provided that the water level in the tank of the pumping station is enough high to permit suction by the pump.

The control system has a pair of water level sensors for high and low water level in the distribution tank and a control relay in the pump starter panel.

This control mode is the most effective and easiest to operate the pump by a GIC, however, it is confronted with a constraint of electrical signal attenuation which may be used only for distances that are less than 1,500 meters. Beyond this distance between the tank and the pumping station, this control mode is not appropriate and another method should be applied.

2 Control by "Pressure Gauge"

The automatic control of the RWS pumping system is made by the "Pressure gauge" control system. This system requires two main devices:

- float valve which is installed in the inlet pipe of the distribution tank. It close the inlet pipe when the tank is filled up and thus arrange the operation point of the pump.
- a pressure gauge with electrical contacts which will be installed in the discharge pipe of the pumping station.

Operational principle is as follows:

- by making the electric circuit live under automatic setting, the pump set starts at once whatever is the water level in the tank. A timer must be installed in the control circuit to make the contacts of the pressure gauge out of work during the starting period of the electric pump set in order to avoid the stop of the pump, if the pressure surge due to the water hammer exceeds the value of the preset pressure to stop the pump.
- to stop the electric pump must be controlled by the signal from the pressure gauge with electrical contacts, which are under the arrangement of the pump operation point according to the water level in the distribution tank. When the tank is filled up, the float valve close the inlet pipe and then the friction loss head of the distribution

pipeline increases. The pressure to stop the pump is settled at the total pump head plus a friction loss head which is estimated from 0.3 to 0.6 bars at the maximum.

- The automatic restart must take place after passing fixed period time by setting the second timer which is adjustable between 0 and 120 hours.
- It is obvious that the time adjustment must change according to the water demand which depends on the seasons. Moreover, in order to avoid the pump starting when the distribution tank is full, for example, in the night with no consumption, it is necessary to install other adjustable timer in the pump starter panel so as not to start the pump during the specific period time in a day.

It should be underlined that this control mode is applied to the pumping system of which distance between the distribution tank and the pumping station is up to around 3000m. This control mode depends on the reliability of installed devices such as the float valve and the pressure gauge. Though float valves are available on the market, they are not effective and require daily maintenance by GICs. Certain CRDAs recommend using more reliable "Compensated type float valve" or "Hydrobloc" which is the valve with hydraulic serve-mechanism possible to control valve opening when control of operation is necessary. These devices are more expensive than the simple float valve but are much more efficient.

3 Control by "Radio"

This control mode is appropriate for the distance between the pumping station and the distribution tank longer than 3 km, but it requires maintenance and management which necessitates certain technical skill difficult for GIC to assure.

The operating principle is based on the control of the water level in the distribution tank and the pumping station exactly as the control by a pilot line. The only difference is that the latter uses information transmission by electrical cable while the radio control uses the diffusion of waves to transmit messages on full or empty state of the tank.

The power supply from the STEG network is necessary for the devices such as water level sensor, signal transmitter, etc. in the distribution tank facilities. It impose heavy cost burden to sub-projects, especially those located far from the STEG line.

Moreover, the devices and materials for the "Radio" system should be authorized by the relevant ministries, especially the Ministry of Interior and Rural Development and the Ministry of Technology of Communication and Transportation, for the setting and the use of frequency range applied to the system. It is also shall conform to the standards in force in Tunisia. These constraints may delay the construction works especially small contractors with no great experience in this field.

For all these reasons, this control mode is seldom used in the RWS projects.

Appendix 8.4.5 Manual for OM/M

1 Manual for Pump Operator

1.1 Introduction

This manual is prepared for the pump operator of the water supply system, which is managed by GIC, under the rural water supply project. The operator can fulfill his assignment, which is especially to operate pumping station everyday, by using this manual and can achieve required target.

1.2 Tasks assigned to the pump operator of the water supply system

The pump operator of the water supply system has to fulfill following duties under the administration of the president of GIC board of trustees:

a) Securing enough quantity of water that users demand
b) Management and maintenance of hydraulic equipment, measuring devices, system protection installation, etc.
c) Management and maintenance of pipe network with ancillary facilities
d) Disinfection facilities using Javel water
e) Keeping the pumping station management book and recording the daily operation.
f) Keeping devices, tools and documents in the pumping station
g) Guarding the pumping station and hydraulic equipment
h) Reporting to the President of GIC on the technical conditions of equipment, apparatuses and devices of water supply system

1.2.1 Securing enough quantity of water that users demand

The pump operator should prepare a daily operation program under the assistance of trustees of GIC and the CRDA service division for GIC to secure enough quantity of water that users demand. The pump operator decides the operating times of a pump and service points based on the needs of beneficiaries.

1.2.2 Management and maintenance of hydraulic equipment, measuring devices, system protection installation, etc.

It is necessary to operate the equipment, apparatuses and devices in the water supply system considering the characteristics of them to prevent from taking place troubles which may cause leakage and/or suspension of water supply and to maintain them good conditions.

The working activities on the management and maintenance of them differ by the type of

energy supply i.e. electric energy (STEG power supply system) or thermal energy (Diesel generator) to the pumping station.

(1) The management and maintenance of equipment, apparatuses and devices of the thermal energy supplied pumping station

The working activities on the management and maintenance of the pumping station are divided into following two categories:

- Daily management and maintenance
- Periodical management and maintenance

1) Daily management and maintenance

The working activities of daily management and maintenance of the said station are executed before, during and after the equipment operation.

i) Before starting the equipment operation

The items assigned to the pump operator before starting the equipment operation are as follows:

a) Opening the windows of the pumping station and cleaning the outside of an engine and a motor pump room.
b) Checking oil level of the engine
c) Checking stretching degree of engine belt
d) Checking water level of battery
e) Checking water level of pressure regulating tank
f) Checking Javel water level in a tank
g) Measuring hydraulic pressure
h) Recording the starting time of pump operation

ii) During the equipment operation

The items assigned to the pump operator during the equipment operation are as follows:

a) Vibration, noise, color of exhaust gas and oil leakage
b) Indication of various signal lamps on a pump starter panel
c) Dynamic water level of a well
d) Working conditions of the system protection equipment and measuring devices
e) Working conditions of a water meter.
f) Working conditions of Javel injection point

iii) After the equipment operation:

a) Recording a pumpage
b) Consumed fuel and injected Javel volumes
c) Recording putting gas in the engine
d) Checking remainder of fuel tank, Javel water tank, lubricant tank

2) Periodical inspection

The main working activities for periodical inspection to the thermal energy supplied pumping station are as follows:

a) Changing engine oil in every 120 hours operation
b) Changing a oil filter in every 240 hours operation
c) Cleaning an air filter, whenever it necessitates
d) Changing a belt in every 500 hours operation
e) Checking system protection equipment once a week (exhausting, tank, pressure regulating, etc.)

(2) The management and maintenance of equipment, apparatuses and devices of the electric energy supplied pumping station

In case of an electric energy supplied pumping station, the pump operator should execute following assignment:

1) Before starting the equipment operation

a) Confirming the electric current by turning on a lamp of the pumping station
b) Measuring receiving voltage
c) Measuring internal pressure of a transmission pipe
d) Recording the starting time of the pump operation in the pump operation book

2) During the equipment operation

a) Measuring the receiving voltage
b) Measuring the receiving electric current
c) Confirming lighting of the pumping station
d) Inspection of working conditions on hydraulic equipment
e) Inspection of working conditions on measuring devices
f) Inspection of working conditions on water meter and measuring transmission discharge

3) After the equipment operation

a) Inspecting the function of indicators
b) Inspection of hydraulic equipment function
c) Measuring the internal pressure of the transmission pipeline
d) Recording the stopping time of the pumping station operation and reading electrical meters

1.2.3 Management and maintenance of pipe network with ancillary facilities

Since pipeline network is the basic component of the water supply system, it necessitates periodical management and maintenance. The working activities on the management and maintenance of the pipeline network are as follows:

a) Inspection of pipe conditions and pits of air valves, wash outs and partition works. Confirming inexistence of water in a chamber of them.
b) Inspection of air valves and other valves
c) Inspection of a reservoir with ancillary facilities and cleaning it at least two time in a year.
d) Inspection of service points regarding installation conditions, tap and water meter and confirming inexistence of water around them.
e) Measuring water volume taken by users with water meters at service points such as communal taps and potences and a tank.

1.2.4 Disinfection facilities using Javel water (hypochlorite)

The pump operator of the water supply system shall disinfect water continuously and periodically according to the regulation defined by a district public hygiene service.

(1) In case that disinfection facilities are installed in a pumping station, the pump operator of the water supply system should execute following matters:

a) Control of disinfection facilities operation
b) Control of the hypochlorite concentration of Javel water which shall meet the characteristics of the water supply system.
c) Keeping Javel water in the shade with less moisture

(2) In case that disinfection facilities are not installed in the pumping station, the pump operator of the water supply system should execute following matters:

a) The pump operator should pour 12 degree concentration Javel water with ratio of water: $10m^3$ to Javel water: 1 liter to a tank.

b) Distribution of water shall be started 30 minutes after pouring Javel water into the tank to secure the effectiveness of hypochlorite (Javel water).

c) The pump operator should measure the concentration of hypochlorite (Javel Water) at service points by using colorimeter.

1.2.5 Keeping the pumping station management book and recording the daily operation.

Keeping the operation, management and maintenance book of the water supply system enable GIC to maintain and operate it by recording clearly and periodically technical information on the pumping station operation.

The pump operator should record following information on the pump working in the book:

a) Date
b) Starting time
c) Stopping time
d) Total working hours
e) Reading kilowatt meter and measuring diesel oil consumed
f) Reading water meter
g) Measuring Javel water consumed
h) Working activities of periodical maintenance and spare parts used
i) Repairs executed by GIC, CRDA or private
j) Causes of troubles and their duration

1.2.6 Keeping devices, tools and documents in the pumping station

It is necessary that devices, tools and documents, which is utilized by the pump operator of the water supply system everyday and/or when necessary, should be kept in the pumping station. These are as follows:

a) Tool box and grease
b) Operation and management books of the water supply system
c) Tables and charts regarding data on the water supply system: Scheme of the water supply system, description sheet on equipments.
d) Guidelines on the operation and maintenance of equipment, apparatuses and devices of the pumping station. (the motor, the pump, the starter panel, the system protection installation, the measuring devices)

It is recommended to keep these devices, tools and documents with their list in a locked cabinet.

1.2.7 Guarding the pumping station and hydraulic equipment

Guarding the water supply system (the pumping station, the tank, the pipeline and service points) and all the equipment and protecting them from all damages are one of the most important roles of the pump operator.

The pump operator, therefore, should patrol in the area of the water supply system day and night and inspect all the equipment, apparatuses and devices of the system. The pump operator should lock buildings and structures.

Devices which are most apt to have damages are taps, potences, partition works, air valves and washouts. When troubles and/or damages of equipment, apparatuses and devices are taken place, the pump operator should inform the president of GIC trustees board about the case. The president can take necessary measures, accordingly.

1.2.8 Reporting to the President of GIC on the technical conditions of equipment, apparatuses and devices of water supply system

The pump operator should inform the president of GIC board of trustees or representative of GIC about all the working activities and/or other necessary matters on the water supply system smoothly and regularly. These are as follows:

a) Abnormal change technically recognized on the function characteristics of the equipment, apparatuses and devices (Excessive energy consumption, pressure depression, abnormal temperature of working pump, etc.).
b) Supplies which the pump station necessitates for operation and maintenance (diesel oil, spare parts, Jabel water, lubricant, etc.)
c) Recorded troubles and used spare parts
d) Minutes on the visits by member of GIC service division, a maintenance team and a member of district public hygiene service.

2 Tasks of the Technical Director (or Management Agent)

The agent is committed to carry out the following missions:

1. Establishing the programme of pumping, water distribution and employing necessary personnel for the GIC
2. Implementing the decisions of the Board of Directors and GIC activities
3. Keeping the administrative, financial and technical documents of the GIC
4. Preparing and holding the general assemblies and the periodic meetings of the Board of Directors and the formalisation of minutes of meeting
5. Solving the problems of the GIC
6. Supervising and following-up the activities of the employees of the GIC and encouraging them in good execution, controlling the condition of the equipment and protecting the environment around the hydraulic facilities
7. Representing the GIC and contacting the public and private organizations
8. Evaluating GIC activities
9. Preparing the annual budget of the GIC and updating the list of the GIC members
10. Collecting the money received by tap keepers and providing the users with receipts and executing the expenditure authorised by the Board of Directors
11. Recording the operations of revenues and expenses in the accounting book and keeping the documentary evidences of revenues and expenses
12. Following-up GIC financial situation through the periodical preparation of the statement on the GIC financial situation and submitting a report concerned to the Board of Directors of the GIC
13. Presenting GIC accounts and all the documentary evidences to the request of the fiscal receivers
14. Informing and sensitising the users about GIC activities, their rights and duties, the necessity to preserve GIC property, the importance of paying the charges and the principal decisions of the Board of Directors of the GIC
15. Keeping and updating the following administrative, financial and technical documents:

- a copy of the file of GIC establishment
- the list of GIC members
- the register of minutes of meeting of the general assembly and meetings of the Board of Directors
- copies of laws and decrees relating to the GIC
- copies of the contracts concluded by the GIC
- a copy of the authorisation to open a bank or postal account
- documents on correspondence
- the inventory of GIC property
- the register of visits
- the budget file
- the register of membership fees and monthly family flat rates
- a book of receipts
- a book of inventory
- a bank or postal note
- documentary evidences of the revenues and expenses
- membership cards
- all the technical documents transferred by the administration
- a copy of the physicochemical analysis
- a book of the follow-up of the pumping station operation
- all the other necessary documents that are used by the GIC for the follow-up of water distribution.

16. Respecting all the closes of the law concerning the status of GIC (Statutes Type), the internal regulations and manuals of procedures relating to the administrative and financial management of the GIC.

It should be noted that these tasks represent all the tasks of the GIC and they can vary from a GIC to another and from one agent to another following the contract established between the two parties. For example, for an agent who is recruited to take care of two or three GICs, at the same time, his missions can be centred only on the financial part and accounts.

3 Tasks of the BF operator

3.1 Introduction

This instruction manual is prepared for the keeper of one or more water supply points in a drinking water supply system, exploited by the GIC, within the framework of rural drinking water supply projects. By making good use of the following manual, the BF operator can accomplish his tasks under the best conditions, in order to assure the good functioning of the water supply points (Public tap or Potence), and to be able to reach the expected objectives.

3.2 Tasks of the keeper of a water point in a drinking water supply system

The keeper has to fulfill the following obligations, under the responsibility of the President of the Management Committee of the GIC:

a) Provide the quantity of water necessary for the consumers;
b) Check and look after the hydraulic equipments, the protection and measurement devices that exist at the water supply point(s);
c) Check and look after the water supply facility;
d) Watch over the good use of the water supply point(s) by the beneficiaries;
e) Keep the credit notebooks of the credit sales;
f) Watch over the hydraulic equipments of the civil engineering works and of the water supply point(s);
g) Take samples for water analysis and coordinate with the person responsible for this service (the President of the Management Committee of the GIC or another person appointed by the GIC to coordinate with the hygiene service);
h) Inform the President of the GIC about the technical situation of the equipments, the conditions of functioning of the water supply points (output and pressure), and any other detected problem.
i) Execution of small repairs.

3.2.1 Assure the quantity of water necessary for the beneficiaries

In order to provide the beneficiaries with the necessary quantity of water, the BF keeper, and after consultation with the members of the management committee, with the GIC cell of the CRDA, and with the other operators of the drinking water supply system (pump keeper, network keeper and project leader), fixes the opening hours of the water supply point, according to the needs of the population. The choice of the opening time must comply with the needs of the beneficiary population, and which may be varying according to the seasons.

3.2.2 Control and maintenance of the hydraulic equipments, the protection and measurement devices existing at the water supply points

It is necessary to operate the equipments and the devices of the drinking water supply system, taking into consideration their characteristics in order to predict any problem, trouble or any other thing that may cause losses or/and cuts of water, and in order to keep these equipments in a good condition.

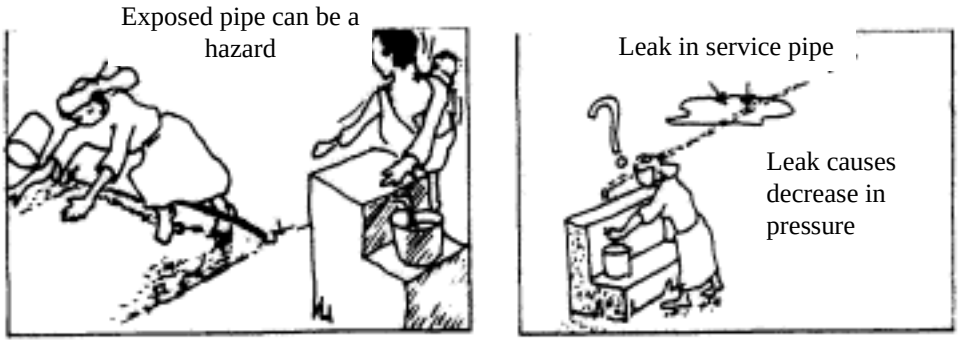
The operations of checking and maintenance of such equipments and devices can be divided up into two categories:

- Daily checking and maintenance
- Periodical checking and maintenance

(1) Daily checking and maintenance

Some checking and maintenance operations have to be carried out daily. These operations are considered as a preventive maintenance which consists in the verification and the regular revision of the parts, in order to reduce the risks of break up as well as to extend the resistance of the different components. The following preventive maintenance measures are recommended:

- Supply pipeline: Water is supplied from the distribution mains towards the distribution point by means of a feeding pipeline. Between these two networks, there are couplings and joints (saddle, flange collar, electro-fusion sleeve, etc…) that may cause water leakage. Therefore, the BF operator has to watch over the checking of the losses by making a journey there and back, from the water supply point to the feeding mains. A leakage may cause two major problems:
  - · Water losses resulting from the muddy, unwholesome water puddles around the pipe and the water supply point
  - · A decrease in the pressure of water in the tap, and which requires more time for the recipients to be filled
- A regular checking of the supply pipeline may prevent these slight water losses to become serious ones, once detected in time.
- Moreover, the coverage of the pipe has to be inspected on a regular basis. Every apparent part of the pipe has to be buried under the earth. A pipe put next to a water supply point may be dangerous for the consumers (see figure above):



- Check the functioning of the water meter: The statements of the water meter have to be compared from time to time in order to detect any abnormal variation. The BF keeper has to inform the President of the Management Committee of the GIC or the network keeper or anyone designated by the GIC, when there is any doubt concerning the precision of the statements.

  Visual inspection of the flow of water (output and pressure): A visual inspection may attract the attention of the BF operator to the problems that may occur on the main network. A fall in pressure may be caused by a breakage or a blockage at the level of the supply pipeline. If such a fall is observed and if it persists, the BF keeper has to inform the President of the Management Committee of the GIC or the network keeper or anyone designated by the GIC.

(2) Periodical maintenance:

The main periodical maintenance operations of a water supply point are:

- Checking and cleaning of the fixed grid
- Cleaning of the facility for the draining of the used waters
- Maintenance of the tap of a water supply point

In order to proceed to the maintenance of the public tap, the keeper has to follow these operations:

a) Close the stopcock to proceed to the maintenance
b) Use a key to dismantle the crown of the valve
c) Dismantle the valve's crown and the joint
d) Replace the joint
e) Tighten the valve's crown with a key

3.2.3 Control and maintenance of the water supply facilities

The operation of checking and maintenance is very important and it is defined by:

a) the checking of the facility's condition : whitewash, earthware, tiles, etc…
b) the checking of the fixed grid and the removable grid
c) the checking of the drainage pipeline and the outlet protection
d) the inspection of the facility's surroundings and the checking of the existence of stagnant water.

3.2.4 Watching over the good usage of the water supply points by the beneficiaries

Apart from his tasks of keeping, the BF operator has to watch over the good exploitation of the water supply point, and has to encourage the beneficiaries in order to adopt good habits for the manipulation of water according to the following aspects:

(3) Collection of water:

The following aspects have to be respected in the collection of water:

a) Wash the hands before collecting water: Users should be encouraged to wash their hands before collecting water.
b) Use clean containers: The containers have to be washed before the collection of water. The washing has to be done on the concrete surface (protection area) and the water of washing should go to the drain sump in order to avoid the contamination of the place and the formation of mud around the water supply point.
c) Use of covers for the containers: Incite the users to close the containers just after their filling in order to avoid the contamination of water by the dust and the insects, especially during the carriage.

(4) Use of the water supply points:

a) Closing of the public taps: The BF operator has to incite users to close the taps at the end of every use to avoid the losses of water.
b) Abstention to hang up the buckets: The BF keeper has to prevent the users from hanging up the buckets on the taps during the collection of water. Such practice would weaken the tap and use up the joints, and consequently, damage the public tap.
c) Interdiction of drinking directly from the tap: Drinking directly from the tap has to be forbidden. It is better to drink at 10 – 15 cm far from the tap using hands, or simply to use a clean glass.

3.2.5 Keeping the notebooks for the credit sales:

The BF operator has to keep the credit notebook for the credit sales. This notebook should be prepared in the simplest way, given that the BF operators may not have an

educational level. This notebook can include the following data:

- Name of the beneficiary
- Quantity of water bought on credit

It is not necessary to register on this notebook the quantities of water paid for in cash.

3.2.6 Control of the hydraulic equipments in the civil works for water supply

The keeper has to watch over the equipments as well as the facility itself. He has to make sure that these facilities are not damaged by children or by thieves. The BF keeper should sensitize the users, to make them responsible for the safety of their own water supply points. For this purpose, it is advised not to install these points far from the localities.

3.2.7 Taking samples for water analysis and coordinating with the responsible staff (the President of the GIC or another person appointed by the GIC who coordinates with the hygiene service)

Every BF operator has to be trained in sample taking in order to facilitate the task of the person in charge of the follow up of water quality. For this purpose, the BF operator should know the method of sample taking, the mode of keeping of the samples and all other operations necessary for the reliability of the analysis results. The frequency of sample taking will be set by the staff in charge of this action (the President of the GIC or another person appointed by the GIC to coordinate with the hygiene service).

3.2.8 Inform the President of the GIC of the condition of the water supply system; the function of the service installations (discharge and pressure) and all the observed problems

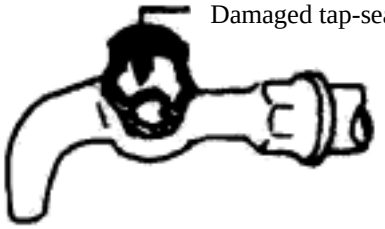
The BF operator has to inform the president of the GIC or his representative about the technical conditions of the equipments, the functioning conditions of the water supply points (Outflow and pressure) and any other recurrent problem such as acts of violence, breakage of pipes, fall of pressure, etc…

3.2.9 Execution of small repairs

In this section, we will take into consideration only the small repairs in relation to the water supply points and to the supply pipeline, given that they are under the responsibility of the BF operator. However, the beneficiaries should be encouraged to assist the GIC when it comes to other repairs, and for which they may be responsible.

(1) Taps:

The taps necessitate the biggest attention. It is preferable to try to mend the taps before they become seriously damaged or to replace them.

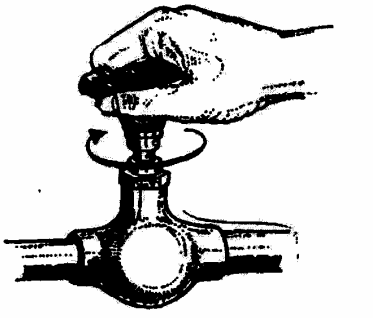

Damaged tap-seat

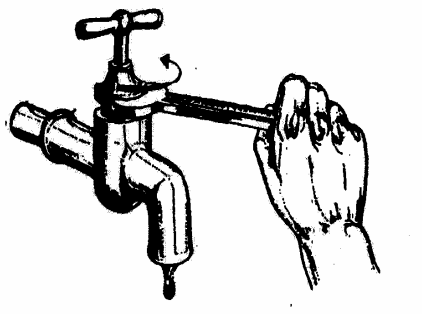
*Check the seat of a tap when it is dismantled. If it is smooth and shiny, without any grooves or ridges, then the tap can be reassembled. If the seat shows signs of wear or damage, it will have to be re-cut.

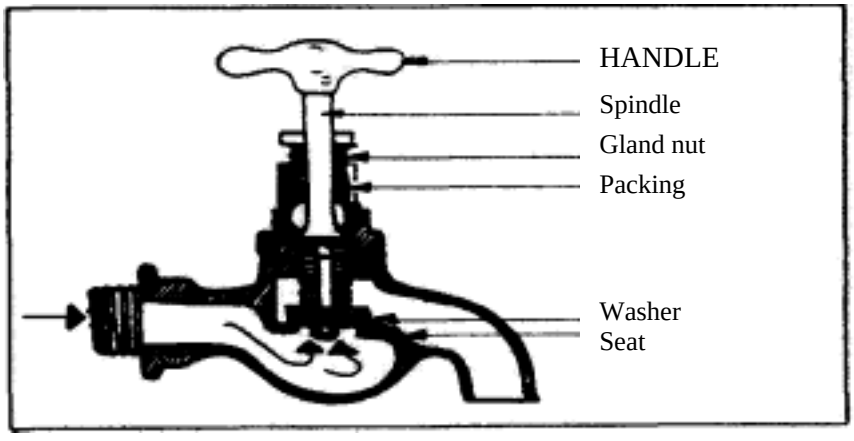
Tap washer replacement:

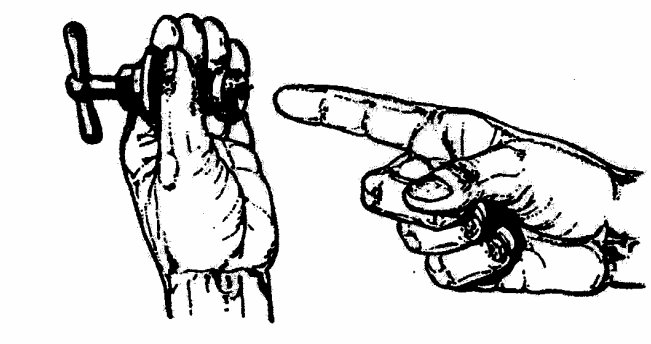
A spanner and a spare washer are needed for the replacement of a worn out washer. The figures show the parts of a screw-down tap and how to replace a tap washer. The spare washer should be made of vulcanised rubber, leather or plastic (neoprene).

Ordinary rubber should not be used, as it is not hard enough.

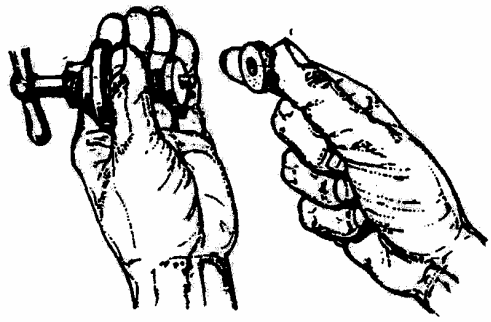

Turn off the valve of the Service valve


Unscrew the tap





Remove worn washer

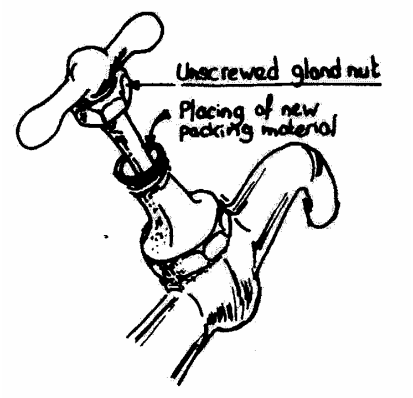


Replace washer

Leaking gland:

Water leaking from the gland around the spindle of a tap or valve is caused by worn-out packing. The gland packing can be tightened by carefully screwing down the gland nut just enough to stop the leak, no more. However, as the packing gets older, there will come a time when the gland nut cannot be tightened any further and the packing will need to be replaced.

The replacement of the packing is a simple procedure as follows:

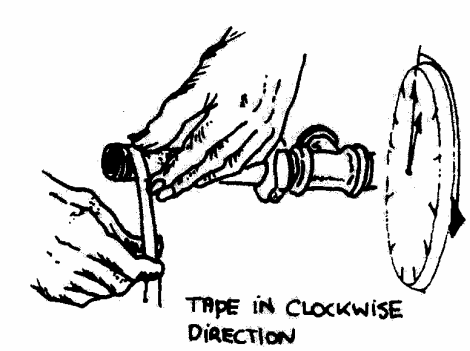


- Unscrew the gland nut
- Remove the old packing and clean around the spindle
- Place new packing material
- Screw back the gland nut
- Slowly tighten the gland nut until there are no leaks past the gland.

Some taps have an O-ring seal instead of a gland packing. In this case, if there is a leak past the spindle, the rubber O-ring must be replaced.

Fitting a new tap:

The threads of the pipe need to be cleaned with a steel brush to remove any rust and remaining old jointing compound.



To join a new tap, either flax or hemp with a jointing compound or a white plastic tape known as PTFE is used. The flax, hemp or tape should be wrapped around the thread in a clockwise direction. The tap should be screwed on

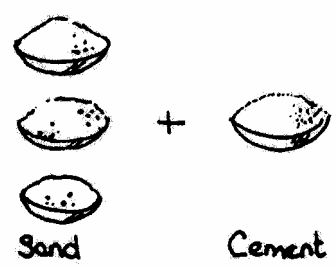
tightly but care should be taken to hold the pipe with a wrench and not to rely on the concrete to hold the pipe steady or the concrete may break.

It may be not possible to repair a tap and then it will be necessary to change it completely. The dismantling of the tap from the connecting pipe has to be done carefully so as not to damage the pipe threads or bend the pipe.

(2) Service installation:

Stand posts, platforms and drain channels may develop cracks in the concrete:

Cracks in concrete structures should be repaired with cement mortar which consists of a mix of 3 parts of sand and 1 part of cement by volume. Only enough water should be added to make the mixture workable. Too much water weakens the mortar.

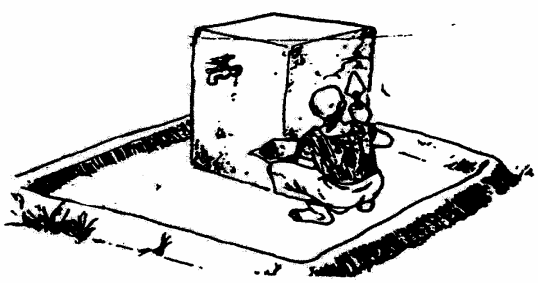


▪**Cleaning:**

All loose material should be removed from the crack and the crack area cleaned, as far as possible, so that the new mortar can bind onto a clean, solid surface.

▪**Water:**

The old concrete should be splashed with water around the repair site so that the mortar will not dry out too fast.

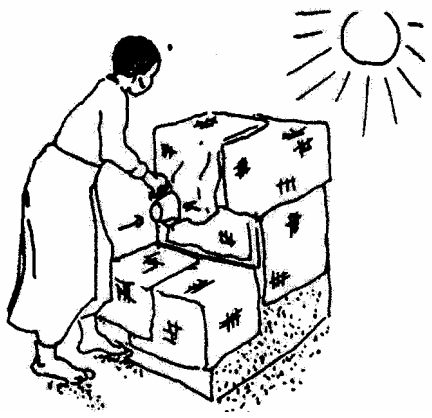


▪**Fresh mortar:**

The fresh mortar can be applied with a mason's trowel and smoothed with a flat wooden board, called a float.

▪***Important: Not Drying Out**

It is important that the repair is not allowed to dry out too fast. This is because the cement mortar needs water to gain strength and this can take a few days. If the repair dries very quickly in the sun, it will soon crack again and the effort will have been wasted. Therefore, the repair should be kept wet for a few days by splashing water on it from time to time and then covered with old cement bags, sand or large leaves until strong.



4 Manual for Treasurer of GIC

4.1 Introduction

The objectives of this manual are to define the financial management concept of GIC under the framework of the national strategy execution on the creation of GIC and its follow up. This manual aims to give further independency to GIC and then to make its activities more flexible.

4.2 Tasks assigned to the treasurer of GIC

Treasurer shall be authorized by the president of GIC board of trustees and shall fulfill following his assignment:

4.2.1 Annual budgeting of GIC

According to the article 11, new decree No. 2160 in 1992 dated December 14, 1992, the treasurer of GIC is supposed to be responsible the budgeting of GIC. The budget prepared by the treasurer should be approved by the bard of trustees and then should be approved by the governor of the region who is qualified as the president of GIH (Group Related to Water-use) and is responsible to sound management of the whole GICs of the region. The beneficiaries of GIC should be informed the content of the said budget to follow their financial commitment to GIC.

It is necessary to estimate annual expenditure through an estimated annual water supply for the annual budgeting. Then, annual revenue should be estimated based on the number of GIC members, contribution from them, water sales and income from minor services.

- **The treasurer shall take responsibilities to bring up the draft budget to the GIC board of trustees and the governor for approval.**

4.2.2 Preparation of GIC members list

The treasurer should make a list of all beneficially family members in cooperation with local authorities such as Omdas, the president of GIC, a pump operator of GIC, etc. The treasurer should determine a contribution amount based on the consumption per each family. Then, he brings up the list including the contribution amounts to the GIC board and then the governor. It comes into effect due according to the article 14 of decree No.1261 in 1987 dated October 27, 1987.

The treasurer issues a membership card for each beneficiary family. This membership card assures each family to have the services from GIC and to contribute the decision process by electing trustees of GIC board.

- **The treasurer has the responsibility to bring the beneficiary list, which should be prepared by the treasurer, up the governor for the approval.**
- **Becoming a member of the GIC assure the right of the beneficiary.**

4.2.3 Registering income and issuing a receipt

The treasurer as the entrusted person by the GIC board has the responsibility to levy the admission fee and the membership fee of a member.

In return, the treasurer should issue the receipt based on the cashbook approved by the service division for GIC in CRDA or a tax office. The treasurer and the president of the GIC board of trustees should make the signature and clearly write received amount of water charge for which a beneficiary pay or fixed membership fee to all the receipts. The treasurer should issue the receipt for the advanced payment of the necessary amount. The treasurer should issue the receipt after the registration of received amount in the cashbook for an easy administrative work and the reinforcement of the confidence between all the members of GIC and the trustees of GIC board.

It is possible for the treasurer to entrust someone to collect the admission fee and water charge at a service point under his responsibility and administration.

- **The treasurer should always issue the receipt for an actual income even a partial payment.**
- **The treasurer should not issue any receipt without any income.**
- **The treasurer and the president of the GIC board of the trustees should make signature to all the receipt.**

4.2.4 Payment of authorized amount by the GIC board of the trustees

The treasurer should get the approve to all the payment based on the regulation which came into effect according to the new article No22 of decree No 2160 in 1992 dated 14 December, 1992.

Notwithstanding an amount, the treasurer should register all the expenditures with number and date in the book in which the president of the GIC board of trustee as the representative of the board signed. It represents the approval of the payment.

- **The treasurer can not make any expenditures without the authorization by the president of the GIC board of trustees.**

4.2.5 Registration of income and expenditure in the book

The treasurer should register income and expenditure in the cashbook and a current book. The account books should be numbered and stamped by a delegation or a tax office or governorate or CRDA. This procedure can be made in a district court of a municipal office.

4.2.6 Keeping the receipts of income and expenditure

The treasurer should keep all the receipts of income and expenditure after the registration of them with numbering in the account books.

- **The account books of GIC should be numbered and stamped by a delegation or a tax office or governorate or CRDA or a district court.**
- **The treasurer should keep all the receipts of income and expenditure after the registration of them with numbering in the account books.**

4.2.7 Preparation of a GIC financial statement

The treasurer should prepare a GIC financial report based on the registered incomes and expenditures in the account book at the end of every fiscal year.

The GIC board of trustees approves the report and then it is presented to a GIC ordinary general meeting which is to be hold at least one time in a year. Furthermore, it is circularized to the governor as the head of GIH (Group Related to Water-use) and Regional Taxation Bureau for auditing.

- **The financial report of GIC should be prepared every year and it should be approved at the GIC board of trustees and then the GIC general meeting.**

4.2.8 Presenting the financial report to the board of trustees and the GIC general meeting.

The treasurer should prepare a yearly financial report of GIC based on the registered contents in the account books and present it to the GIC board of trustees and then the GIC general meeting which is to be held at least one time in a year for approval. Special consideration should be given that any member has the right to inspect this report during preceding eight (8) days to the GIC general meeting.

- **Any member of GIC has the right to inspect the GIC financial report in preceding eight (8) days to the GIC general meeting.**

4.2.9 Submission of the GIC financial report with all corroborative data to a Regional Taxation Bureau or the concerned department of the Ministry of Finance.

GIC should be audited by the Regional Taxation Bureau or the concerned department of the Ministry of Finance according to the materials to which the treasurer submitts. The treasurer, therefore, has the duty to submit the GIC financial report with corroborative data in response to the requirement of a Regional Taxation Bureau.

- **The treasurer should submit the GIC financial report with corroborative data to the Regional Taxation Bureau or the concerned department of the Ministry of Finance for approval. It is to be done in response to the requirement of the authorities.**

Appendix 8.6.1 Stability analysis of the elevated tank

1.1 Stability analysis of foundation ground

Following conditions shall be examined in order to confirm the stability of the foundation ground for the elevated tank

$q \leq qa$

q : Stress of foundation ground

qa : Bearing capacity of foundation ground

1.1.1 Computation of the bearing capacity of foundation ground (qa)

Following Terzaghi's formulas are applied to calculate the bearing capacity of the foundation ground.

(1) Bearing capacity on the long term basis (ordinary conditions)

$$qa = \frac{1}{3}(\alpha \cdot C \cdot Nc + \beta \cdot \gamma 1 \cdot B \cdot N_{\gamma} + \gamma 2 \cdot Df \cdot Nq) : (tf / m^2)$$

(2) Bearing capacity on the short term basis (during earthquake or scirocco)

$$qa = \frac{2}{3}(\alpha \cdot C \cdot Nc + \beta \cdot \gamma 1 \cdot B \cdot N_{\gamma} + \frac{1}{2}\gamma 2 \cdot Df \cdot Nq) : (tf / m^2)$$

Where,

qa : Bering capacity per square meter (tf/m^2)

c : Soil cohesion (tf/m^2)

Nc,Nγ,Nq : Non-dimensional factor for the bearing capacity (refer to Table 1)

γ1 : Unit weight of soil under the foundation (tf/m^3)

γ2 : Unit weight of soil from ground surface to foundation bottom (tf/m^3) (When the groundwater level is higher than foundation, buoyancy should be reduced from the unit weight of γ1 and γ2)

α,β : Coefficient of cohesion related to the foundation type (refer to table 2)

B : Width of foundation (m)

Df : Depth of foundation (m)

Table 1 Non-dimensional factors for the bearing capacity

φ (°)	Nc	Nγ	Nq
0	5.3	0	3.0
5	5.3	0	3.4
10	5.3	0	3.9
15	6.5	1.2	4.7
20	7.9	2.0	5.9
25	9.9	3.3	7.6
28	11.4	4.4	9.1
30	15.5	6.5	12.0
32	20.9	11.0	16.1
34	30.0	19.0	24.0
36	42.2	31.0	33.6
38	68.0	58.0	55.0
40 以上	95.7	114.0	83.2

φ: Internal friction angle

Table 2 Coefficient of cohesion related to the foundation type

Type of foundation	Sequence	Square	Rectangular	Circle
α	1.0	1.3	1.0+0.3 (B/L)	1.3
β	0.5	0.4	0.5-0.1 (B/L)	0.3

It is preferable to obtain the cohesion (c) and internal friction angle (φ) of foundation soil by direct shear test or triaxial compression test and so on. However, it is difficult to take undisturbed soil sample from the foundation ground for tests mentioned above. In such case, above two values can be estimated by following formulas through "N-value" got from the standard penetration test (SPT) of the geotechnical survey:

(a) Sand layer: $\varphi=\sqrt{(20N)}+15$ (°)

where, N: N-value

(b) Clay layer: C=qu/2

where, qu: Strength of unconfined compression (tf/m^2)

qu = 1.25N

therefore, C = 1.25N/2 = 0.625N (in this case φ is assumed as 0)

1.1.2 Computation of the stress of foundation ground (q)

Stress of foundation ground (q) by the elevated tank can be calculated by formula below:

$$q = \frac{\Sigma V}{B}\left(1 \pm \frac{6 \cdot e}{B}\right)$$

e : Eccentric distance(m)

$$e = \left| \frac{\Sigma M}{\Sigma V} - \frac{B}{2} \right|$$

q : Compression stress at the both sides of foundation (tf/m^2)

M : Turning moment at the toe of foundation (tfm/m) caused by both vertical and horizontal load

B : Width of foundation (m)

V : Vertical load (tf/m)

(1) Wind load

The wind load is usually considered as horizontal load for the stability analysis of the elevated tank. It is obtained from following formula:

$Pw = Cd*0.5*Pa*V^2$

Pw : Wind load (N/m^2)

Cd : Coefficient of wind power– 1.20

Pa : Air density (kg/m^3) – 1.23

V : Wind velocity (m/s) – 50 (m/s) refer to table 3

The table below shows the maximum wind velocity in each governorate. The maximum value of 50 m/s in the table is applied to the safety analysis in this report.

Table 3 Wind Velocity

Govnernorate	Period	km/h	m/s
Jendouba	1974-2003	115	31.94
Kairouan	1974-2003	137	38.06
Gafsa	1974-2003	101	28.06
Sfax	1974-2003	108	30.00
Sidi-Bouzid	1978-2003	108	30.00
Siliana	1980-2003	122	33.89
Nabeul	1981-2003	122	33.89
Beja	1986-2003	104	28.89
Le-Kef	1990-2003	112	31.11
Kasserine	1998-2003	**180**	**50.00**
Mahadia	2002-3003	86	23.89

Source: National Institute of Meteorology

1.2 Result of the stability analysis

The result of stability analysis is summarized in the table below followed by the example of the analysis of three types of the elevated tank:

Table 4 Result of calculation

Governorate	Sub-project	Height and Capacity of the tank	Layer*	Load		Stress of foundation ground q (tf/m^2)	Bearing Capacity qa (tf/m^2)	Judg-ment
				Vertical (tf)	Horizontal (tf)			
Nabeul	El Bassatine	H12m*50m^3	Sand	90.4	2.9	37.9	159.4	OK
	Bir Ben Zahra	H15m*25m^3	Sand	74.0	1.9	30.2	159.4	OK
Sousse	Ouled El Fellah	H12m*25m^3	Sand	66.7	1.9	26.2	159.4	OK
	Chraifia	H15m*50m^3	Clay	86.9	2.9	40.3	73.7	OK
Kairouan	Ouled Abbes	H15m*50m^3	Sand	86.9	2.9	40.3	159.4	OK
	Ouled Boudabbous	H15m*25m^3	Sand	74.0	1.9	30.2	159.4	OK
Mahdia	Ouled Ammar	H20m*50m^3	Clay	520.8	28.8	110.0	250.8	OK
Le Kef	Forna	H15m*25m^3	Silt	74.0	1.9	30.2	73.7	OK
Kasserine	Bnana/Ouled Benajeh	H12m*50m^3	Sand	90.4	2.9	37.9	159.4	OK
	Oued Lahtab	H12m*50m^3	Sand	90.4	2.9	37.9	159.4	OK
Gafsa	Enjaimia	H12m*100m^3	Sand	122.9	3.5	49.6	159.4	OK
	Smaidia	H15m*25m^3	Sand	74.0	1.9	30.2	159.4	OK
Sfax	Gargour-Brahma -Fkayha	H12m*150m^3	Gravely Tuff	676.9	17.7	104.3	268.8	OK

*At depth of 1-2m where the bottom of foundation is situated.

Appendix 8.6.2 Stability analysis of the elevated tank (1)

Elevated tank : Volume 25 m^3, H=12.0m, Layer: Sand (Ouled El Fallah sub-projects in Sousse)

1. Applied method of analysis

$q \leq qa$ q : Stress from foundation ground

qa : Bearing capacity of soil

2. Calculation for Load

(1) Turning moment by vertical load

1) Weight of tank

Estimated total weight of tank is calculated based on the drawings. Each parts of weight is shown as below;

a) Superstructur : 21.4 tf

b) Footy : 28.3 tf

c) Foundation : 17.0 tf

ΣV	66.7	tf

2) Line of action for vertical load : L

Width of bottom : B1= 4.00 m B/2 = 4/2 = 2.00 m

3) Turning moment by vertical load at the point of action (O)

ΣMv = ΣV * L = 2*66.69

ΣMv	133.4	tfm

(2) Turning moment by horizontal load

*Horizontal load is calculated applying wind pressure

1) Load of Wind

$Pw = Cd*0.5*Pa*V^2$

Pw : Pressure of wind 1,845 (N/m^2)

→ 188 (kgf/m^2)

Cd : Coefficient of wind 1.20

Pa : Air density 1.23 (kg/m^3)

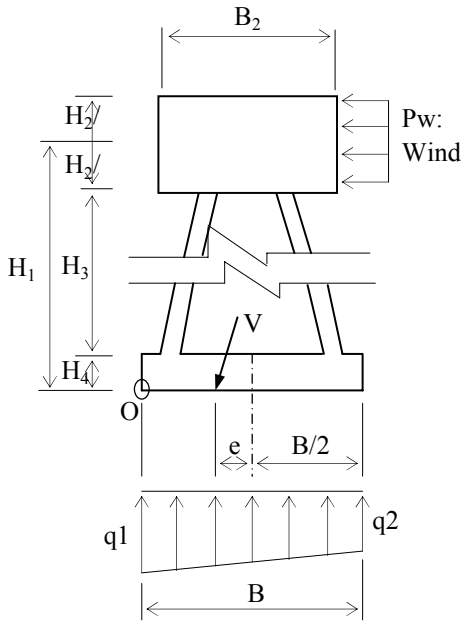
V : Velocity of wind 50 (m/s)

Area against wind: A 10.0 m^2

$= H_2*B_2$ = 2.08*4.8

Load of wind : = Pw*A/1,000 = 188*10/1,000

ΣH	1.9	tf



O: Calculation point

2) Line of action for horizontal load

H1 = H2/2+H3+H4 =2.08/2+12+0.

H1	13.4	m

3) Turning moment by horizontal load at the point of action (O)

ΣMH = ΣH * H1 = 1.9*13.44

ΣMH	25.5	tfm

(3) Result of calculation

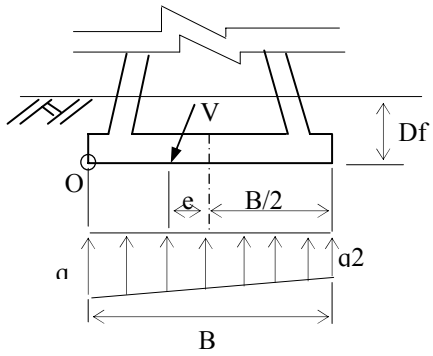
ΣV	66.7	tf
ΣH	1.9	tf
ΣM	107.9	tfm

= (133.4 - 25.5)

3. Calculation for Stability

(1) Overturning

$$e = \left| \frac{\Sigma M}{\Sigma V} - \frac{B}{2} \right| \leq \frac{B}{6}$$



e = |107.9/66.7 - (4/2)|

e = **0.38** ≤ **0.67** **; OK**

(2) Soil Bearing Capacity

1) Calculation for Stress from foundation ground

$$q = \frac{\Sigma V}{B} \times \left(1 \pm \frac{6e}{B} \right) \leq qa$$

q : Stress from foundation ground (t/m^2)

qa : Bearing capacity of soil (tf/m^2)

q1 = 66.7/4*(1+(6*0.38/4))

= ***26.2*** (tf/m^2)

q2 = 66.7/4*(1-(6*0.38/4))

= 7.2 (tf/m^2)

2) Calculation for Bearing capacity of soil : qa

2)-1 Basic Terzaghi formula

Basic Terzaghi formula : qd = C*Nc+1/2*γ*B*Nr+γ*Df*Nq

2)-2 Modified formula

Soil type:		Sandy	
	Applied safety factor	3.0	

(a) Long term formula : qa = 1/3 (α*C*Nc+β*γ1*B*Nr+γ2*Df*Nq)

C :	Cohesion	0.0	(t/m^2)
γ1 :	Unit weight of soil under foundation	1.8	(t/m^3)
γ2 :	Unit weight of soil upper foundation	1.8	(t/m^3)
B1 :	Minimum width of foundation	4.0	(m)
Df :	Penetration depth	1.0	(m)
N_c :	Coefficient	95.7	
N_r :	Coefficient	114.0	
N_q :	Coefficient	83.2	
ϕ :	Internal friction angle ϕ = √ (20N)+15°	46.6	(°)
N:	N Value	50.0	
α:	dimensional coefficient	1.3	
β:	dimensional coefficient	0.4	

qa= 1/3*(1.3*0*95.7+0.4*1.8*4*114+1.8*1*83.2)

= ***159.4*** (tf/m^2)

(b) Short term formula : qa = 2/3(α*C*Nc+β*γ1*B*Nr+1/2*γ2*Df*Nq)

qa= 2/3*(1.3*0*95.7+0.4*1.8*4*114+1/2*1.8*1*83.2)

= ***268.8*** (tf/m^2)

3) Result of calculation

q = 26.2 (tf/m^2)

qa = 159.4 (tf/m^2)

Here, **qa>q ; OK**

Appendix 8.6.2 Stability analysis of the elevated tank (2)

Elevated tank : Volume 150 m^3, H=12.0m, Layer: Sand (Gargour-Brahama-Fkayha sub-project in SFAX)

1. Applied method of analysis

$q \leq qa$ q : Stress from foundation ground

qa : Bearing capacity of soil

2. Calculation for Load

(1) Turning moment by vertical load

1) Weight of tank

Estimated total weight of tank is calculated based on the drawings. Each parts of weight is shown as below;

a) Superstructur : 85.7 tf
b) Footy : 455.1 tf
c) Foundation : 136.1 tf

ΣV	676.9	tf

2) Line of action for vertical load : L

Width of bottom : B1= 8.00 m | B/2 = 8/2 = 4.00 | m

3) Turning moment by vertical load at the point of action (O)

ΣMv = ΣV * L = 4*676.87

ΣMv	2,707.5	tfm

(2) Turning moment by horizontal load

*Horizontal load is calculated applying wind pressure

1) Load of Wind

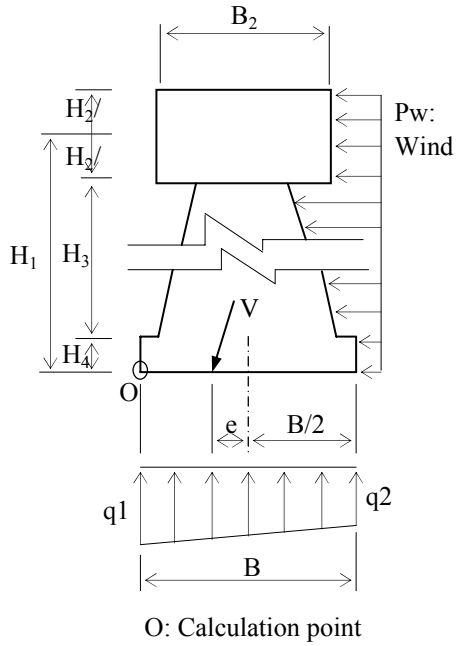
$Pw = Cd*0.5*Pa*V^2$

Pw : Pressure of wind 1,845 (N/m^2)
→ 188 (kgf/m^2)
Cd : Coefficient of wind 1.20
Pa : Air density 1.23 (kg/m^3)
V : Velocity of wind 50 (m/s)

Area against wind:(Superstructure) A1 57.0 m^2
Area against wind:(Footy) A2 37.0 m^2

Wind load on superstructure | ΣH1 | 10.7 | tf
= Pw*A/1,000 = 188*57/1,000

Wind load on footing | ΣH2 | 7.0 | tf
= Pw*A/1,000 = 188*37/1,000



O: Calculation point

2) Line of action for horizontal load

H1 = H2/2+H3+H4 =4/2+12.6+0.4 | H1 | 15.0 | m
HL = H3/2+H4 =12.6/2+0.4 | HL | 6.7 | m

3) Turning moment by horizontal load at the point of action (O)

ΣMH1 = ΣH1 * H1 = 10.7*15 | ΣMH1 | 160.5 | tfm :Superstructure
ΣMH2 = ΣH2 * HL = 7*6.7 | ΣMH2 | 46.9 | tfm :Footy

(3) Result of calculation

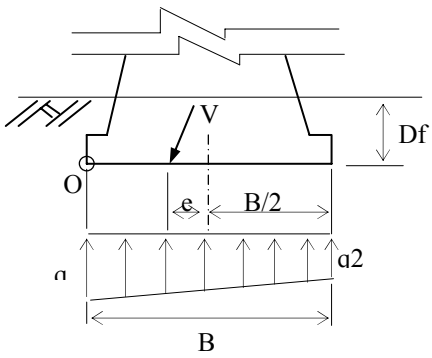
ΣV	676.9	tf
ΣH	10.7	tf
ΣM	2,500.1	tfm

= (2707.5 - 160.5 - 46.9)

3. Calculation for Stability

(1) Overturning

$$e = \left| \frac{\Sigma M}{\Sigma V} - \frac{B}{2} \right| \leq \frac{B}{6}$$



e = |2500.1/676.9 - (8/2)|

e = **0.31** ≤ **1.33** **; OK**

(2) Soil Bearing Capacity

1) Calculation for Stress from foundation ground

$$q = \frac{\Sigma V}{B} \times \left(1 \pm \frac{6e}{B} \right) \leq qa$$

q : Stress from foundation ground (t/m^2)

qa : Bearing capacity of soil (tf/m^2)

q1 = 676.9/8*(1+(6*0.31/8))
= ***104.3*** (tf/m^2)

q2 = 676.9/8*(1-(6*0.31/8))
= 64.9 (tf/m^2)

2) Calculation for Bearing capacity of soil : qa

2)-1 Basic Terzaghi formula

Basic Terzaghi formula : qd = C*Nc+1/2*γ*B*Nr+γ*Df*Nq

2)-2 Modified formula

Soil type:		Sand	
	Applied safety factor	3.0	

(a) Long term formula : qa = 1/3 (α*C*Nc+β*γ1*B*Nr+γ2*Df*Nq)

C :	Cohesion	0.0	(t/m^2)
γ1 :	Unit weight of soil under foundation	1.8	(t/m^3)
γ2 :	Unit weight of soil upper foundation	1.8	(t/m^3)
B1 :	Minimum width of foundation	8.0	(m)
Df :	Penetration depth	1.0	(m)
N_c :	Coefficient	95.7	
N_r :	Coefficient	114.0	
N_q :	Coefficient	83.2	
ϕ :	Internal friction angle ϕ = √(20N)+15°	0.0	(°)
N:	N Value	50.0	
α:	dimensional coefficient	1.3	
β:	dimensional coefficient	0.4	

qa= 1/3*(1.3*0*95.7+0.4*1.8*8*114+1.8*1*83.2)
= ***268.8*** (tf/m^2)

(b) Short term formula : qa = 2/3(α*C*Nc+β*γ1*B*Nr+1/2*γ2*Df*Nq)

qa= 2/3*(1.3*0*95.7+0.4*1.8*8*114+1/2*1.8*1*83.2)
= ***487.7*** (tf/m^2)

3) Result of calculation

q = 104 (tf/m^2)

qa = 269 (tf/m^2)

Here, **qa>q ; OK**

Appendix 8.6.2 Stability analysis of the elevated tank (3)

Elevated tank : Volume 50 m^3, H=15.0m, Layer: Clay (Chraifia sub-project in Sousse)

1. Applied method of analysis

$q \leq qa$ q : Stress from foundation ground

qa : Bearing capacity of soil

2. Calculation for Load

(1) Turning moment by vertical load

1) Weight of tank

Estimated total weight of tank is calculated based on the drawings. Each parts of weight is shown as below;

a) Superstructur : 34.3 tf

b) Footy : 35.6 tf

c) Foundation : 17.0 tf

ΣV	86.9	tf

2) Line of action for vertical load : L

Width of bottom : B1= 4.00 m B/2 = 4/2 = 2.00 m

3) Turning moment by vertical load at the point of action (O)

ΣMv = ΣV * L = 2*86.89

ΣMv	173.8	tfm

(2) Turning moment by horizontal load

*Horizontal load is calculated applying wind pressure

1) Load of Wind

$Pw = Cd*0.5*Pa*V^2$

Pw : Pressure of wind 1,845 (N/m^2)

→ 188 (kgf/m^2)

Cd : Coefficient of wind 1.20

Pa : Air density 1.23 (kg/m^3)

V : Velocity of wind 50 (m/s)

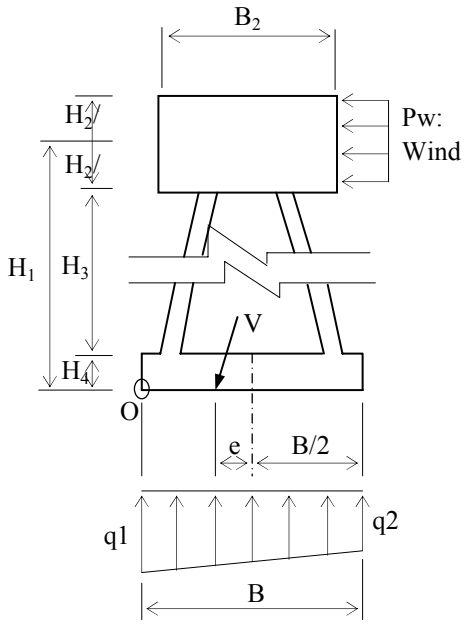
Area against wind: A 15.6 m^2

$= H_2*B_2$ = 3.25*4.8

Load of wind :

ΣH	2.9	tf

= Pw*A/1,000 = 188*15.6/1,000



O: Calculation point

2) Line of action for horizontal load

H1 = H2/2+H3+H4 = 3.25/2+15+0.4

H1	17.0	m

3) Turning moment by horizontal load at the point of action (O)

ΣMH = ΣH * H1 = 2.9*17.025

ΣMH	49.4	tfm

(3) Result of calculation

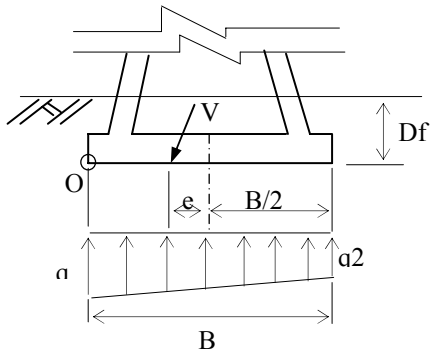
ΣV	86.9	tf
ΣH	2.9	tf
ΣM	124.4	tfm

= (173.8 - 49.4)

3. Calculation for Stability

(1) Overturning

$$e = \left| \frac{\Sigma M}{\Sigma V} - \frac{B}{2} \right| \leq \frac{B}{6}$$



e = |124.4/86.9 - (4/2)|

e = **0.57** ≤ **0.67** **; OK**

(2) Soil Bearing Capacity

1) Calculation for Stress from foundation ground

$$q = \frac{\Sigma V}{B} \times \left(1 \pm \frac{6e}{B} \right) \leq qa$$

q : Stress from foundation ground (t/m^2)

qa : Bearing capacity of soil (tf/m^2)

q1 = 86.9/4*(1+(6*0.57/4))

= ***40.3*** (tf/m^2)

q2 = 86.9/4*(1-(6*0.57/4))

= 3.2 (tf/m^2)

2) Calculation for Bearing capacity of soil : qa

2)-1 Basic Terzaghi formula

Basic Terzaghi formula : qd = C*Nc+1/2*γ*B*Nr+γ*Df*Nq

2)-2 Modified formula

Soil type:		Clay	
	Applied safety factor	3.0	

(a) Long term formula : qa = 1/3 (α*C*Nc+β*γ1*B*Nr+γ2*Df*Nq)

C :	Cohesion	40.8	(t/m^2)
γ1 :	Unit weight of soil under foundation	1.8	(t/m^3)
γ2 :	Unit weight of soil upper foundation	1.8	(t/m^3)
B1 :	Minimum width of foundation	4.0	(m)
Df :	Penetration depth	1.0	(m)
N_c :	Coefficient	5.3	
N_r :	Coefficient	0.0	
N_q :	Coefficient	3.0	
ϕ :	Internal friction angle ϕ = √ (20N)+15°	0.0	(°)
N:	N Value	50.0	
α:	dimensional coefficient	1.3	
β:	dimensional coefficient	0.4	

qa= 1/3*(1.3*40.8*5.3+0.4*1.8*4*0+1.8*1*3)

= ***95.5*** (tf/m^2)

(b) Short term formula : qa = 2/3(α*C*Nc+β*γ1*B*Nr+1/2*γ2*Df*Nq)

qa= 2/3*(1.3*40.8*5.3+0.4*1.8*4*0+1/2*1.8*1*3)

= ***189.2*** (tf/m^2)

3) Result of calculation

q = 40.3 (tf/m^2)

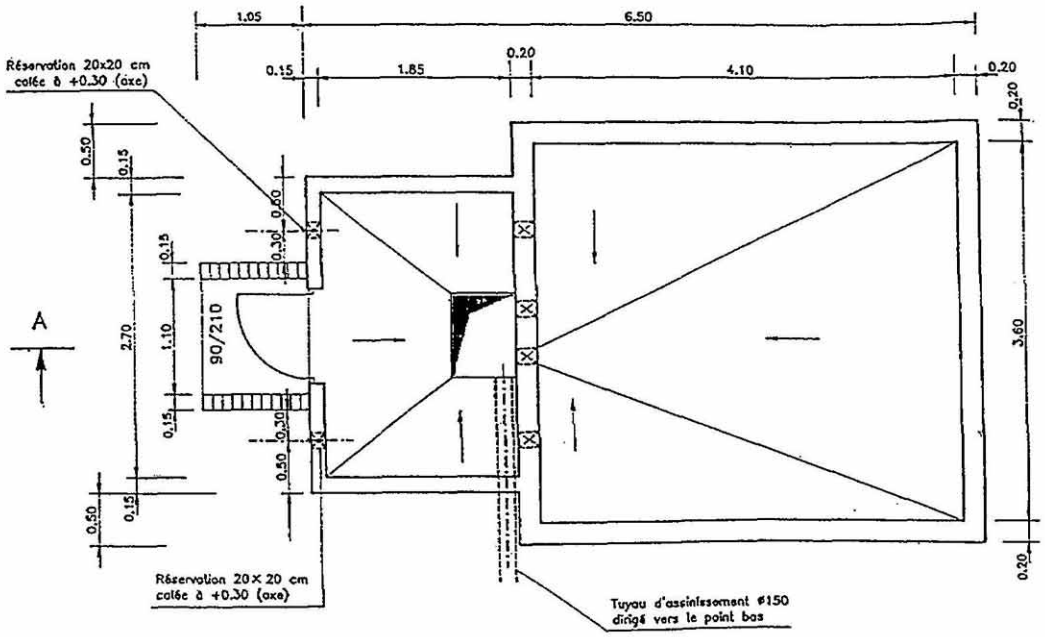
qa = 95.5 (tf/m^2)

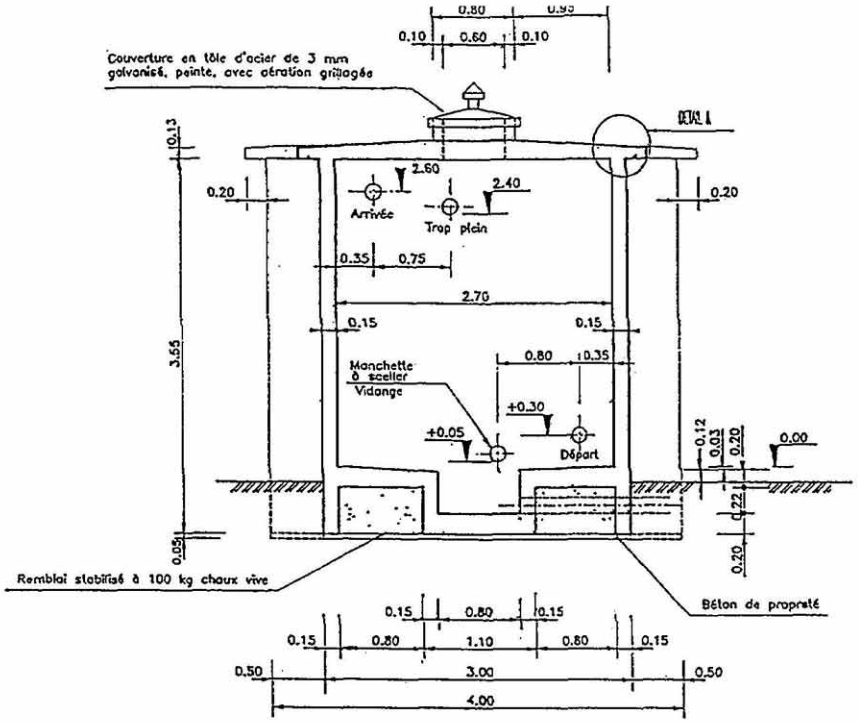
Here, **qa>q ; OK**

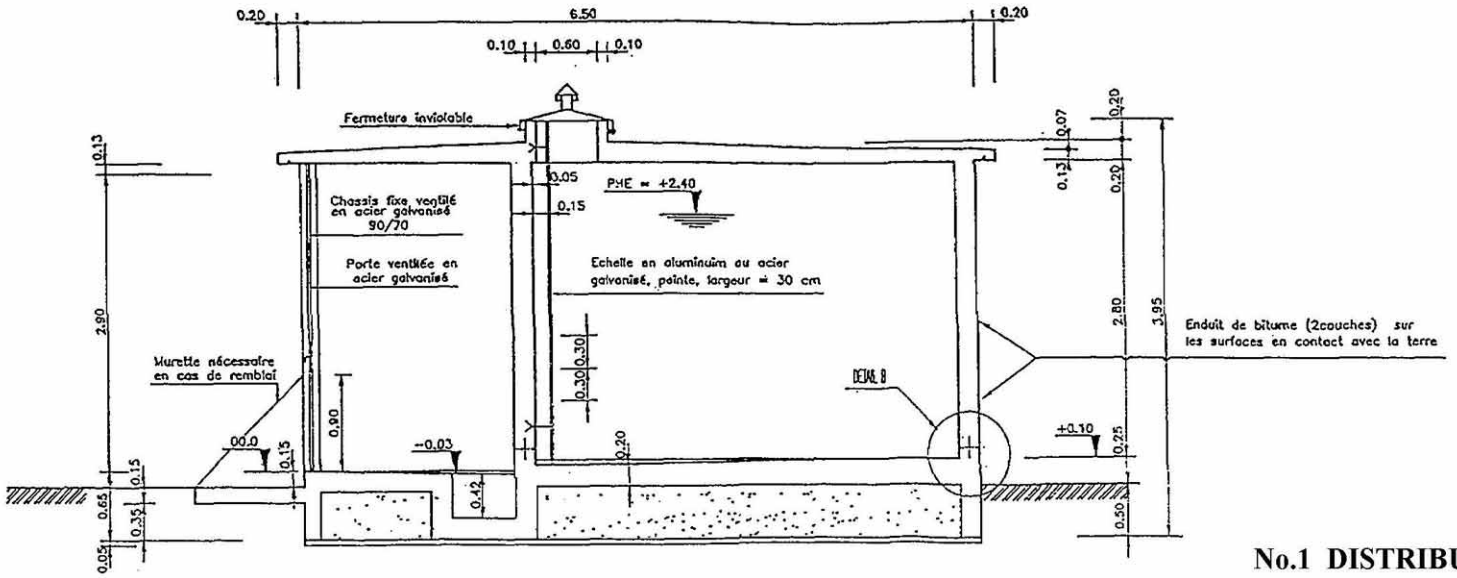
Appendix 8.6.3 Standard drawings for the Rural Water Supply facilities

List of Drawings

Drawing No.1 DISTRIBUTION TANK, SEMI-BURIED TYPE
Drawing No.2 DISTRIBUTION TANK, ELEVATED TYPE (TYPE DGGREE, V=25m^3)
Drawing No.3 DISTRIBUTION TANK, ELEVATED TYPE (SONEDE TYPE, V=150m^3)
Drawing No.4 RELAY STATION, IN-LINE PUMP
Drawing No.5 RELAY STATION, SUBMERGIBLE PUMP
Drawing No.6 BREAK PRESSUR TANK
Drawing No.7 MANHOLE FOR AIR VALVE
Drawing No.8 MANHOLE FOR WASHOUT VALVE, INDIRECT
Drawing No.9 MANHOLE FOR SECTIONNING VALVE
Drawing No.10 PUBLIC TAP
Drawing No.11 POTENCE
Drawing No.12 GIC OFFICE
Drawing No.13 DISINFECTION FACILITIES

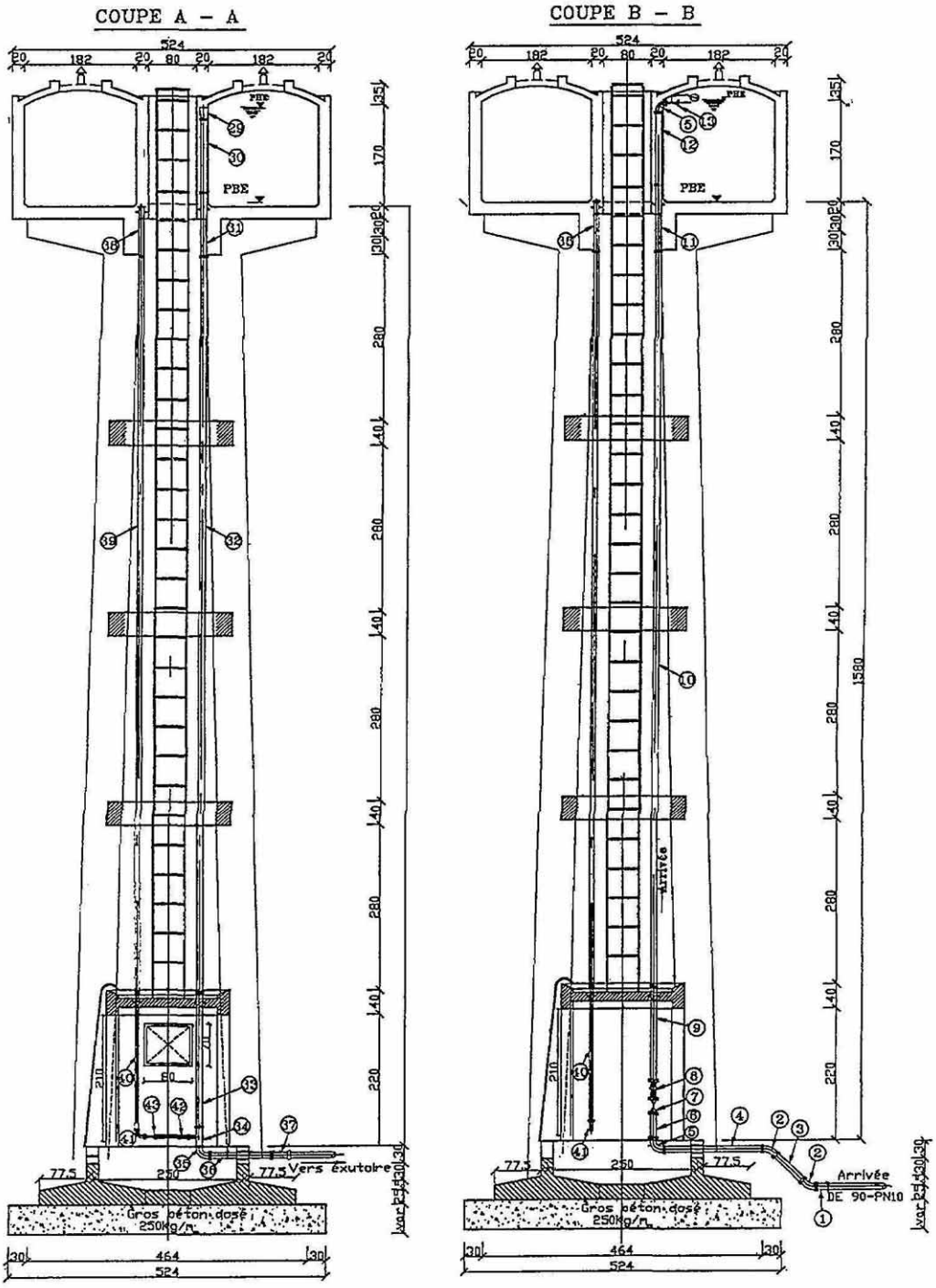


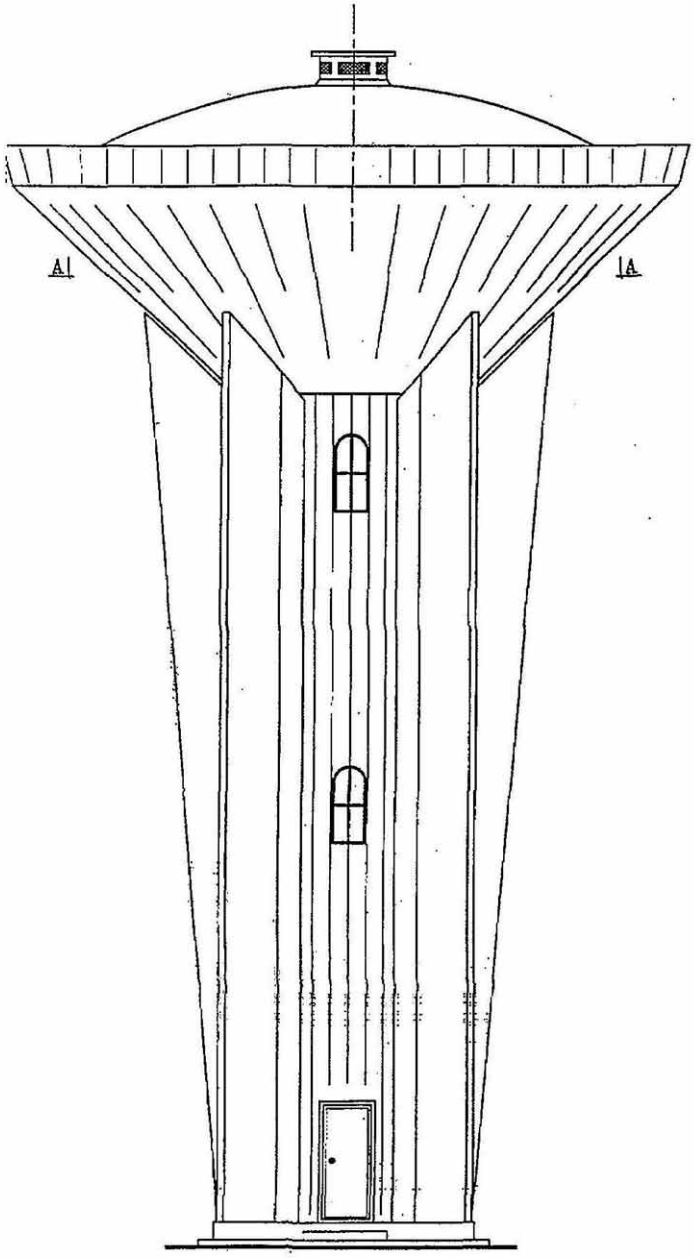


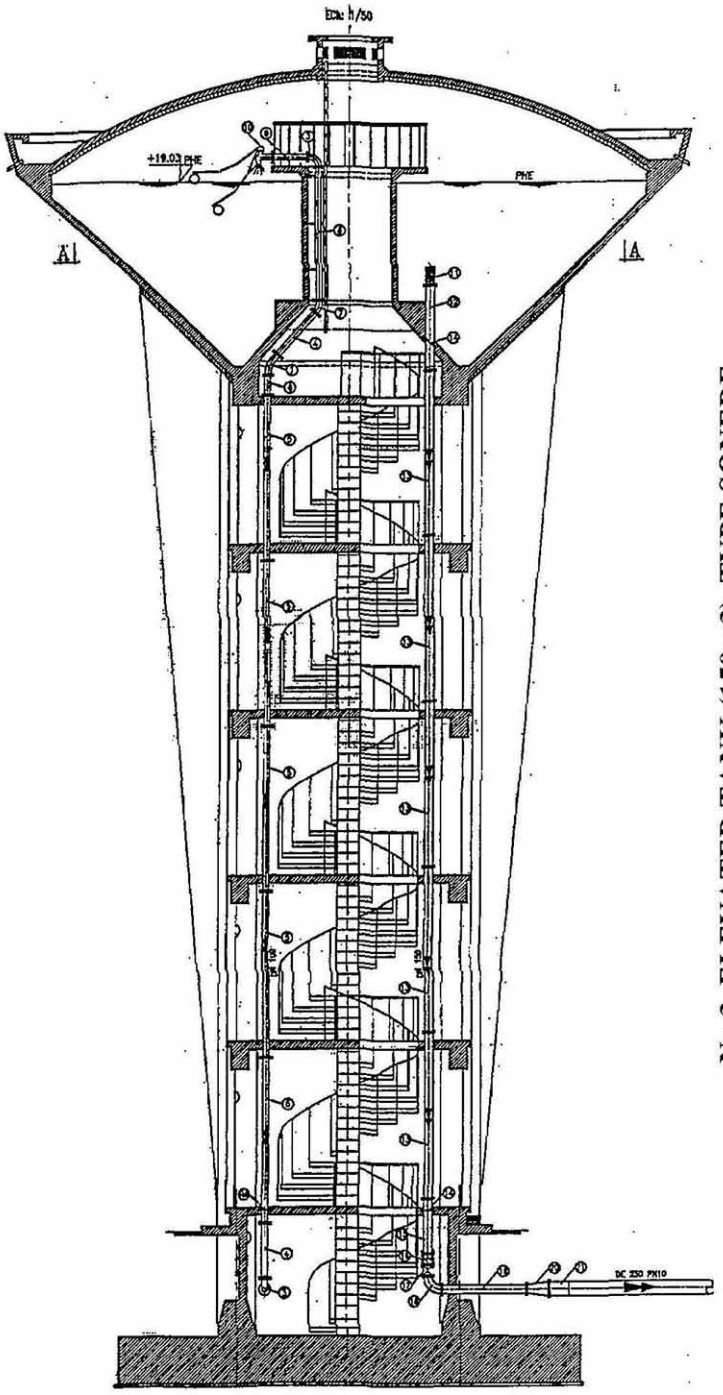


No.1 DISTRIBUTION TANK, SEMI BURIED TYPE

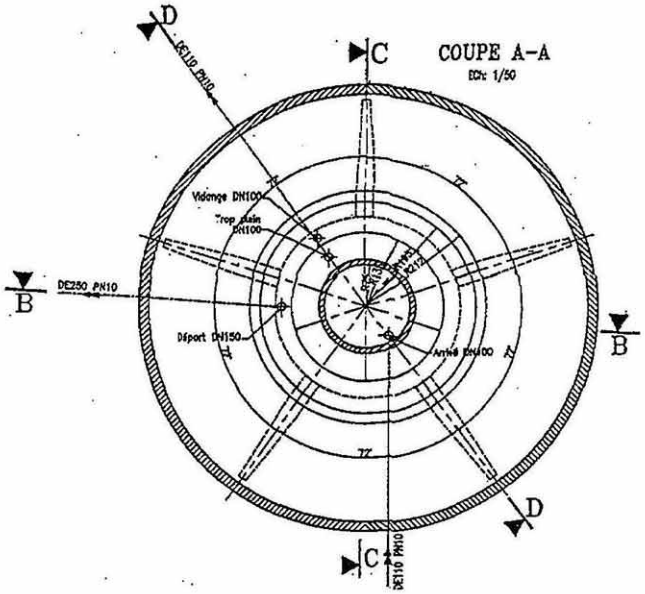
No. 2 ELEVATED TANK (25m3, H=15m) TYPE DGGREE



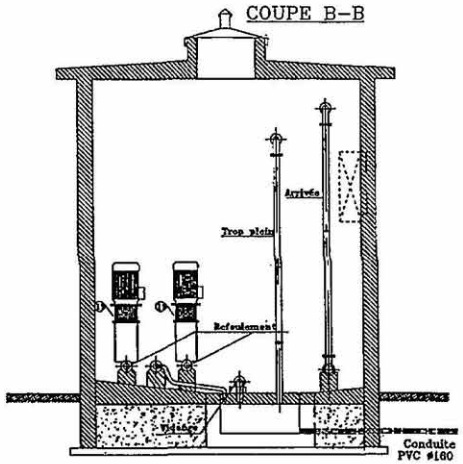


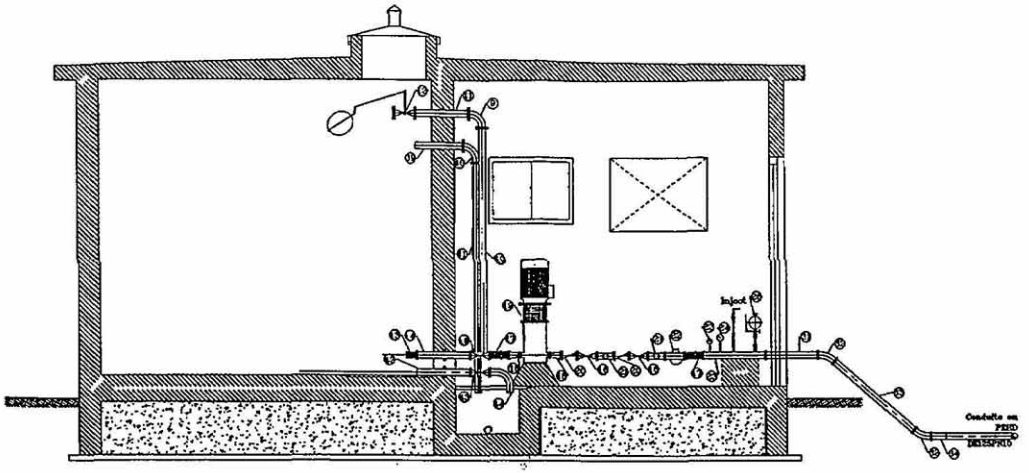


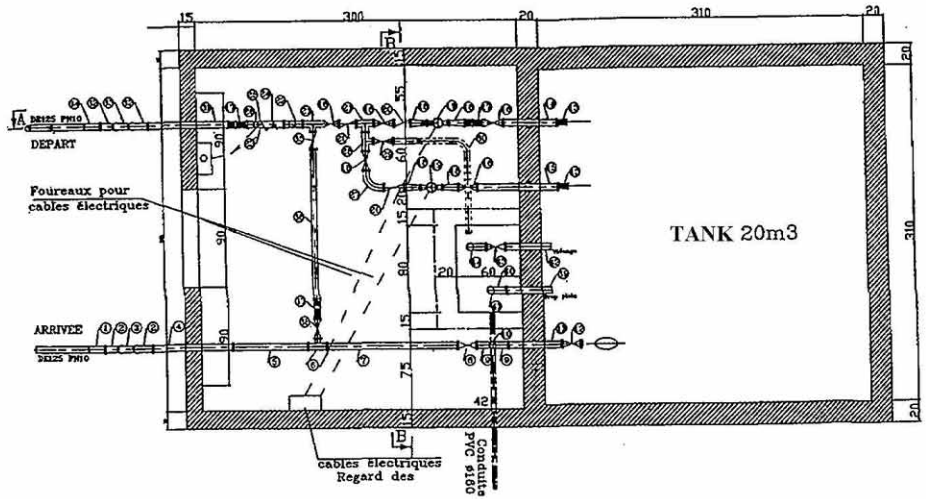
No.3 ELEVATED TANK (150m3) TYPE SONEDE



N°	DESIGNATION	DN(mm)	Nbre
	Arrivée		
1	Collet à souder en PEHD avec bride et M.ES type long PN10	125/100	1
2	Coude 1/8 bridé en fonte PN10	100	2
3	Manchette bridée en fonte L= 1m PN10	100	1
4	Manchette bridée en fonte L= 0,75m PN10	100	1
5	Tuyau bridé en A.G L=2m PN10	100	1
6	Té à trois brides en fonte	100/100/100	1
7	Tuyau bridé en A.G L=1,8m PN10	100	1
8	Vanne à opercule courte à passage Nase en fonte PN10	100	1
9	Coude 1/4 bridé en A.G PN10	100	2
10	Tuyau bridé en A.G L=2,3m PN10	100	1
11	Manchette bridée en A.G avec collerette L=0,6m PN10	100	1
12	Robinet fotolteur PN10	100	1
	Départ		
13	Crépine en bronze PN10	100	2
14	Manchette bridée en fonte avec collerette L=0,6m PN10	100	1
15	Manchette bridée en fonte avec collerette L=0,75m PN10	100	1
16	Vanne à opercule courte à passage Nase en fonte PN10	100	5
17	Joint de démontage en acier PN10	100	2
18	Coude à 2 brides en A.G PN10	DNpompe/DN100	4
19	Electro-pompe-bti-tige Q=6 /s HMT= 32 m PN10	–	5
20	Clapet anti-retour PN10	100	5
21	Té à trois brides en fonte	100	2
22	Compteur d'eau PN10-Gneom-Si/e émetteur d'impulsion	100	1
23	Manchette bridée en A.G L=0.80m avec 4 piquages dont 1 bridé pour ventouse et 3 piquages filetés pour injection du chlore, eau de service et manomètre	100	1
24	Manomètre à contact électrique à glycerine Ø16cm avec robinet 3voies	–	1
25	Manomètre à glycerine Ø10cm avec robinet 3voies	–	1
26	Ventouse à double effet avec robinet vanne PN10	80	1
27	Coude 1/4 bridé en A.G PN10	100	1
28	Manchette bridée d'adaptation L=0,3m avec piquage bridé DN50 pour vidange conduite	100	1
29	Robinet vanne à cage métalle en fonte PN10	50	1
30	Tuyau en A.G L=2,5m	50	1
31	Manchette bridée en fonte L=0,75m PN10	100	1
32	Coude 1/8 à bride unie en fonte PN10	100	2
33	Manchette bridée en fonte L=1 m PN10	100	1
34	Collet à souder en PEHD avec bride et M.ES type long PN10	100	1
	By-pass		
35	Clapet anti-retour PN10	100	1
36	Manchette bridée en AG L=1,5 m PN10	100	1
37	Joint de démontage en acier PN10	100	1
38	Vanne à opercule courte à passage Nase en fonte PN10	100	1
	Trop plein		
39	Manchette à ibride en fonte avec collerette L=0,5m	150	1
40	Coude 1/4 bridé en fonte	150	1
41	Tuyau à ibride en A.G L=2,7m	150	1
	Vidange		
42	Manchette à ibride en fonte avec collerette L=0,5m	80	1
43	Robinet vanne à cage métalle en fonte	80	1
44	Coude 1/4 à bride Unie en A.G	80	1







No.4 RELAY PUMPING STATION WITH TANK (IN-LINE PUMP)