CHAPTER 7 WILLINGNESS TO PAY SURVEY RESULT

7.1 General

General background of willingness to pay and affordability to pay for the potable water in rural communities is described as follows.

(1) Most of communities do not collect any water fee or collect very small amounts of water fee because of natural gravity flow system,
(2) Average household incomes in rural communities are lower than urban communities,
(3) Some residents are not satisfied with present water supply services.

In order to obtain detailed information on the water fees that should be paid by the local residents, the Study shall conducted the survey for willingness to pay and affordability to pay for the potable water. Therefore, the willingness to pay survey of 1,000 informants was carried out.

7.2 Methodology

A sample survey was applied taking into consideration the survey period. The willingness to pay survey was conducted with 1,000 informants, which were equivalent to 1.9% of the total household numbers, in 24 rural communities by a local consultant during the period from June to August 2007. The survey team conducted the interview survey for each household using the survey form. It was prepared to be answered by figures, the surveyor carried out each survey smoothly and the interviewees could reply without being distressed deeply. As a result, every surveyor could collect the same level of responses from each interviewee.

Largely populated rural communities are advantageous in terms of the field period. The Study selected the 24 large scaled rural communities as the target rural communities. Selection procedures were as follows:

(1) Grouping of the rural communities by the areas in each marz

It was assumed that rural communities, which were located closely together, had similar water supply situations and their responses would probably be similar to each other. Thus, rural communities were grouped by areas.

(2) Selection of the large population rural communities in each group

It was considered that the largest population rural community in the group represented the area. One or several rural communities in the area were selected as the surveyed rural communities. Area grouping and rural communities selected are shown in Figure 7.2.1.

(3) Allocation of the sample numbers in each rural community

Total sampling number was 1,000. The sampling number of each marz and rural community was allocated in proportion to the population. Sampling numbers for each rural community is given in Table 7.3.1.

7.3 Survey Results

The survey results are summarized in Table 7.3.1.

7.3.1 Socio-economic Conditions

The survey asked about average house members, duration of stay in the rural community, major household income sources, and average annual household income amount. Average number of house members is 4.4 persons and this figure ranged from 4.1 to 4.8 persons in each marz. There was not much difference among the four marzes.

Major income sources were mostly the same in each of the four marzes. They were livestock, vegetables, and other agricultural products. Besides, between 10 and 20% residents lived on a pension.

The survey asked the annual average household income. Monthly income was estimated based on the annual household income data. The average monthly income was AMD 43,000 among the 1,000 informants. A monthly average income distribution is shown in Table 7.3.2. Though the rate of higher income household, who earns more than AMD 50,000 per month shown in Table 6.4.1, is larger than the one of the socio-economic survey results, both survey results indicate that monthly household income of (b) AMD 10,001-30,000 is the modal figure and (c) AMD 30,001-50,000 follows. Financial study for O&M fee shall remind the fact that average monthly household income in the 153 rural communities mainly ranges between AMD 10,000 and 50,000.

Table 7.3.2 Average Monthly Income Per Household

Average monthly income per household (AMD)	Aragatsotn	Shirak	Gegharkunik	Tavush	Total	% of total	% of total in Table 4.4.1
(a) <10,000	11	0	78	1	90	9.4	10.5
(b) 10,001-30,000	94	21	192	35	342	35.8	60.1
(c)30,001 – 50,000	79	39	84	26	228	23.9	21.6
(d) 50,001-100,000	58	33	76	15	182	19.1	5.2
(e) >100,001	48	27	35	2	112	11.7	2.6
Effective total by marz	290	120	465	79	954	100.0	100.0
Sample numbers	300	120	500	80	1,000	-	-

Source: JICA Study Team, 2007

7.3.2 Present Water Supply Conditions and Expected Water Supply Methods

The survey asked the drinking water source of each house and evaluation of the drinking water source. Rural communities mainly used house connections and public taps. In Tavush Marz, house connection ratio was remarkably low in comparison with the other Marzes. Approximately 85% of the population used public taps and the remaining 15% used house connections. The survey also asked the preferable water supply source in the future. The people in all marzes replied that they preferred house connections in the future as shown in Table 7.3.3.

Table 7.3.3 Present Water Source and Preferable Water Source in the Future

Marz	House connection		Public tap		Others	
	Present	Future	Present	Future	Present	Future
Aragatsotn	53	63	35	37	12	0
Shirak	53	77	47	23	1	0
Gegharkunik	47	87	39	13	15	0
Tavush	15	99	85	1	0	0
Average	47	79	43	21	12	0

Source: JICA Study Team, 2007

As for water supply schedules, more than 80% of residents could access water 24 hours a day or regularly. There were no remarkable seasonal differences between summer and winter as shown in Table 7.3.4

Table 7.3.4 Average Regular Water Supply Schedule

Marz	Summer	Winter
Aragatsotn	5.9 hrs	5.9 hrs
Shirak	12.0 hrs	15.0 hrs
Gegharkunik	9.0 hrs	6.9 hrs
Tavush	12.7 hrs	12.7 hrs
Average	9.9 hrs	10.1 hrs

Source: JICA Study Team, 2007

Though access to water was relatively satisfactory in every marz as shown in Table 7.3.5, 30% of the residents replied that water quantity was too little and quality was bad. In particular Aragatsotn Marz was not satisfied with the present water quantity and quality.

Table 7.3.5 Water Quantity and Water Quality Evaluation

Marz	Water quantity (%)			Water quality (%)		
	Satisfactory	Fair	Poor	Good	Fair	Bad
Aragatsotn	28	30	42	31	22	48
Shirak	35	39	26	69	24	7
Gegharkunik	23	49	28	65	17	18
Tavush	38	44	19	36	28	38
Average	27	42	31	53	20	27

Source: JICA Study Team, 2007

7.3.3 Present Monthly Water Fees and Affordable Water Fees in the Future

Present monthly water fees in each rural community surveyed are summarized in Table 7.3.6. Eight (8) out of 24 rural communities collected water fees from the users. All rural communities that collected fees applied a flat rate. Water fee ranges from AMD 100 to 500 per month and there was not much difference among the eight rural communities. The collection ratios vary from 10% to 90%. For example, collection ratio of No. 49 Shevavan in Aragatsotn is 10% for the water fee of AMD 500 per month per household, whereas No.14 Kamo in Shirak Marz has a collection ratio of 90% for the water fee of AMD 250 per month per household. Average collection ratio in the eight communities is 48.5 %, which is consistence with the collection ratio of 40% of AWSC in 2006. The remaining 16 rural communities, which did not collect monthly water fees, collected the repair cost when the water supply system was broken. A range of AMD 100~500 per household was collected in the past when needed, but only from the residents that could afford it.

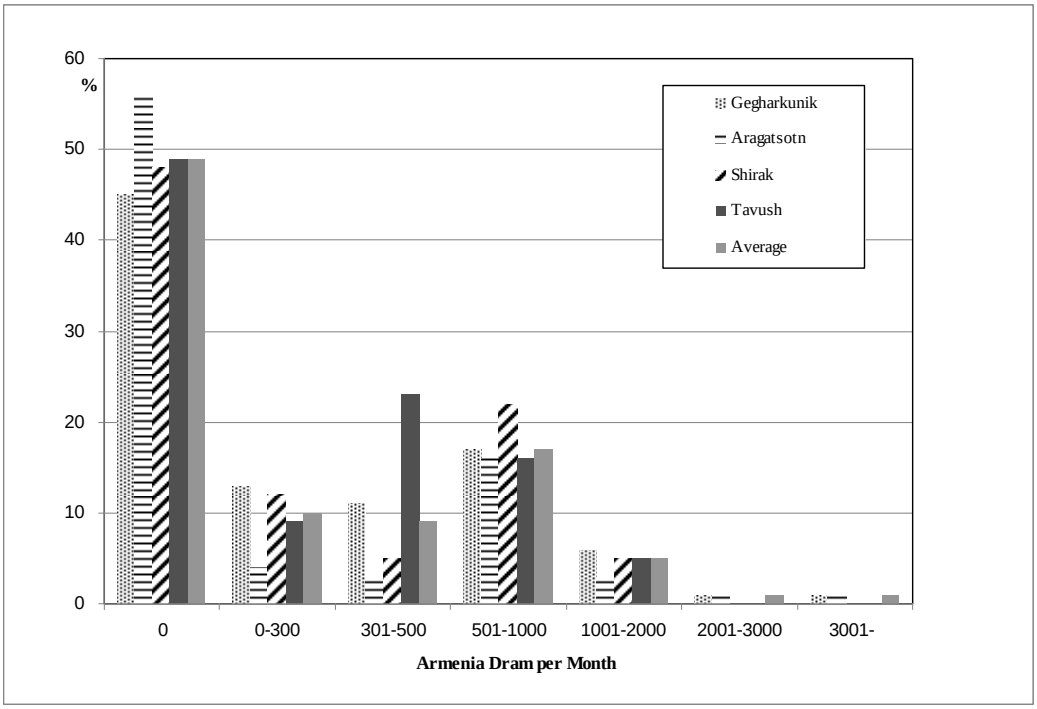
Table 7.3.6 Present Water Fee of the Rural Communities Surveyed

Rural community	Water fee	Pay	Not pay	Repair cost	Remarks
	AMD/M/HH	%	%	AMD/HH	
Aragatsotn Marz	0				
No.09 Aragats	100-300	82	18		
No.14 Byurakan	0			150	3% of interviewees pay
No.34 Dzaxkahovit	500	60	40		
No.37 Katnaghbyur	0	0	100	100-500	
No.38 Karmarashen	0	0	100	100-500	
No.43 Melikgyugh	0	0	100	100-500	
No.49 Shenavan	500	10	90		AMD 250/M/HH was designed.
Shirak					
No.07 Garnaridg	0	0	100	200-300	
No.14 Kamo	250	90	10		
No.24 Musaelyan	0	0	100	250-300	
No.31 Sarnaghbyur	0	0	100	200-300	
Gegharkunik					
No.01 Akunq	500	0	100		Residents pay voluntarily
No.03 Aygut	0	0	100		
No.06 Astghadzor	300	62	38		
No.09 Geghamavan	0	0	100		
No.11 Geghovit	0	0	100		

Rural community	Water fee	Pay	Not pay	Repair cost	Remarks
	AMD/M/HH	%	%	AMD/HH	
No.14 Drakhtik	0	0	100		
No.15 Eranos	0	0	100		
No.20 Lusakunq	100	16	84		
No.24 Tsovagyugh	200-500	45	55		
No.34 Mets Masrik	100	23	88		
Tavush					
No.02 Gandzakar	0	0	100		
No.06 Teghut	0	0	100		
No.12 Navur	0	0	100	100	95% residents pay irregularly
Average		48.5%	51.5%		

Source: JICA Study Team, 2007

Monthly affordable water fee of each surveyed informant was illustrated in Figure 7.3.1. Almost half of the informants replied that they did not have a willingness to pay the monthly water fee. This is because the majority of informants can use water without paying any monthly charge though they sometimes complain about the water supply services. A total of 50% of informants expressed their willingness to pay a monthly water fee.



Source: JICA Study Team, 2007

Figure 7.3.1 Affordable Monthly Water Fee of Each Marz

Based on the survey results, affordable water fees were estimated as shown in Table 7.3.7. When adding all the replies including those of AMD 0 per month, the monthly affordable water fee could be estimated at around AMD 300 per month per household. If the water

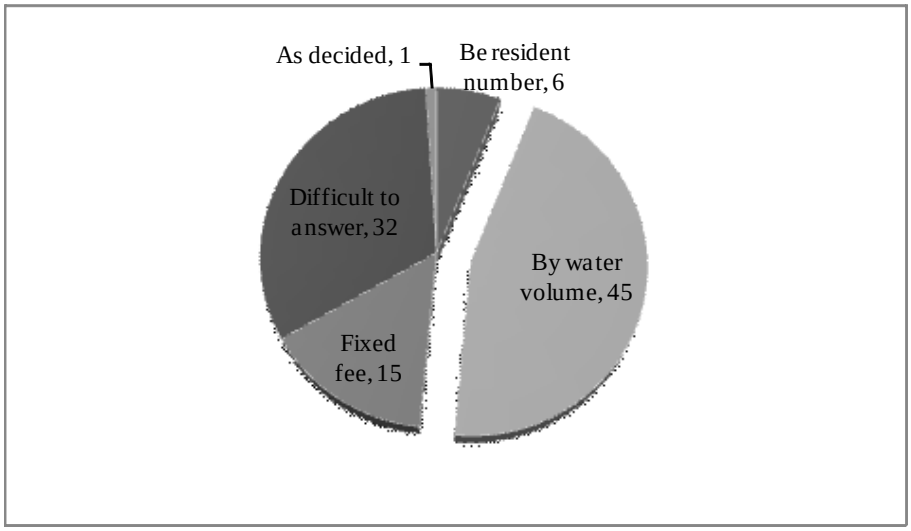
fees are calculated applying only the replies which intend to pay water fees, the monthly affordable water fee is AMD 700 per month per household. There are not large differences among the marzes.

Table 7.3.7 Evaluation of Monthly Affordable Water Fee per Household

Marz	All replies	Excluding 0 AMD reply
Aragatsotn	264	971
Shirak	300	635
Gegharkunik	365	702
Tavush	296	571
Average	323	700

Source: JICA Study Team, 2007

As for the preferable water payment method, the majority said that they would prefer payment by water volume even though fixed water fees are applied currently as shown in Figure 7.3.2. Besides, 46% of residents agreed to install a water meter. These two replies are complimentary; therefore, it can be considered that the residents who accept the water meters prefer to pay by water volume.



Source: JICA Study Team, 2007

Figure 7.3.2 Desirable Payment Method

7.3.4 Water Related Diseases and Sanitary Facilities Situation

About 10% of the residents were affected by water-related diseases in the last year except in Shirak Marz. In Shirak, no residents were affected by water-related diseases. Major diseases were diarrhea, dysentery, typhus, kidney diseases, and stomach diseases. The rural communities which reported a high percentage of bad water quality such as No.8 Aragats and No.14 Byurakan in Aragatsotn Marz, suffered high rates of water-related diseases.

The survey also asked whether the residents owned sanitary facilities, such as flushing toilets and showers because those facilities will become necessary when water supply volume is increased. Average possession of those facilities was between 20 ~ 30%, however, it depended on the rural community. It fluctuated from 0% to 60%. If sewerage systems are provided after the water supply improvement, it will eliminate any serious negative impacts on the downstream area.

7.4 Summary of the Willingness to Pay Survey

The following articles can be itemized at through the willingness to pay survey results for the 24 rural communities

.

- AMD 10,000 ~ 30,000 is the most common average monthly income per household as well as the socio-economic survey.
- 30% residents are not satisfied with the current water supply services.
- Present monthly water fees are between AMD 100 ~ 500 per household, where collected.
- Affordable monthly water fees are estimated to be between AMD 300 ~ 700 per household.
- Residents prefer to pay by water volume.

It is considered that affordable water fees should be in the range of AMD 300 ~ 500 per month per household judging from the present water fee and affordable water fee. This corresponds to a guideline for affordable water fee recommended by the World Bank; not more than 3% of income per household.

Table 7.3.1 Summary of Willingness to Pay Survey Results (1/3) – Gegharkunik Marz

	GEGHARKUNIK										
	Akunq	Ayugt	Astghadzor	Geghamavan	Geghhovit	Drakhtik	Eranos	Lusakunq	Tsovagyugh	Mets Masrik	Average
Sample Numbers	50	30	50	30	80	30	80	30	70	50	-
1. Ave. house number (persons)	4.7	4.3	1.7	2.3	4.8	5.1	5.0	4.0	5.2	3.4	4.1
2. Residential period											
2.1 Native residents	100	27	90	57	90	0	90	100	90	82	80
2.2 Immigrants	0	73	10	43	10	100	10	0	10	18	20
3. Major income sources (%)	Livestock 28.0	Livestock 34.6	Vegetable 60.0	Livestock 36.5	Vegetable 40.4	Livestock 34.8	Vegetable 27.8	Vegetable 39.5	Livestock 34.2	Vegetable 36.6	Vegetable 26
	Vegetable 21.3	Other crop 26.9	Pension 14.5	Other crop 23.1	Other crop 36.0	Other crop 23.9	Pension 19.0	Livestock 18.6	Pension 27.2	Livestock 19.7	Livestock 20
	Other crop 16.0	Pension 23.1	Livestock 9.1	Assistance 13.8	Livestock 10.1	Pension 21.7	Other crop 11.9	Pension 16.3		Other crop 11.3	Other crop 15
	Pension 16.0					Vegetable 13.0					Pension 14
4. Household income (AMD/year) (%)											
-100000	26	10	4	3	30	18	10	10	5	30	16
100,000 - 400,000	32	51	52	30	32	45	33	52	42	32	39
400,000 - 600,000	24	14	16	32	10	24	11	15	21	12	17
600,000 - 1,000,000	6	3	18	21	16	3	22	13	23	10	15
1,000,000- 2,000,000	0	3	10	0	3	10	10	10	9	11	7
2,000,000 -	0	0	0	0	0	0	1	0	0	0	0
5.Water source (%)											
House connection	53	10	8	70	74	26	86	6	59	2	47
Public fountain	45	74	30	30	18	67	5	74	38	78	39
Private well	2	7	2	0	0	7	8	3	1	12	4
Public well	0	7	58	0	8	0	1	13	0	6	9
Other	0	3	2	0	0	0	6	3	1	2	2
6. Daily water volume (lit/day) (%)											
-100	54	32	18	33	58	30	44	48	49	59	45
100 - 150	12	7	8	7	5	17	4	13	6	6	7
151 - 200	14	31	38	27	18	43	23	19	21	10	23
201 - 300	10	21	30	7	6	0	13	16	17	16	14
301 -	9	24	6	26	22	10	16	4	7	8	13
7. Water supply time											
7.1 Water supply in Summer (%)											
24 hours	88	100	32	0	89	97	6	87	47	51	56
Regular	10	0	4	97	8	3	62	0	24	41	26
Irregular	2	0	64	3	3	0	30	13	29	8	18
No water	0	0	0	0	0	0	4	0	0	0	1
Average hours	7.5	24.0	8.0	5.0	11.0	6.0	8.0	6.0	5.0	9.0	9.0
7.2 Water supply in Winter (%)											
24 hours	86	90	34	0	96	60	88	87	54	47	68
Regular	12	0	4	73	3	3	4	0	19	29	13
Irregular	2	10	60	20	3	3	6	13	24	20	16
No water	0	0	2	7	0	34	2	0	7	4	4
Average hours	7.5	2.0	8.0	5.0	11.0	6.0	10.0	6.0	5.0	8.0	6.9
8. Water usage (%)											
Cooking	31	31	32	35	32	29	30	32	30	33	32
Shower and bath	31	31	32	26	32	28	30	32	29	32	31
Laundry	32	30	32	29	32	28	29	31	29	31	30
Toilet	6	2	1	1	3	2	10	5	4	0	4
Gardening	0	6	3	9	1	13	1	0	8	4	4
9. Water quantity evaluation (%)											
Rich	44	0	56	7	28	0	1	74	2	33	23
Fair	30	27	28	87	65	73	58	19	58	32	49
Bad	26	73	16	6	7	27	41	7	40	35	28
10. Water quality evaluation (%)											
Good	94	17	96	80	43	60	79	84	40	67	65
Fair	6	20	4	17	12	23	17	13	39	12	17
Bad	0	63	0	3	45	17	4	3	21	21	18
11. Monthly water fee (AMD/month)											
Monthly regular water fee	500	0	300-500	0	0	0	0	100	200-500	100	150~340
12. Affordable water fee (AMD/month) (%)											
0	76	63	4	70	78	47	36	36	31	14	45
0-300	0	10	4	0	0	10	34	29	22	12	13
301-500	18	7	32	0	10	10	0	7	19	2	11
501-1000	4	10	48	10	4	23	14	6	15	33	17
1001-2000	2	0	4	0	6	4	7	3	3	22	6
2001-3000	0	0	0	3	0	3	0	3	0	4	1
3001-	0	0	4	0	1	3	1	0	1	2	1
13. Desirable payment method (%)											
Be resident number	2	10	4	10	16	3	32	14	0	0	11
By water volume	16	40	88	40	20	30	35	40	80	76	47
Fixed fee	14	16	6	6	14	34	7	30	10	17	14
Difficult to answer	68	17	2	37	50	33	21	13	10	5	26
As decided	0	17	0	7	0	0	5	3	0	2	3
14. Water meter installation (%)											
Acceptance rate	18	47	28	88	23	20	43	33	68	43	40
15. Preferable water supply (%)											
House connection	84	86	100	100	61	90	95	100	100	65	87
Public tap	16	7	0	0	39	7	5	0	0	35	13
Water truck	0	3	0	0	0	3	0	0	0	0	0
16. Water related desease in 2006 (%)											
Percentage of sampling numbers	6	13	0	7	19	10	15	13	13	8	11

Source: JICA Study Team, 2007

Table 7.3.1 Summary of Willingness to Pay Survey Results (2/3) – Aragatsotn Marz

	ARAGATSOTN							
	Aragatsavan	Byurakan	Dzaxkahovit	Katnaghbyur	Karmrashen	Melikgyugh	Shenavan	Average
Sample Numbers	90	60	30	30	30	30	30	-
1. Ave. house number (persons)	4.6	4.8	4.5	4.8	4.4	4.6	5.6	4.8
2. Residential period								
2.1 Native residents	96	95	93	97	90	90	90	94
2.2 Immigrants	4	5	7	3	10	10	10	6
3. Major income sources (%)	Vegetable 21.5	Pension 23.7	Live stock 26.9	Livestock 35.0	Livestock 42.6	Livestock 35.3	Livestock 34.0	Livestock 29.3
	Livestock 19.3	Vegetable 17.1	Vegetable 21.2	Vegetable 22.5	Vegetable 21.3	Other crop 25.5	Vegetable 28.3	Vegetable 20.7
	Public service 19.3	Livestock 13.2	Other crop 13.5	Pension 17.5	Other crop 14.9	Vegetable 21.6	Other crop 24.5	Pension 10.0
	Pension 11.9	Other crop 11.8	Public service 11.5					Other crop 10.0
4. Household income (AMD/year) (%)								
-100000	3	0	3	13	7	3	0	4
100,000 - 400,000	33	42	47	44	26	10	3	31
400,000 - 600,000	32	25	17	20	37	33	10	26
600,000 - 1,000,000	20	20	10	10	30	34	10	19
1,000,000- 2,000,000	10	6	13	3	0	17	50	13
2,000,000 -	0	2	0	0	0	3	27	3
5.Water source (%)								
House connection	14	70	63	47	40	93	100	53
Public fountain	47	28	37	53	60	7	0	35
Private well	39	0	0	0	0	0	0	12
Public well	0	0	0	0	0	0	0	0
Other	0	2	0	0	0	0	0	0
6. Daily water volume (lit/day) (%)								
-100	28	79	60	13	44	20	17	39
100 - 150	6	3	0	64	23	13	0	12
151 - 200	19	12	30	17	30	43	13	21
201 - 300	27	3	4	3	3	24	0	12
301 -	20	3	6	3	0	0	70	15
7. Water supply time								
7.1 Water supply in Summer (%)								
24 hours	16	82	90	47	93	97	3	54
Regular	76	13	10	43	4	3	97	41
Irregular	0	5	0	10	3	0	0	2
No water	8	0	0	0	0	0	0	2
Average hours	5.0	9.0	10.0	3.0	1.5	10.0	3.0	5.9
7.2 Water supply in Winter (%)								
24 hours	16	82	83	90	93	97	3	58
Regular	76	13	17	10	4	3	97	38
Irregular	0	5	0	0	3	0	0	1
No water	8	0	0	0	0	0	0	2
Average hours	5.0	9.0	10.0	3.0	1.5	10.0	3.0	5.9
8. Water usage (%)								
Cooking	34	33	33	33	33	32	30	33
Shower and bath	33	32	33	32	31	32	30	32
Laundry	33	32	34	32	33	31	30	32
Toilet	0	3	0	3	3	5	7	3
Gardening	0	0	0	0	0	0	3	0
9. Water quantity evaluation (%)								
Rich	4	28	16	53	33	60	47	28
Fair	9	43	27	32	37	40	50	30
Bad	87	28	57	32	10	0	3	42
10. Water quality evaluation (%)								
Good	4	8	63	33	67	60	57	31
Fair	3	30	20	27	37	30	33	22
Bad	93	62	17	40	10	3	10	48
11. Monthly water fee (AMD/month)								
Monthly regular water fee	100-300	150	500	0	0	0	250	250-300
12. Affordable water fee (AMD/month) (%)								
0	3	65	60	67	97	100	97	56
0-300	5	12	0	0	0	0	0	4
301-500	9	0	3	0	0	0	3	3
501-1000	31	12	27	17	0	0	0	16
1001-2000	9	0	3	0	0	0	0	3
2001-3000	0	2	0	3	0	0	0	1
3001-	0	0	7	0	0	0	0	1
13. Desirable payment method (%)								
Be resident number	1	10	0	0	0	0	0	2
By water volume	64	35	53	17	0	0	3	34
Fixed fee	31	15	13	23	17	10	4	19
Difficult to answer	4	40	34	60	83	90	90	45
As decided	0	0	0	0	0	0	0	0
14. Water meter installation (%)								
Acceptance rate	87	43	60	27	7	3	3	45
15. Preferable water supply (%)								
House connection	54	74	65	39	38	75	100	63
Public tap	46	23	35	61	62	25	0	37
Water truck	0	0	0	0	0	0	0	0
16. Water related desease in 2006 (%)								
Percentage of sampling numbers	21	34	0	10	0	7	0	15

Source: JICA Study Team, 2007

Table 7.3.1 Summary of Willingness to Pay Survey Results (3/3)– Shirak and Tavush Marz

	SHIRAK					TAVUSH				Total average
	Garnaridg	Kamo	Muselyan	Sarnaghbyur	Average	Gandzakar	Teghut	Navur	Average	
Sample Numbers	10	30	30	50	-	40	20	20	-	-
1. Ave. house number (persons)	4.9	5.5	4.5	4.3	4.8	4.1	4.0	4.3	4.1	4.4
2. Residential period										
2.1 Native residents	100	100	97	94	97	95	100	95	96	87
2.2 Immigrants	0	0	3	6	3	5	0	5	4	13
3. Major income sources (%)	Cereal	Livestock	Livestock	Livestock	Livestock	Livestock	Pension	Livestock	Live stock	Livestock
	52.9	41.0	37.7	38.0	35.0	36.0	38.0	47.0	32.5	25.4
	Vegetable	Vegetable	Other crop	Vegetable	Vegetable	Other crop	Other crop	Pension	Pension	Vegetable
	41.2	24.6	24.5	26.1	25.8	21.0	19.0	17.0	20.0	22.2
		Other crop	Vegetable	Other crop	Other crop	Pension	Livestock	Other crop	Other crop	Other crop
		21.3	22.6	10.9	15.0	13.0	15.0	11.0	17.5	13.7
					Cereal		Private manage		Private manag	Pension
					4.2		10.0		2.5	11.4
4. Household income (AMD/year) (%)										
-100000	0	0	0	0	0	0	5	0	1	9
100,000 - 400,000	20	10	17	22	18	34	65	38	44	34
400,000 - 600,000	50	27	30	33	33	34	20	38	33	23
600,000 - 1,000,000	30	43	20	22	28	29	0	24	20	18
1,000,000- 2,000,000	0	20	33	21	23	3	5	0	3	10
2,000,000 -	0	0	0	0	0	0	0	0	0	1
5.Water source (%)										
House connection	40	60	63	44	53	15	24	5	15	47
Public fountain	60	40	37	54	47	85	76	95	85	43
Private well	0	0	0	2	1	0	0	0	0	6
Public well	0	0	0	0	0	0	0	0	0	5
Other	0	0	0	0	0	0	0	0	0	1
6. Daily water volume (lit/day) (%)										
-100	0	0	10	8	6	21	45	10	24	37
100 - 150	90	20	55	34	41	12	25	23	19	14
151 - 200	10	37	11	40	29	37	25	29	33	24
201 - 300	0	30	14	10	15	20	5	33	20	14
301 -	0	13	10	8	9	10	0	5	6	13
7. Water supply time										
7.1 Water supply in Summer (%)										
24 hours	100	30	37	96	65	0	10	100	28	54
Regular	0	70	60	4	34	95	15	0	51	34
Irregular	0	0	3	0	1	5	75	0	21	11
No water	0	0	0	0	0	0	0	0	0	1
Average hours	24.0	12.0	7.0	5.0	12.0	10.0	4.0	24.0	12.7	9.9
7.2 Water supply in Winter (%)										
24 hours	100	100	83	98	95	0	20	100	30	65
Regular	0	0	17	2	5	98	5	0	50	23
Irregular	0	0	0	0	0	2	75	0	20	10
No water	0	0	0	0	0	0	0	0	0	3
Average hours	24.0	24.0	7.0	5.0	15.0	10.0	4.0	24.0	12.7	10.1
8. Water usage (%)										
Cooking	34	34	32	32	33	33	30	33	33	32
Shower and bath	33	33	32	31	33	32	31	33	33	32
Laundry	33	33	32	31	33	33	30	34	33	31
Toilet	0	0	3	6	3	2	6	0	3	4
Gardening	0	0	1	0	0	0	3	0	1	2
9. Water quantity evaluation (%)										
Rich	0	30	20	54	35	12	30	95	38	27
Fair	90	40	37	30	39	66	40	5	44	42
Bad	10	30	43	16	26	22	30	0	19	31
10. Water quality evaluation (%)										
Good	10	77	63	80	69	17	10	100	36	53
Fair	40	23	37	14	24	34	40	0	28	20
Bad	50	0	0	6	7	49	50	0	38	27
11. Monthly water fee (AMD/month)										
Monthly regular water fee	200-300	250	250-300	0	230-280	0	0	100	100	180-260
12. Affordable water fee (AMD/month) (%)										
0	90	10	50	62	48	42	90	19	49	49
0-300	10	43	0	0	12	12	5	5	9	10
301-500	0	10	3	4	5	17	5	52	23	9
501-1000	0	27	23	22	22	19	0	24	16	17
1001-2000	0	7	14	0	5	10	0	0	5	5
2001-3000	0	0	0	0	0	0	0	0	0	1
3001-	0	0	0	0	0	0	0	0	0	1
13. Desirable payment method (%)										
Be resident number	10	0	0	2	2	0	0	0	0	6
By water volume	10	83	47	38	49	76	55	91	74	45
Fixed fee	20	7	13	10	11	17	15	4	14	15
Difficult to answer	60	10	40	50	38	7	30	5	13	32
As decided	0	0	0	0	0	0	0	0	0	1
14. Water meter installation (%)										
Acceptance rate	10	60	57	46	49	90	55	95	83	46
15. Preferable water supply (%)										
House connection	100	77	83	67	77	97	100	100	99	79
Public tap	0	23	17	33	24	3	0	0	1	21
Water truck	0	0	0	0	0	0	0	0	0	0
16. Water related desease in 2006 (%)										
Percentage of sampling numbers	0	0	0	0	0	10	35	0	14	11

Source: JICA Study Team, 2007

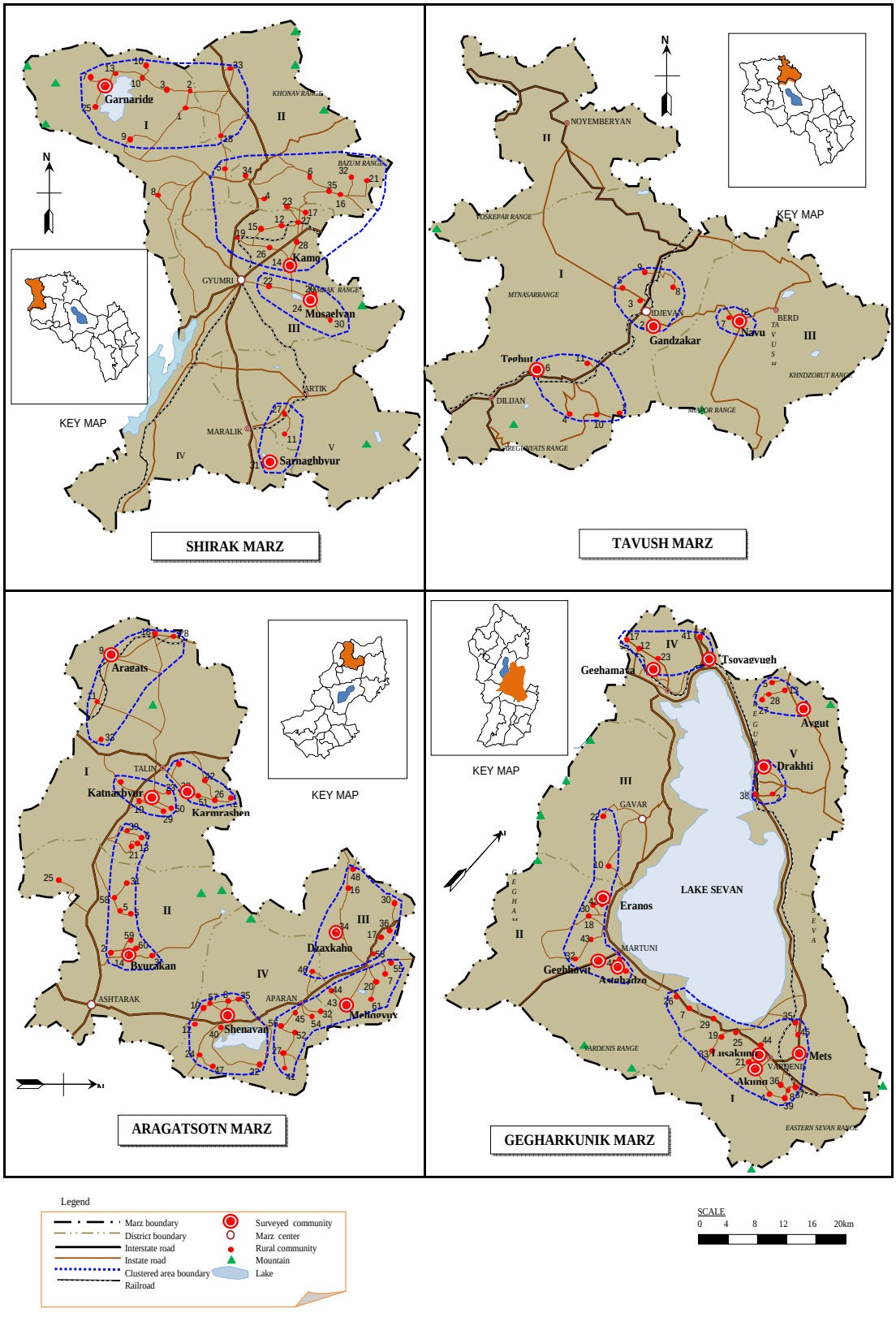


Figure 7.2.1 Willingness to Pay Survey Target Rural Communities

Source: JICA Study Team, 2007

CHAPTER 8 ORGANIZATION AND INSTITUTIONAL STUDY OF RURAL WATER SUPPLY SYSTEMS

8.1 Administrative Framework for Rural Water Supply in the Republic of Armenia

8.1.1 Institutional and Policy Framework

The legal and institutional structure of the water sector in Armenia is based on the National Water Code adopted in 2002. The Water Code defines three major functions in the water sector: (1) management of water resources, (2) management of water systems, and (3) regulation of water supply and wastewater services. Table 8.1.1 summarizes the main functions of the water sector management authorities in the Republic of Armenia.

Table 8.1.1 Main Functions of the Water Sector Management Authorities

	Water Resources Management and Protection	Tariff Regulation	Management of Water Systems
Responsible Agency	Water Resources Management Agency under the Ministry of Nature Protection	Public Services Regulatory Commission	State Committee on Water Systems under the Ministry of Territorial Administration
Main Functions	- Water resources monitoring and distribution - Strategic water management and protection	- Protection of consumer rights and tariff regulation for monopoly water supply and wastewater treatment in the drinking, household and irrigation sectors	- Management of water systems under state ownership - Assistance to development of water user associations and water user federations - Organization of biddings on transfer of water systems' management
Enforcement Tools/ Mechanisms	Water use permits	Water systems use permits	Management contract

Source: JICA Study Team, 2008

After adoption of the Water Code, the legal framework in the water sector in Armenia was further developed through adoption of the Law on Fundamental Provisions of the National Water Policy in the Republic of Armenia and the Law on the National Water Program.

Law on Fundamental Provisions of the National Water Policy in the Republic of Armenia was adopted in 2005. It represents a long-term development concept for strategic use and protection of water resources and water systems.

The Law on the National Water Program was adopted in 2006. The main objectives of the law are satisfaction of the needs of population and economy through efficient management of water resources, provision for ecological sustainability of the

environment, formation and use of strategic water reserves, and determination of actions towards solution of issues related to the protection of the national water reserves.

In addition to this, the Government of Armenia has adopted the Republic of Armenia Draft Law on Drinking Water, which will be discussed in the National Assembly (Parliament) later in 2009. The purpose of this draft law is the definition of the state policy principles and mechanisms for regulating drinking water supply and the wastewater collection sector, as well as ensuring present and future provision of services for supply of necessary quantity, duration and quality of drinking water and wastewater collection, aimed at the well-being of the population.

8.1.2 Role of Key Authorities and Agencies

(1) The Ministry of Nature Protection (MONP)

The MONP has a broad mandate of natural resources management and protection, which is fulfilled through various agencies of the MONP. The Water Resources Management Agency (WRMA) under the MONP is the state authorization for water resources management and protection. It is responsible for carrying out the RoA's water resources management and protection responsibilities under the Code. This entity is charged with estimating water availability and ensuring water use efficiency, through the permitting and planning processes. It is also responsible for management of competing water uses and for ensuring that environmental needs are met. Moreover, the WRMA is charged with the coordination of the National Water Policy and the National Water Program development. It is also responsible for development of the river basin management and planning components described in the Water Code. The Basin Management Organizations (BMOs) under WRMA are responsible for developing water management plans at the river basin level, recording water use permits, ensuring water resources protection, assuring compliance with conditions set in water use permits, developing extraction regimes, and for participating in the development of water allocation plans for each of the established five primary basin management areas.

(2) The Public Services Regulatory Commission (PSRC)

The PSRC is responsible issuing water system use permits, the monitoring of the quality of service provision and the setting of tariffs. The PSRC was established by the Water Code on the institutional basis of the former Energy Regulatory Commission. The PSRC only recently became actively engaged in economic regulation in the water sector. Some of the functions of the PSRC in the water sector are not yet clearly defined by law or not

yet appropriately interpreted by other agencies and organizations in the water sector.

(3) The State Committee on Water Systems (SCWS)

The SCWS under the Ministry of Territorial Administration is a state authorized body for water systems management and is responsible for the management and operation of state owned drinking water supply, irrigation water supply, drainage structures and public wastewater collection, treatment and disposal facilities. It is also responsible for operation of Vorotan-Arpa-Sevan tunnel, issuance of contracts and agreements for third party management, operation and maintenance of water systems, as well as for transferring authorities for exploitation of irrigation systems to Water Users Associations (WUA) and Federations of Water Users Associations (FWUA).

The SCWS manages the assets of the Armenian Water and Sewerage Company (AWSC) (100% state-owned Closed-Joint Stock Company (CJSC)), Yerevan Water (100% state-owned CJSC). It also manages the state shares (51%) of "Nor-Akunk", "Shirak" and "Lori" Water Supply and Sewerage Companies. SCWS also manages the "Water Systems Development and Improvement Project Implementation Unit (PIU)", the "Municipal Development Project Management Unit", and the "Department of Vorotan-Arpa-Sevan Tunnel Operation".

The SCWS under the Ministry of Territorial Administration of the Republic of Armenia was established by the Government of Armenia Decision No.92 of February 9, 2001. According to the Charter, the Committee develops and implements Government of Armenia policy on management and use of water systems under the State ownership.

The main objectives and goals of the SCWS are the following:

- Management and provision of safe water systems under the state ownership,
- Implementation of the National Water Program components under its jurisdiction,
- Development and implementation of investment policy on water systems, as well as organization of expertise on investment programs.

The main functions of the SCWS include the following:

- Participation in preparation of the National Water Program,
- Participation in works for calculating annual and long-term demand of usable water resources,
- Implementation of re-distribution of usable water resources,
- Management of state organization implementation investment programs in the

sector,

- Provision of initial expertise on construction and renovation works impacting water systems,
- Provision and oversight of the safe use of hydro-technical structures,
- Monitoring of works for entities holding a non-competitive water system use permit,
- Management functions related to commercial organizations in the sector which have the state as one of the shareholders,
- Participation in development of norms for water supply and discharge, as well as reduction of water losses,
- Submission of proposals to PSRC on regulatory tariffs, water system use permits and permit conditions,
- Definition of sanitary protection zones for water ecosystems,
- Implementation of administrative statistical registers,
- Support for international cooperation in the sector within its jurisdiction.

The SCWS management is done by the Chairman of the SCWS, who is appointed and released from duties by the Prime Minister of the Republic of Armenia. The Chairman of the SCWS has Deputies who are appointed and released from duties by the Minister of Territorial Administration.

The organizational chart of the SCWS is shown in Figure 8.1.1. Staff of the SCWS include various departments and divisions. The structure of the Staff of the SCWS is provided below.

The SCWS has 64 employees, 11 of which work in the top management level, 16 in the Secretariat, 10 in the Department for Coordination of Water-Economy Infrastructures, 13 in the Department for Coordination of Financial, Economic and Registry Activities, 5 in the Legal Department and 9 in the Department for Inspectorate Control.

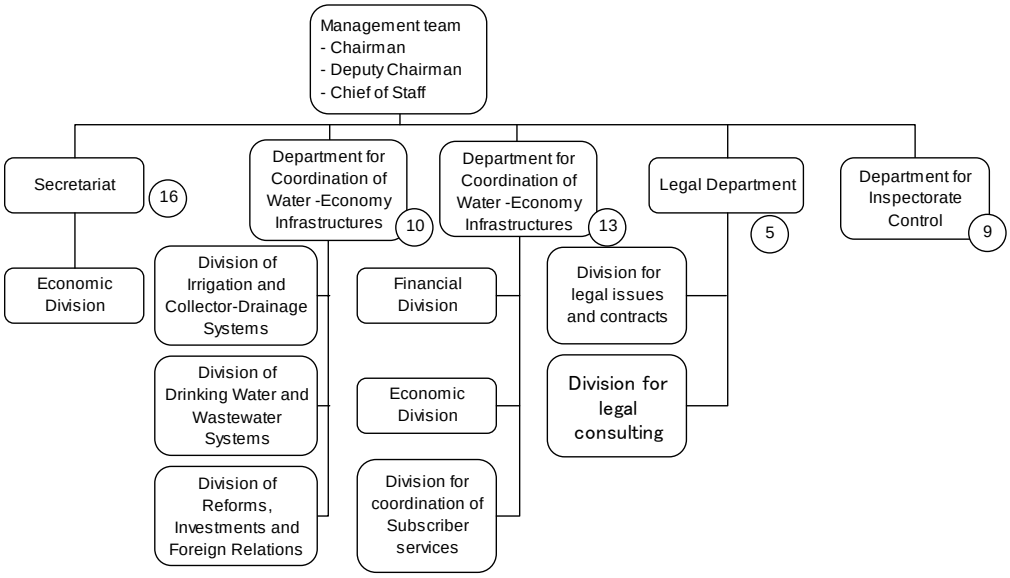


Figure 8.1.1 Organizational Chart of SCWS

Source: SCWS, 2008

8.2 Water Supply Systems

8.2.1 Water Supply Companies

There are currently five water supply and sewerage companies in the Republic of Armenia: Yerevan Water, Armenia, Lori, Shirak and Nor Akunk Water Supply and Sewerage Companies.

"Yerevan Water" serves the city Yerevan and neighboring 27 rural communities in Kotayq, Aragatsotn, Ararat and Armavir marzes. The total population of the service area of "Yerevan Water" is over 1,165,000. As of 2008 the number of water customers in Yerevan Water was 328,200, and approximately 91.4% of the customers of Yerevan Water had installed water meters.

The "Armenian WSC" serves 279 urban and rural communities in the Republic of Armenia. The service area of the AWSC includes 38 urban and 241 rural communities in Aragatsotn, Armavir, Ararat, Gegharkunik, Lori, Kotayq, Shirak, Syunik, Vayotz Dzor and Tavush marzes. The total population of the service area of the "Armenian WSC" is approximately 915,000. As of 2008 the number of water customers in AWSC was 268,000. As of 2008 approximately 63.5% of the customers of AWSC had installed water meters.

The "Lori" WSC serves 17 communities in Lori Marz, including the city Vanadzor. The total population of the service area of "Lori" WSC was approximately 115,000. As of 2008 the number of water customers in LWSC was 38,700, and approximately 81.9% of the customers of LWSC had installed water meters.

The "Shirak" WSC serves 35 communities in Shirak Marz, including the cities Gyumri and Maralik. The total population of the service area of "Shirak" WSC is approximately 185,000. As of 2008 the number of water customers in SWSC was 65,800, and approximately 39.9% of the customers of SWSC had installed water meters.

The "Nor Akunq WSC" serves 12 communities in Armavir Marz, including the cities Armavir and Metsamor. The total population of the service area of "Nor Akunq" WSC is approximately 63,000. As of 2008 the number of water customers in NAWSC was 16,200, and approximately 96.6% of the customers of NAWSC had installed water meters.

As seen in Table 8.2.1, tariff levels and collection rates are still below that which is needed to cover full operation and maintenance (O&M) costs. Capital expenditures will continue to be unaffordable from utility revenue alone. Long-term financing from subsidies and/or donors will remain necessary until Armenia's average incomes are a multiple of current levels. The only exception is Yerevan Water, which did not receive state subsidies in 2007. Moreover, in 2007 Yerevan Water has paid to the state budget 1.9 billion AMD.

Table 8.2.1 Combined Summary Information for the Five Water Supply Companies for 2007

	Yerevan Water	AWSC	LWSC	SWSC	NAWSC	Total
Communities served	28	279	17	35	12	371
Population	1,165,000	915,000	115,000	185,000	63,000	2,443,000
Water Customers	328,200	268,000	38,700	65,800	16,200	716,900
Water Meter Installation	91.4%	63.5%	81.9%	39.9%	96.6%	77%
Water tariff*1, AMD/m^3	172.8	140.0	121.16	120.14	150.20	-
Collection rate (%)	92	75	70	67	91	-
Net profit (loss) after deduction of profit tax, in thousand AMD, 2006 data	1,688,125	(1,002,610)	(12,677)	(37,516)	(183,852)	-

Source: Public Services Regulatory Commission, 2008

Note; *1: Water tariff consists of portable water supply, drainage and wastewater treatment fees

8.2.2 Community-owned Water Supply Systems

As of 2007, there are 549 communities[1] in the Republic of Armenia not being served by any of the five water supply companies. The total population in those communities is approximately 550,000, or roughly 18.5% of the total population of the country.

For the communities with their own supply there are no specialized organizations in charge of operation and maintenance of drinking water supply systems. In most cases, offices of the communities are in charge of O&M, however in most cases they don't have specialized staff in charge of the drinking water sector.

As of the153 surveyed rural communities within JICA Study area, full or partial repair of most of the water supply facilities (intake, transmission pipe, reservoir, distribution pipe, public taps, and pumps) is required.

8.3 Operation and Maintenance Arrangements

As of 2008, 371 communities representing over 81.5% of the total population are served by the State water companies. Remaining population is served by the community-owned water supply systems.

According to the law "On Local Self-governance", head of communities are responsible for providing water service within a community unless the water sources and facilities serve more than one community. If the water sources and facilities do serve multiple communities, one of five state-owned companies shall provide the water service.

There are three types of operational arrangements for water supply systems in Armenia as shown in Table 8.3.1.

Table 8.3.1 Main Operation Arrangements for Water Supply Systems

	Water Supply System		Owner of System	O&M	Assistance
Type 1	CJSC	Yerevan Water, AWSC	State	Foreign companies	World Bank
Type 2	CJSC	LWSC, SWSC, NAWSC	State and communities	State and communities	KfW
Type 3	Community-owned	Self-supply	Communities	Communities	None

Source: JICA Study Team, 2007

[1]) This number is approximate, since some communities include more than one settlement, and some other communities are just in the list of communities, and currently there is no population.

(1) Type 1 Operational arrangement

The first type of companies (Yerevan Water, AWSC) is owned by the State (100% of the shares of the CJSC); however, the operation and maintenance services are provided by foreign operators under management and lease contracts.

Yerevan Water is the largest of the five state companies and provides water and sewer services to the city of Yerevan and 27 neighboring communities, or roughly 39% of the total population. Yerevan Water is operated under a recently signed lease contract with Veolia, a French water company.

The next largest State water company is the Armenia Water Supply and Sewerage Company (AWSC). AWSC provides service to 279 urban and rural communities or roughly 30.5% of the population. AWSC is operated under the terms of a management contract with Saur, also a French water company.

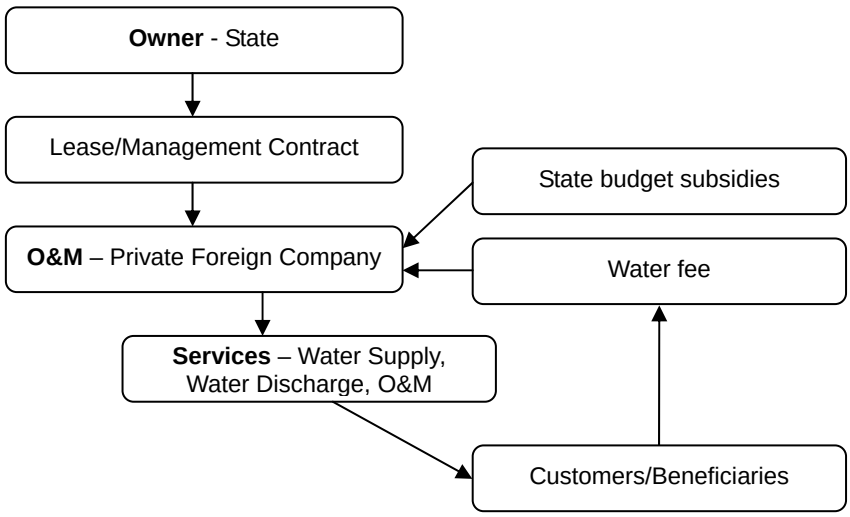


Figure 8.3.1 The Flow Chart of the Type 1 Operational Arrangements

Source: JICA Study Team, 2007

(2) Type 2 Operational arrangements

For the second type of companies (LWSC, SWSC, NAWSC) provide services to over 12% of the total population. These companies are managed with significant input from foreign consultants under the terms of a financing agreement between the State and the German leading agency, Kridietanstalt fur Wiederaufbau (KfW). It is important to note that the three companies that have financial support from KfW are owned 51% by the State and 49% by the respective municipality.

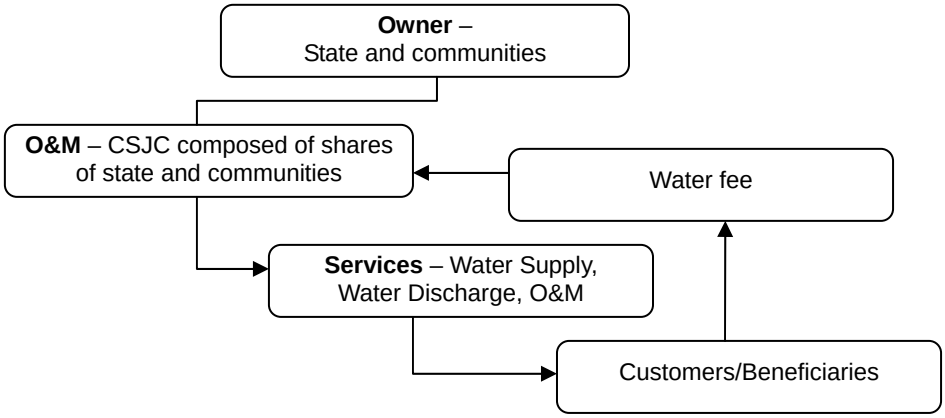


Figure 8.3.2 The Flow Chart of the Type 2 Operational Arrangements

Source: JICA Study Team, 2007

(3) Type 3 Operational arrangements

The third type refers to communities with their own supply of drinking water. Here, no specialized organizations exist and the responsibility for operation and maintenance of the system is on the respective community administrations (rural community heads).

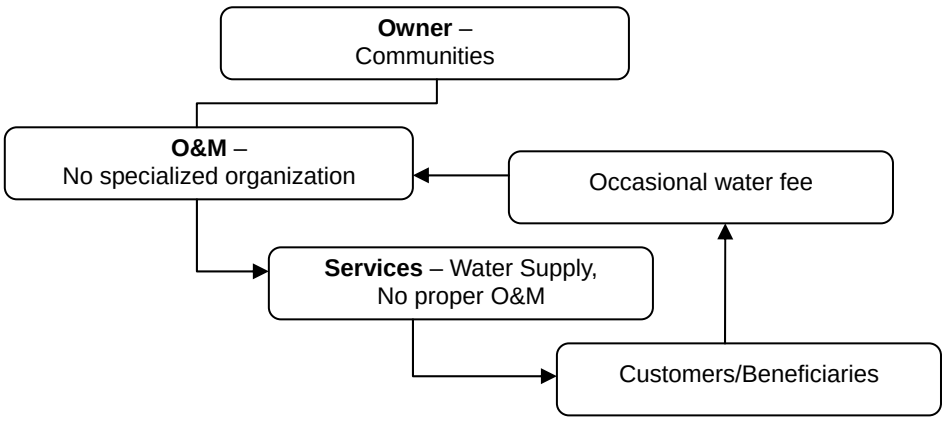


Figure 8.3.3 The Flow Chart of the Type 3 Operational Arrangements

Source: JICA Study Team, 2007

8.4 Water Tariff Methodology

(1) Water supply companies

On April 5, 2005 the PSRC issued its Resolution No. 33, which specifies the tariff methodology adopted by Commission for potable water supply, sewerage and wastewater treatment services by water supply companies. The methodology has been developed in

the line with the requirements of Article 14 of the Water Code of the Republic of Armenia, and defines the principles for developing tariff systems and calculating the tariff rates for utilities that provide drinking water supply, sewerage and wastewater treatment services.

According to the approved methodology, the tariff systems shall be developed in the following phases: a) calculating annual revenue requirements of the utilities, b) calculating the cost of services provided to customers and groups of customers, and c) developing tariff structures and calculating tariff rates. This section provides a brief description of each phase of tariff formulation.

The total revenue which the Companies are allowed to receive through tariffs, is called the revenue requirement or total cost of service. The revenue requirement should be sufficient to meet the total operating costs to ensure reliable, safe and uninterrupted functioning of the system and to receive reasonable profit from the attracted capital.

The revenue requirement shall be calculated by the following formula: RR=AC+D+AP-OI, where AC is allowed annual costs, D is annual depreciation of the fixed assets, AP is allowed profit and OI is other incomes.

The next phase of the tariff development is the cost analysis, which is aimed at determining the portion of total costs attributable to the various consumer groups and to allocate such costs proportionately among the respective groups. The cost analysis includes the following steps: 1. classification of costs, 2. classification of consumers, and 3. determination of allocation multipliers and allocation of costs.

The tariff structure is composed of the following types of retail and wholesale tariffs: 1. water supply tariffs, 2. water discharge tariffs, and 3. wastewater treatment tariffs. The tariff shall be considered in calculating the rates: 1. flat tariff structures, and 2. tariff structures by used volume.

(2) Community owned water supply systems

The community owned water supply systems are individually decided to the water tariff for the rural water supply. The water fee is not collected from beneficiaries in the majority of the community owned water supply systems. The Resolution No. 33 issued by PSRC for water tariff methodology is not applied to the community owned water supply systems.

CHAPTER 9 RURAL WATER SUPPLY PLAN

9.1 Strategies for the Improvement of Rural Water Supply and Sewage System

According to the results of the Socio-Economic and Water Supply Inventory Surveys, the strategies for the rehabilitation and improvement plan of the rural water supply and sewerage systems are described in the following sections.

(1) Most water supply facilities have already deteriorated and water leakage is the most severe problem. It shall be necessary to rehabilitate the water supply facilities in the rural communities.

(2) Water volume at the source is potentially sufficient judging from the Study Team's rough water availability and demand calculations. Water saving methods such as water meter installations are essential to improve the rural water supply systems.

(3) Once residents can receive water 24 hours a day, they intend to pay the water fees continuously. It shall be indispensable that an organization manages the water supply system surely and safely. An operation and maintenance organization shall be established.

(4) SCWS should coordinate the implementation of rehabilitation of the rural water supply systems to avoid duplication of the projects, since many rural water supply projects are being conducted by various entities in Armenia. According to the study, 14 on-going rehabilitation projects by international donors/NGOs/social funds or local budgets are currently in progress. Of these, 4 rural communities should be excluded from the proposed rehabilitation plan (since the on-going projects will rehabilitate the entire systems) and for another 10 (partial rehabilitation), the extent of on-going works should be taken into consideration.

9.2 Preconditions

The rehabilitation and improvement plan for the rural water supply and sewerage systems has been prepared according to the below-mentioned concepts:

(1) The water supply plan is for rehabilitation and improvement of the existing water supply facilities. New water supply facilities are not designed in principle.

(2) The water supply plan does not consider the population growth and population number in 2007 is applied as baseline number of population served.

(3) The rehabilitation of water supply facilities plan shall be based on the field survey results in which the rural community has requested rehabilitation.

9.3 Unit Water Demand Volume

(1) Applied guideline

The water supply plan shall follow the Armenian water supply criteria, Water supply transmission pipes and structure's construction norms and rules 2.04.02-84, and Water supply distribution network and structures' construction norms and rules 2.04.01-85. Most of the unit water demands are not regulated in the Armenian water supply criteria. The Study applies the following figures taken from the past experience and other guidelines.

(2) Unit water demand per person

The OECD EAP task force prepares "National Policy Dialogue on Financing Strategy for Rural Water Supply and Sanitation in Armenia". The final report is presented in June 2008. They propose policy scenario on a unit water demand per person in their program and set it at 1) 50 L/capita/day for public tap household or minimal water supply guideline, 2) 100 L/capita/day for yard tap household, and 3) 150 L/capita/day for in house tap household or maximal scenario.

Currently, 60% of households in 153 rural communities have already received house connection water supply services. The SCWS recommended 100 L/capita/day as a unit water demand for the rural water supply. Thus, the Study applies the unit water demand of 100 L/capita/day.

(3) Unit water demand for factories, pupils, clinics, hospitals, and livestock

1) Factories

There are two factories operating in two out of 153 rural communities in Gegharkunik Marz. One is a plastic factory, which consumes 50m^3/day, in Tsovagyugh and the other one is a milk factory, which consumes 15m^3/day, in Norakert. These water demands are included in the water demand calculation.

2) Pupils and medical facilities

The figures were estimated based on empirical studies of Armenia as shown in Table 9.3.1

Table 9.3.1 Unit Water Demand for Schools and Medical Facilities

Item	Unit water demand
Pupils	10L/pupils/day
First aid health post	500L/post/day
Medical ambulance station	1,200L/station/day

Source: Empirical studies done under USSR administration

3) Livestock

It is difficult to estimate the exact number of livestock in the target rural communities. The agricultural water supply investigation describes the livestock numbers per household. Unit water demand of livestock per household is calculated using these figures and it is designed to be 87L/household/day as shown in Table 9.3.2.

Table 9.3.2 Unit Livestock Water Demand Calculation

Livestock	Average Quantity per household	water demand	Total water Demand/household
	Head	L/head/day	L/day
Cattle	1.1	60	66.0
Sheep	0.6	8	4.8
Pig	0.2	30	6.0
Horse	0.1	50	5.0
Bird (chicken, duck)	2.5	2	5.0
Total	-	-	87.0

Source: Agricultural water supply by Karambirov N.A 1978

(4) Unaccounted for water

There is no regulation and guideline about unaccounted for water ratio in the Armenia. On-going international water supply projects are planned and designed to reduce unaccounted for water ratio from existing water supply facilities' leakage level, which is estimated about 50~70%, up to 20~25%. The Study applies to 20% of the total water demands as unaccounted for water.

(5) Peak factors

Peak factors that meet the Armenian water supply criteria are presented in Table 9.2.3.

Table 9.3.3 Applied Peak Factors

Item	Coefficient
Maximum daily water supply	K_{max} : 1.2
Maximum hourly water supply	$\alpha_{max}*\beta_{max}$ α_{max} : 1.3 β_{max} : 4.5~1.4 depending of the population

Source: Water supply transmission pipe and structure construction norms and rules 2.04.02-84

9.4 Water Supply Planning

(1) Population to be served

The Socio-economic survey asked about the population and household numbers for each rural community. Population data was taken from the socio-economic survey results.

(2) Water demand

1) Average daily water demand

The average daily water demand consists of base water demand and unaccounted for water, which is 20% of the base water demand.

The base water demand sums up 1) domestic water demand through multiplying population to be served by 100 L/capita/day, 2) factory water demand, 3) school water demand through multiplying the number of pupils by 10L/capita/day, 4) hospital water demand through multiplying the number of policlinic by 1,200L/capita/day, 5) medical ambulance station water demand through multiplying the number of medical ambulance station by 500L/capita/day, and 6) livestock water demand through multiplying the number of household by 87L/household/day.

2) Maximum daily water demand

It is 1.2 times of average daily water demand.

3) Maximum hourly demand

It is calculated multiplying two peak factors mentioned in 9.3 (5) by maximum daily water demand divided by 24. This figure is used to calculate the required reservoir volume.

(3) Evaluation of the water supply rehabilitation and improvement plan

Most of the rural communities have sufficient water sources. However, the water source in twenty one rural communities cannot satisfy the water demand under the present situation as shown in Table 9.4.1.

Almost all rural communities can receive minimal water supply guideline (50L/capita/day) level water supply service even in severe water supply conditions. No.11 Arteni and No.33 Lusakn in Aragatsotn Marz are part of the Irind regional water supply system and No.28 Tlik, and No.18 Getap are part of the Chlkan regional water supply system. It is expected that other rural communities, which take water from these regional water supply systems, save their water volume and allocate enough water volume for the four rural communities. Especially, water supply volume of No.11 Arteni is far less than the water demand, proper arrangement shall be necessary. The Study Team asked for data on water supply volume for No.8 Kamkhut and No.26 Shirak in Shirak Marz additionally since their minimal water demands are still higher than the supply volumes and they responded

that water supply volume was acceptable. Additional water sources would not be required at this moment. It can be expected that water supply rehabilitation plan will fulfill at least minimal water service guideline level. Water flows out from water taps continuously under present situation, however, residents feel water shortage. Realization of the rural water supply plan and saving water are highly required in order to conduct stable water supply service throughout a year.

Table 9.4.1 Rural Communities with Insufficient Water Supply

Rural community	Minimum/ Measured water supply volume (m^3/d)	Water demand (100L/cap/day) (m^3/d)	Water demand (50L/cap/day) (m^3/d)	Remarks
Aragatsotn Marz				
No.1 Akunq	69.1/216.0	122.8	70.1	
No.11 Arteni*	129.6/1512.0	487.8	287.4	Irind regional water supply
No.18 Getap*	17.3/0.0	29.3	18.8	Chlkan regional water supply
No.23 Yeghnik*	43.2/43.2	76.8	48.0	Alternative spring exists 11km away**
No.28 Tlik*	17.3/0.0	20.5	13.8	Chlkan regional water supply
No.33 Lusakn*	17.3/17.3	31.8	19.8	Irind regional water supply
No.36 Tsilqar*	43.2/60.5	82.7	48.5	
No.42 Dzoragyugh	-/259.2	412.8	251.0	
No.49 Shenavan	207.4/432.0	248.3	146.3	
Shirak Marz				
No.8 Kamkhut*	8.6/25.9	47.6	30.1	Alternative spring exists 1km away**
No.12 Lernut	8.6/86.4	31.7	19.5	Water available 24hrs for both seasons***
No.13 Tsaghkut	17.3/43.2	42.6	25.4	Water available 24hrs for both seasons***
No.15 Karmraqar	8.6//17.3	9.0	5.3	Water available 24hrs for both seasons***
No.23 Mets Sariar	60.5/155.5	68.5	40.0	Water available 24hrs for both seasons***
No.24 Musaelyan	259.2/734.4	277.0	166.4	
No.26 Shirak*	8.6/43.2	164.8	98.9	
No.31 Sarnaghbyur	172.8/1166.4	491.9	291.9	
Gegharkunik Marz				
No.9 Geghamavan	43.2/155.5	292.9	177.5	8 free springs are available**
No.18 Tazagyugh	432.0/1468.8	434.3	263.9	Almost sufficient***
No.23 Tsaghkunq*	86.4/86.4	170.9	103.0	
No.24 Tsovagyugh*	604.8/864.0	683.6	443.7	

Note: * rural communities responded during the water resources survey that water volume is insufficient.
** Information comes from the existing water source survey.
*** Information comes from the socio-economic survey.
Source: JICA Study Team, 2008

9.5 Preliminary Water Supply Planning

9.5.1 Intakes

The existing intake structures are located at water source points which are mainly springs and water main pipeline, borehole, and river. The rehabilitation works of intake structures are aimed at replacing the existing ones. The existing intake structures' sizes and materials depend on each project and no standardized designs can be found. Thus, the Study proposes a standardized intake design. Some sites are quite difficult to access so that the use of concrete structures have been adopted for any new construction in view of

material transportation and ease of construction. The intake structures should be sized to provide preliminary settlement of the water. Thus, the intake structure should be designed to store the water flow for one minute. Flow rates range from 0.1~60.0 L/sec most water sources according to the field survey result. The capacities of the intake structures shall be designed from 1 m^3 to 4m^3. Design criteria for the flow rates and the intake structure capacities are presented in Table 9.5.1.

Table 9.5.1 Intake Capacity Standard Design

Flow rate	0~15 L/sec	16~30 L/sec	31~45 L/sec	46~ L/sec
Intake capacity	1 m^3	2 m^3	3 m^3	4 m^3

Source: JICA Study Team, 2007

9.5.2 Pipelines

(1) Material

There are three types of materials mainly used for the water supply systems in Armenia, namely steel pipe, polypropylene pipe, and polyethylene pipe. Steel pipes are mainly used in the existing pipelines. As they were mainly installed in the period of Soviet Union control, rust and corrosion are outstanding at present. Recently, polyethylene pipes have been installed in the rural communities according to the field survey results. It does not rust and the price is reasonable in comparison with steel pipe. Thus, non-steel types of pipe such as polyethylene, polypropylene, and polyvinyl chloride pipe have been chosen for the pipe material.

(2) Diameter

1) Transmission Pipeline

The existing pipeline diameter is relatively big in comparison with water flow rate inside pipe according to the field survey results. There are no guidelines regarding flow velocity in pipeline in Armenia. Pipe diameter of the transmission pipes is designed to allow flow velocity around 0.3~0.5 m/s.

2) Distribution Pipeline

Different diameter pipes are mixed together in the existing distribution pipelines, however, no distribution pipeline network designs exist. It is difficult to study appropriate pipe diameter by a pipeline route. The existing pipelines diameters are rather small in comparison with the transmission pipelines and they are as same level as the transmission pipe diameters which are design by the Study. Therefore, distribution pipe diameter shall be applied to the same diameters as the existing ones being rehabilitated.

9.5.3 Reservoirs

No particular design norm exists for reservoir capacity design in Armenia. The reservoirs should supply water for half a day under accidental disruption of the supply; therefore, storage capacity shall be designed for 12 hours of maximum hourly water demand in principle. If the reservoir serving a rural community does not need rehabilitation but the capacity does not satisfy the 12 hours water demand, an additional new reservoir will be constructed with a capacity designed to hold the 12 hours water demand minus the existing capacity.

Reservoir capacities are planned to range from $50m^3$ to $600m^3$ in $50m^3$ intervals in order to standardize the reservoir designs. If the existing reservoir has more than $600m^3$ capacity, more than one reservoir will be planned to satisfy the existing capacity.

9.5.4 House Connections and Public Taps

(1) House connections

It shall be planned to provide individual connection to ensure a stable water supply in the future. Socio-economic survey has identified the number of house connection in each rural community. Households, which do not have house connection presently, shall be added to the number of house connections to be constructed. No households have water meter currently. Water meter installation work shall be conducted for all the households in the design.

(2) Public taps

The water supply facility plan will provide house connection water supply service, thus the public tap will not be required in principle. Taking into consideration public water usage and emergency purposes, one public tap for up to each one hundred households shall be designed in the Study.

(3) Chlorination

Approximately 30% of rural communities conduct chlorination. They do not use specialized equipment for the chlorination, they simply pour chlorine into the system at a convenient point and at a rate based on their own criteria. It shall be necessary to establish the chlorination system after the project. Thus, chlorination equipment, which drips chlorine water into raw water, is to be provided at reservoir for all the rural communities.

(4) Drainage

Each rural community has a canal along the main road that is used for irrigation and drainage purposes. Drainage construction shall be estimated for 40% of the distribution pipeline rehabilitation work volume.

9.5.5 Proposed Water Supply Plan

(1) Overall summary

Water supply plans for 149 out of the 153 rural communities are presented in Table 9.5.2. Four rural communities have an on-going project run by other financial sources, and that is why they are excluded from the water supply plan.

The water supply rehabilitation and improvement plan will propose to achieve the following water supply services after the implementation:

- House connection water supply system with metered water payment
- Improvement of hygiene conditions by pouring chlorine into water

The total length of transmission pipes is planned to be 564.5 km and of distribution pipes is 843.6 km. The average rehabilitation length of both the transmission and the distribution pipes is about 4.9 km and 6.4 km, and total pipe length is 11.3 km. There are total of 248 intakes which average to nearly 2 intakes for each community. The average number of reservoirs is approximately one for each community. New house connections are estimated at about 21,900 and water meter installations at 51,900 households. Around 40% of households will have water tap inside their house yard after the project. A total of 585 pubic taps will be planed and they are nearly 4 public taps in each rural community.

Table 9.5.3 Summary of Water Supply Plan

Structures	Unit	Total	No of community	Average
Intakes	nos	248	128	1.9
Transmission pipe	km	564.5	116	4.9
Reservoirs	nos	171	126	1.4
Distribution pipe	km	843.6	131	6.4
House connections	nos	21,897	124	176.6
Water meter installation	nos	51,867	147	352.8
Public taps	nos	585	147	3.9
Chlorination	nos	191	147	1.3
Pumps	nos	5	4	-

Source: JICA Study Team, 2008

(2) Aragatsotn Marz

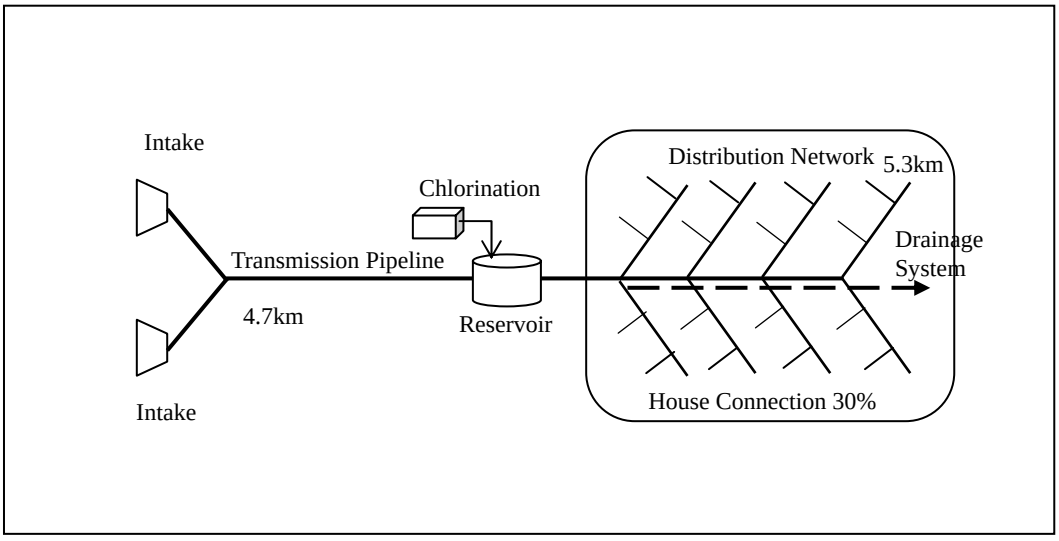
The average length of the transmission pipe (4.7km) is nearly equal to the average length of the whole plan (4.9km), and the average length of the distribution pipe (5.3km) is rather small in comparison with the average length of the whole plan (6.4km). Average number of reservoir rehabilitation is 1.2, it is nearly equal to the average of whole plan (1.4). It proved that one project scale is moderate. 70% of households have already connected to the distribution pipeline out of 61 rural communities, house connection rate is the highest among four marzes. (Refer to Table 9.5.4)

Table 9.5.4 Water Supply Plan in Aragatsotn Marz

Structures	Unit	Total	No. of community	Average
Intakes	nos	120	54	2.2
Transmission pipe	km	237.0	50	4.7
Reservoirs	nos	56	48	1.2
Distribution pipe	km	299.8	57	5.3
House connections	nos	4,478	44	101.8
Water meter installation	nos	15,036	60	250.6
Public taps	nos	178	60	3.0
Chlorination	nos	66	60	1.1
Pumps	nos	3	2	-

Source: JICA Study Team, 2008

General water supply rehabilitation and improvement plan image of the Aragatsotn Marz consists of; 1) two intakes, 2) one transmission pipeline of 4.7km in length, 3) one reservoir with chlorination equipment, 4) 5.3km of distribution pipelines network, 5) expansion of house connection for 30% households, and 6) improvement of drainage system. (Figure 9.5.1)



Source: JICA Study Team, 2008

Figure 9.5.1 General Scheme of Water Supply Plan in Aragatsotn Marz

(3) Shirak Marz

The water supply facilities of No.16 Karmraqar, No.21 Dzorashen, and No.35 Poqr Sariar are rehabilitated under the Shirak Marz budget. These three rural communities are excluded from the water supply plan and the Study prepares the water supply rehabilitation and improvement plan for a total of 32 rural communities.

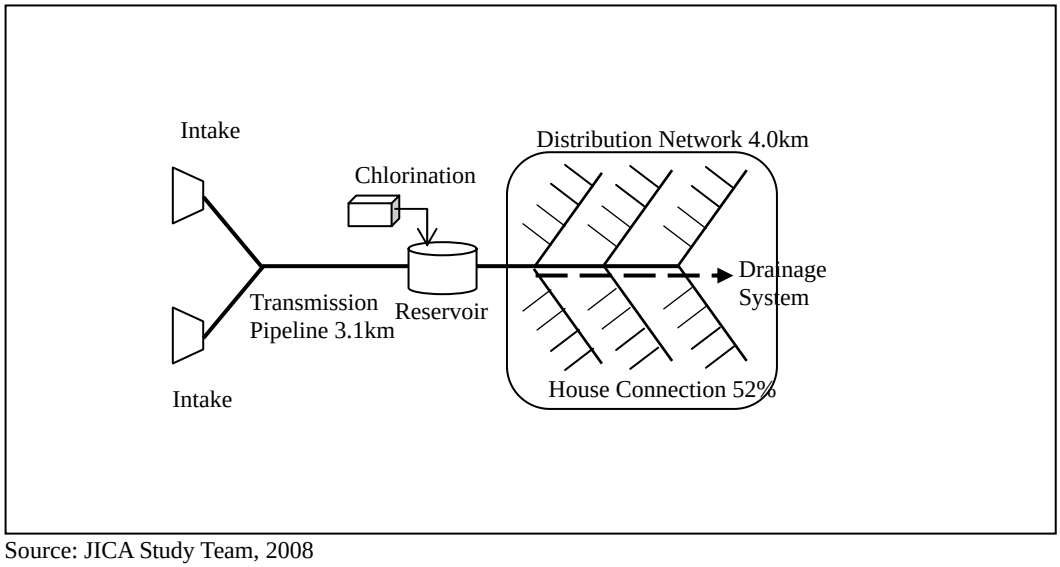
The average length of the pipelines in Shirk Marz is 3.1 km for transmission pipe and 4.0 km for distribution pipe. Average rehabilitation pipeline length in Shirak Marz (7.1 km) is about 60% of average pipeline rehabilitation lengths (11.3 km).

Table 9.5.5 Water Supply Plan in Shirak Marz

Structures	Unit	Total	No of community	Average
Intakes	nos	52	31	1.7
Transmission pipe	km	69.0	22	3.1
Reservoirs	nos	39	32	1.2
Distribution pipe	km	89.1	22	4.0
House connections	nos	3,113	32	97.3
Water meter installation	nos	5,957	32	186.2
Public taps	nos	75	32	2.3
Chlorination	nos	39	32	1.2
Pumps	nos	-	0	-

Source: JICA Study Team, 2008

General water supply rehabilitation and improvement plan image of the Shirak Marz consists of; 1) two intakes, 2) one transmission pipeline of 3.1km in length, 3) one reservoir with chlorination equipment, 4) 4.0km of distribution pipelines network, 5) expansion of house connection for 52% households, and 6) improvement of drainage system. Project scale is the smallest and house connection work volume (52%) is the largest among four marzes.



Source: JICA Study Team, 2008

Figure 9.5.2 General Scheme of Water Supply Plan in Shirak Marz

(4) Gegharkunik Marz

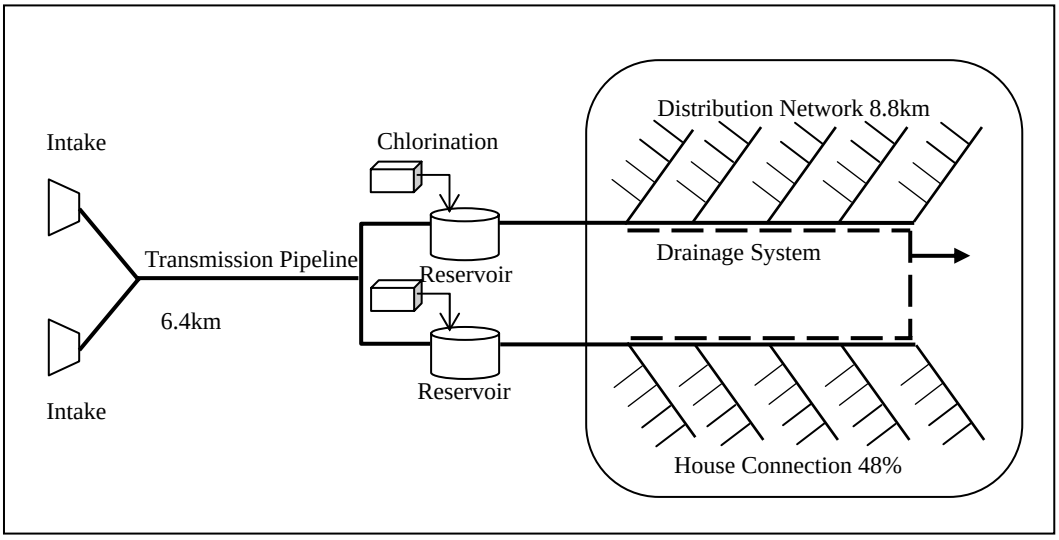
The average length of the pipelines rehabilitation reaches 15.2km, which is 1.3 times larger than the average pipeline length (11.3km). Especially, average transmission pipeline length is long in comparison with other three marzes. Also, house connection numbers and water meter installation numbers are almost twice the average numbers. Water supply rehabilitation and improvement plan is the largest among the four marzes. (Refer to Table 9.5.6)

Table 9.5.6 Water Supply Plan in Gegharkunik Marz

Structures	Unit	Total	No of community	Average
Intakes	nos	57	34	1.7
Transmission pipe	km	210.7	33	6.4
Reservoirs	nos	54	35	1.5
Distribution pipe	km	378.0	43	8.8
House connections	nos	12,970	37	350.5
Water meter installation	nos	26,748	44	607.9
Public taps	nos	287	44	6.5
Chlorination	nos	68	44	1.5
Pumps	nos	2	2	-

Source: JICA Study Team, 2008

General water supply rehabilitation and improvement plan image of the Gegharkunik Marz consists of; 1) two intakes, 2) one transmission pipeline of 6.4km in length, 3) two reservoirs with chlorination equipment, 4) 8.8km of distribution pipelines network, 5) expansion of house connection for 48% households, and 6) improvement of drainage system. Major features of the Gegharkunik water supply rehabilitation plan are; 1) larger scale of pipeline systems and 2) rehabilitation of two reservoirs serving large number of beneficiaries. House connection work rate is also relatively high (48%) and is close the rate in Shirak. (Figure 9.5.3)



Source: JICA Study Team, 2008

Figure 9.5.3 General Scheme of Water Supply Plan in Gegharkunik Marz

(5) Tavush Marz

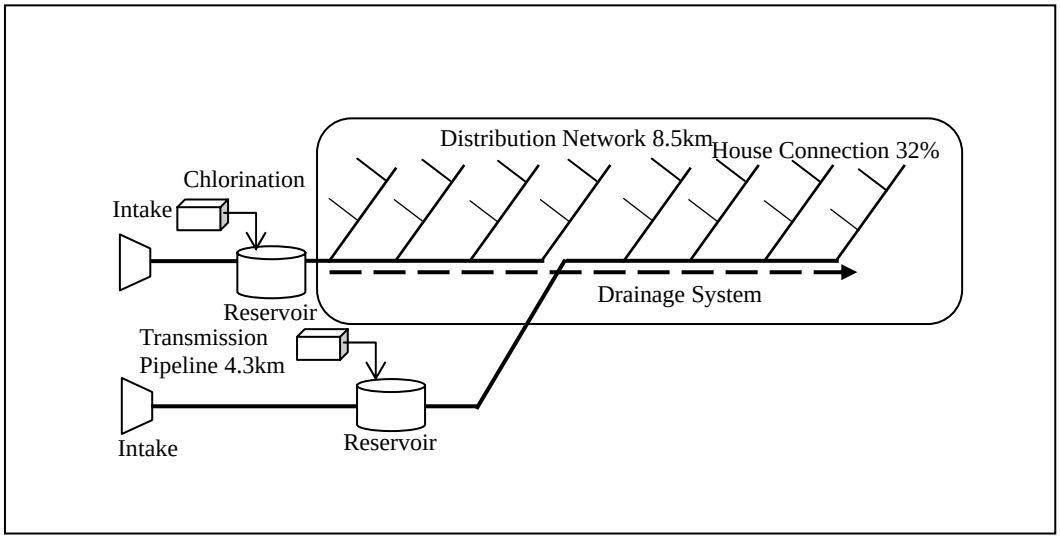
The average length of transmission pipeline rehabilitation (4.3km) is almost the same as the average length of the whole plan (4.9km), however the distribution pipeline rehabilitation lengths (8.5 km) is comparatively longer considering the beneficiaries' scale. Rural communities in Tavush Marz are located along the ridge of mountains, pipeline length is also extended. The plan proposes two reservoirs in average and is the largest of four marzes. House connection and water meter installation numbers per one rural community are almost equal to the average figures. (Refer to Table 9.5.7)

Table 9.5.7 Water Supply Plan in Tavush Marz

Structures	Unit	Total	No of community	Average
Intakes	nos	19	9	2.1
Transmission pipe	km	47.8	11	4.3
Reservoirs	nos	22	11	2.0
Distribution pipe	km	76.7	9	8.5
House connections	nos	1,336	11	121.5
Water meter installation	nos	4,126	11	375.1
Public taps	nos	45	11	4.1
Chlorination	nos	18	11	1.6
Pumps	nos	-	0	-

Source: JICA Study Team, 2008

General water supply rehabilitation and improvement plan image of the Tavush Marz is slightly different from other marzes due to topographical characteristics. It consists of 1) two intakes, 2) two transmission pipelines of 4.3km in length, 3) two reservoirs with chlorination equipment, 4) 8.5km of distribution pipelines network, 5) expansion of house connection for 32% households, and 6) improvement of drainage system. (Figure 9.5.4)



Source: JICA Study Team, 2008

Figure 9.5.4 General Scheme of Water Supply Plan in Tavush Marz

9.6 The Rural Water Supply System Improvement Project

9.6.1 Phased implementation of the Rural Water Supply Improvement Project

One of the main objectives of the JICA study for improvement of rural water supply and sewage systems in the Republic of Armenia is formulation of a project for improvement of rural water supply systems consisting of rehabilitation of the existing water supply facilities. It is obvious that immediate implementation of the project after the Study is one of the most important issues. However, as described in the later chapter, the total construction cost is estimated to be about USD 80.6 million. From a viewpoint of budgetary scale for a typical rural water supply project, this amount is too large to implement as single project. On the other hand, since immediate implementation of the project is needed, it should not be divided into many phases and prolong the completion of the project. Therefore, it is suggested that the project implementation should be divided into two phases. As a result of the alternative studies, the Phase 1 will improve the water supply systems for 56 rural communities in the Gegharkunik and Tavush Marzes and the Phase 2 will improve the ones for 93 rural communities in the Aragatsotn and Shirak Marzes. Alternative studies results are described in the Chapter 11 Implementation Plan.

9.6.2 Project Contents of Phase 1 and 2

Project contents of each phase are summarized in below:

Table 9.6.1 Contents of the Project for Improvement of Rural Water Supply Phase 1

No.	Item	Unit	Gegharkunik	Tavush	Total
1	Intake: Capacity 1~4m^3	Place	57	19	76
2	Transmission pipe				
	Dia.50mm	km	8.5	0.6	9.1
	Dia.75mm	km	31.8	0.8	32.6
	Dia.90mm	km	8.9	15.7	24.6
	Dia.110mm	km	72.8	30.7	103.5
	Dia.150mm	km	38.4	0	38.4
	Dia.200mm	km	51.1	0	51.1
	Dia.250mm	km	0.3	0	0.3
3	Reservoir: Capacity 50~600m^3	Place	54	22	76
4	Distribution pipe				
	Dia.50mm	km	125.7	22.6	148.3
	Dia.75mm	km	30.3	2.7	33.0
	Dia.90mm	km	5.3	2.3	7.6
	Dia.110mm	km	166.9	39.0	205.9
	Dia.150mm	km	45.0	7.6	52.6
	Dia.200mm	km	5.6	2.5	8.1
	Dia.250mm	km	0.3	0	0.3
5	House connection	Place	12,970	1,336	14,306
6	Water meter installation	Place	26,748	4,126	30,874
7	Public tap	Place	287	45	332
8	Chlorine equipment	Place	68	18	86
9	Pump	Place	2	0	2
10	Drainage	km	151.6	30.7	182.3

Source: JICA Study Team, 2008

Table 9.6.2 Contents of the Project for Improvement of Rural Water Supply Phase 2

No.	Item	Unit	Aragatsotn	Shirak	Total
1	Intake: Capacity 1~4m^3	Place	120	52	172
2	Transmission pipe				
	Dia.50mm	km	7.4	0	7.4
	Dia.75mm	km	34.1	5.9	40.0
	Dia.90mm	km	49.2	21.9	71.1
	Dia.110mm	km	64.0	21.1	85.1
	Dia.150mm	km	81.9	19.4	101.3
	Dia.200mm	km	1.2	0.7	1.9
	Dia.250mm	km	0.3	0	0.3
3	Reservoir: Capacity 50~600m^3	Place	56	39	95
4	Distribution pipe				
	Dia.50mm	km	60.8	4.6	65.4
	Dia.75mm	km	8.9	26.9	35.8
	Dia.90mm	km	36.1	1.1	37.2
	Dia.110mm	km	115.0	51.6	166.6
	Dia.150mm	km	68.9	2.1	71.0
	Dia.200mm	km	8.9	2.8	11.7
	Dia.250mm	km	2.3	0	2.3
5	House connection	Place	4,478	3,113	7,591
6	Water meter installation	Place	15,036	5,957	20,993
7	Public tap	Place	178	75	253
8	Chlorine equipment	Place	66	39	105
9	Pump	Place	3	0	3
10	Drainage	km	120.4	35.6	156.0

Source: JICA Study Team, 2008

9.7 Cost Estimates

9.7.1 Construction Costs

(1) Unit price component

The unit price of one work item consists of 1) procurement of the material, 2) transportation cost, 3) construction/installation cost, 4) other expenses (5.3%), and 5) overhead and profit of the contractor (10.0%). The values for the “Other expenses” (5.3%) and “overhead and profit” (10.0%) are the standard figures normally used in Armenia.

(2) Exchange rates

The following exchange rates among Armenian Dram, US Dollar, and Japanese Yen are applied. (issued by the Central Bank of Armenia on May 31st 2008)

1) USD 1 = AMD 305.52 = JPY 105.50
2) JPY 10 = AMD 28.96

(3) Construction costs (direct cost)

The construction cost is estimated through multiplying work quantities shown in Table 9.5.2 by unit prices.

The total construction cost is AMD 24.6 billion, which is equivalent to USD 80.6 million or JPY 8.5 billion. Construction cost of each rural community is attached to DATA BOOK and a summary of the estimated construction costs for each phase and marz is shown in Table 9.7.1.

Table 9.7.1 Summary of Construction Cost by Each Phase and Marz

Construction cost	AMD (x1,000)	USD (x1,000)	JPY (x1,000)	Cost per rural community USD (x1,000)
Phase 1				
Gegharkunik Marz	10,839,251	35,479	3,743,035	788
Tavush Marz	2,086,919	6,831	720,671	621
Total	12,926,170	42,310	4,463,706	756
Phase 2				
Aragatsotn Marz	8,642,993	28,289	2,984,490	464
Shirak Marz	3,057,014	10,006	1,055,663	313
Total	11,700,007	38,295	4,040,123	412
Grand total	24,626,177	80,605	8,503,829	541

Source: JICA Study Team, 2008

9.7.2 Project Costs

(1) Cost components

The project costs consist of Construction cost, plus 1) Price escalation, 2) Physical contingency, 3) Consulting services, 4) Administration cost, 5) Tax and duties, and 6) Interest during the construction period.

No.3) Consulting services mainly consist of two components; a) detailed design, tendering, and supervision of construction works of each rural community's water supply facilities and b) training of O&M staffs and improvement of O&M organization.

The Project is to rehabilitate the existing water supply facilities, land acquisition will not occur in principle. Thus, land acquisition and compensation is estimated to be included in No.4) Administration cost.

The construction cost is huge in volume in order to be conducted as grant aid project. It is assumed that the proposed plans will be conducted by loan. Loan interest is set at 1%, which is the mean value of the existing loan projects related to water supply and sanitation sector. Figures applied for each item are presented in Table 9.7.2.

Table 9.7.2 Figures Applied for Project Cost Components

No.	Item	Figures Applied	Equation
1	Price escalation	3.3%: Inflation rate in Armenia for the last 5 years (2001~2006)	3.3% of construction or consulting services or administration cost

No.	Item	Figures Applied	Equation
2	Physical contingency	5%	5%×(construction cost or consulting services or administration cost + item1 of each cost)
3	Administration cost	10%	10%×((construction cost + item 1+ item 2) + (consulting services + (item 1 + item 2) of consulting services))
4	Tax and duties	20%	20%×(construction cost with item 1 and item2 + consulting service with item 1 and item 2+ administration cost with item1 and item2)
5	Loan interest	1%	Average interest of the existing loan projects

Source: JICA Study Team, 2008

(2) Project costs

Total project costs including not only loan portion but also Armenian side expenses, are nearly USD 144 million (AMD 43,928 million).

Total project cost of Phase 1 is around USD 75 million (AMD 23,026 million). Loan portion is USD 53 million (AMD 16,279 million) and Armenian side costs USD 22 million (AMD 6,747 million).

Total project cost of Phase 2 is around USD 68 million (AMD 20,902 million). Loan portion is USD 48 million (AMD 14,771 million) and Armenian side costs USD 20 million (AMD 6,131 million).

Table 9.7.3 Project Cost Summary of Phase 1 and 2

No.	Item	Phase 1		Phase 2		Total	
		USD (1000)	AMD (million)	USD (1000)	AMD (million)	USD (1000)	AMD (million)
Loan portion							
1	Construction cost	42,310	12,927	38,296	11,700	80,606	24,627
2	Price escalation (3.3% compound) of No.1	5,537	1,691	4,849	1,481	10,386	3,172
3	Physical contingency (5.0%) of No.1 and No.2	2,393	731	2,158	660	4,551	1,391
4	Consultant services (7.0% of item No.1-3)	2,730	834	2,730	834	5,460	1,668
5	Price escalation (3.3% compound) of No.4	158	50	158	50	316	100
6	Physical contingency (5.0%) of No.4 and No.5	144	46	144	46	288	92
	Sub-total	53,272	16,279	48,335	14,771	101,607	31,050
Armenian side expenses							
7	Administration cost (10% of loan portion)	5,327	1,631	4,834	1,479	10,161	3,110
8	Price escalation (3.3% compound) of No.7	679	207	595	181	1,274	388
9	Physical contingency (5.0%) of No.7 and No.8	301	91	271	82	572	173
10	VAT (20% of item No.1-No.9)	11,916	3,640	10,806	3,304	22,722	6,944
11	Loan interest (1% Average of existing projects' interests)	3,858	1,178	3,557	1,085	7,415	2,263
	Sub-total	22,081	6,747	20,063	6,131	42,144	12,878
	Total	75,353	23,026	68,398	20,902	143,751	43,928

Source: JICA Study Team, 2008

Table 9.5.2 Water Supply Plan List (1/5)

No.	Communities	Intake (nos)				Transmission pipe (m)							Reservoir (nos)				Distribution pipe (m)							House connection	Water meter intallation	Public tap	Chlorination	Pump Station
		1m3	2m3	3m3	4m3	50	75	90	110	150	200	250	Q'ty	vol	Q'ty	vol	50	75	90	110	150	200	250					
Aragatsotn marz																												
1	Akunq	1											1	250			3,400			1,600	400	200		175	235	3	1	-
2	Akhdzq	2								2,200			2	200			3,300			4,100				20	470	5	1	-
3	Antarut	2					1,400	1,600					1	150			600		600	800				-	127	2	1	-
4	Ashnak							100												1,700	1,800			-	350	4	1	-
5	Avan		1							1,400			1	250			4,000		3,000	1,000		5,000		95	185	2	1	-
6	Avtona	1						100					1	50			1,500							30	30	1	1	-
7	Avshen	4					3,000						1	150			700		1,000	300				49	50	1	1	-
8	Aragats (Aparan)	6						5,600	8,000				2	150	1	400	4,000		9,600	18,700	3,800			560	600	6	3	-
9	Aragats(Talin)	3									1,000		2	500						1,200	15,600			-	1,600	16	1	2
10	Arayi	2							2,300				1	200			2,800		1,200	2,600	200			-	187	2	1	-
11	Arteni												1	100						3,000	12,000			150	750	8	1	-
12	Apnagyugh	1															1,300		600	1,300				-	-	2	-	-
13	Baysz	2						900	4,000				1	150			700							60	60	1	1	-
14	Byurakan		2		1					23,000			2	500			1,200			6,900	2,400			900	1,850	19	1	-
15	Garnahovit	3					700		2,300				1	200			1,000		800					50	110	2	1	-
16	Geghadir	1			1			500		10,000			1	200			500			4,500				170	200	2	1	-
17	Gegharot	2					2,500						1	50			1,200	500		4,000				63	115	2	2	-
18	Getap	2								5,500			1	100						800	1,100			5	75	1	1	-
19	Davtashen	2							1,400	2,800			1	250					2,900	1,700	1,800			60	244	3	1	-
20	Derek	1								600			1	150				1,100		400	2,300			24	124	2	1	-
21	Dian	2						1,500	4,000				1	100			300			400				24	28	1	1	-
22	Eghipartush	3					500	6,300					1	250			2,900	1,500		400	1,400			-	187	2	1	-
23	Yeghnik												1	250										87	177	2	1	-
24	Yernjatap	1						3,000	4,000				2	100			2,500		600	6,900	800			70	220	3	2	-
25	Nor Edesia	1																		3,900	1,200			-	230	3	1	-
26	Zovasar	3											1	200			1,100		1,000			1,000		20	120	2	1	-
27	Ttujur	2						10,500																23	83	1	1	-
28	Tlik	1					3,800						1	50	1	100			800					65	65	1	1	-
29	Irind	2							3,900	2,300			1	250			1,200		2,800	8,600				9	189	2	1	-
30	Lernapar	5				2,500	2,800						1	50	1	250				1,500				117	142	2	2	-
31	Lernarot	3					6,600		3,300	12,000							1,800			1,000				-	117	2	1	-
32	Lusagyugh	3					1,300	4,400																	247	3	1	
33	Lusakn	1				1,400															1,600			30	70	1	1	-
34	Tsaxkahovit	2								4,500			1	500			1,000	1,000	1,000	4,000	2,000		2,000	31	621	7	1	-
35	Tsaxkashen												1	200			4,500							155	170	2	1	-

Source: JICA Study Team 2008

Table 9.5.2 Water Supply Plan List (2/5)

No.	Communities	Intake (nos)				Transmission pipe (m)							Reservoir (nos)				Distribution pipe (m)							House connection	Water meter intallation	Public tap	Chlorination	Pump Station
		1m3	2m3	3m3	4m3	50	75	90	110	150	200	250	Q'ty	vol	Q'ty	vol	50	75	90	110	150	200	250					
Aragatsotn marz																												
36	Tsilqar	3				1,100							1	200			500							73	123	2	1	-
37	Katnaxgyur	2				600			1,400	5,200			1	300			500			900	300			29	304	4	1	-
38	Karmrashen	1	1							1,000			1	200			300	200			2,300				180	2	1	-
39	Kaqavadzor									4,500			1	250						5,300		2,500		-	240	3	1	-
40	Hartavan	1							6,700								600	1,600	900	1,000	1,500			226	246	3	1	-
41	Dzoraglux	2					1,200	3,500									2,200		400					20	98	1	2	-
42	Dzoragyugh	3															300							398	798	7	-	-
43	Meliq Gyugh	4						5,200	2,300				1	300						1,000	1,000			-	300	3	1	-
44	Miraq	1					2,500						1	100				1,700						70	70	1	1	-
45	Mulki	3				300	600										3,000			3,000				-	178	2	1	1
46	Nigavan	1																			200			50	160	2	1	-
47	Norashen	1						3,000	2,700				2	50			2,800	1,200						-	86	1	2	-
48	Norashen (Geghadir)		1										1	300			1,300		1,600	1,300	1,800			40	240	3	1	-
49	Shenavan	2					500		8,500				1	350						7,600	4,800			-	378	4	1	-
50	Shgharshik	3						1,000		700			1	200							1,800			130	200	2	1	-
51	Vosketas		1							6,000							1,100			3,500				38	128	2	1	-
52	Chqnagh	3											1	150										-	65	1	1	-
53	Jamashlu	1					3,800						1	100			1,200			1,300				75	75	1	1	-
54	Saralanj	5						1,500					1	150						1,300				21	65	1	1	-
55	Sipan	3							2,600				1	150			200			500				25	85	1	1	-
56	Vardenis	4					300	400					1	200			500			4,800				-	228	3	1	-
57	Vardenut	2					2,500		2,500				1	250					2,100	2,100				52	302	4	1	-
58	Verin Sasunik																							80	80	1	1	-
59	Tegher					1,000			2,500				1	150			3,500		100					101	111	2	1	-
60	Orgov	1											1	200					5,000		5,000			-	220	3	1	-
61	Oratachya	2				400			1,500				1	150			1,200				1,600			8	48	1	1	-
	Total	48	3	-	-	3,400	11,400	14,600	30,700	17,400	-	-	20	-	-	-	19,200	4,700	10,100	33,600	20,300	2,500	-	1,436	5,008	60	27	1

Source: JICA Study Team 2008

Table 9.5.2 Water Supply Plan List (3/5)

No.	Communities	Intake (nos)				Transmission pipe (m)							Reservoir (nos)				Distribution pipe (m)							House connection	Water meter intallation	Public tap	Chlorination	Pump Station
		1m3	2m3	3m3	4m3	50	75	90	110	150	200	250	Q'ty	vol	Q'ty	vol	50	75	90	110	150	200	250					
Shirak marz																												
1	Alvar	1						1,500					1	100						3,000				18	33	1	1	-
2	Aghvorik	2						1,200					1	50						3,500				17	17	1	1	-
3	Ardenis												1	150					700					25	45	1	1	-
4	Arpeni	4						6,000					1	50	1	100			400	600				19	89	1	2	-
5	Badivan	1							1,000				1	100						1,200				7	63	1	1	-
6	Bashgyugh	1							4,700				1	50										5	24	1	1	-
7	Garnaridg+Yeghnajur		1						5,500				1	50	1	100				8,000				14	54	1	2	-
8	Gdashen /Kamrut	1											1	150										63	103	2	1	-
9	Zarishat	1					400						1	50						1,100				21	21	1	1	-
10	Zorakert + Darik	1							4,000				2	50										-	31	1	2	-
11	lernakert	2								3,800			1	300						3,000				180	300	3	2	-
12	lernut	1					700						1	100										52	67	1	1	-
13	Tsaghkut	2											1	50						5,000				63	73	1	1	-
14	Kamo	2											1	350						3,000				250	400	4	1	-
15	Karmraqar	1											1	50										13	13	1	1	-
16	Kaqavasar																											
17	Krashen	3						300		300			1	50	1	100	500	400						-	76	1	2	-
18	Krasar	1						3,200					1	150										-	120	2	1	-
19	Mayisyan Kayaran	1											1	50										-	20	1	1	-
20	Hovit	1						1,500					1	200			1,300							13	133	2	1	-
21	Dzorashen																											
22	Akhuryan Kayaran	1											1	50										-	5	1	1	-
23	Mets Sariar	1					2,000						1	200				1,000		3,000				-	96	1	1	-
24	Musaelyan	3								8,300			1	400						300				-	497	5	1	-
25	Shaghik	1							2,000				1	100						2,000				30	30	1	1	-
26	Shirak	1											1	50										220	300	3	1	-
27	Pemzashen		1								700		2	400						700	2,100	2,800		820	1,150	12	1	-
28	Jajur	3						5,200	2,300				2	200			2,000	4,000		3,000				680	800	8	2	-
29	Jajuravan	2							1,600				1	150			800							58	68	1	1	-
30	Jrarat	4					2,800	1,300					1	300				5,000		2,000				4	304	4	1	-
31	Sarnaghbyur	2											2	300				1,500		7,000				500	800	8	2	-
32	Sarapat	1						1,700					1	100										23	38	1	1	-
33	Sizavet	3								7,000			1	150				15,000						18	68	1	1	-
34	Tzoghamarg	2											1	150						5,200				-	119	2	1	-
35	Poqr Sariar																											
	Total	50	2	-	-	-	5,900	21,900	21,100	19,400	700	-	36	-	3	-	4,600	26,900	1,100	51,600	2,100	2,800	-	3,113	5,957	75	39	-

Source: JICA Study Team 2008

Table 9.5.2 Water Supply Plan List (4/5)

No.	Communities	Intake (nos)				Transmission pipe (m)							Reservoir (nos)				Distribution pipe (m)							House connection	Water meter intallation	Public tap	Chlorination	Pump Station
		1m3	2m3	3m3	4m3	50	75	90	110	150	200	250	Q'ty	vol	Q'ty	vol	50	75	90	110	150	200	250					
Gegharkunik Marz																												
1	Akunq	1								200			2	400						3,000	8,500			200	1,200	12	1	-
2	Aghberq	4				4,500							4	50			8,000							4	81	1	4	-
3	Aygut	3						1,500	6,200				1	100	1	150	12,000			10,000				247	347	4	2	-
4	Ayrk	1					3,500						1	150			1,500			2,500				-	105	2	1	-
5	Antaramej	1					4,500						1	100			1,500							54	60	1	1	-
6	Astghadzor																18,000			20,000				-	800	8	5	-
7	Artsvanist	2							9,100				1	100	1	200			500	5,000				560	700	7	2	-
8	Geghambak	1					7,500						1	100			3,500							36	36	1	1	-
9	Geghamavan	3						1,000	5,200				1	400							6,000			11	561	6	1	-
10	Gegharkunik	3						800	2,200				1	450			3,700		2,300					9	369	4	1	-
11	Geghahovit		1							1,000	11,300						20,000			15,000				2,100	2,700	27	1	-
12	Ddmashen	1																		13,000	2,000			427	727	8	1	-
13	Dprabak	3					2,500	1,000					2	100			5,000			2,000				56	256	3	2	-
14	Drakhtik	1							2,500				1	300						800				380	380	4	1	-
15	Eranos																	6,000		10,000	2,500	3,000		200	1,200	12	2	-
16	Zolakar		1										2	550			6,000	8,000		1,300	1,400			520	1,300	13	1	-
17	Zovaber	1							11,000				1	350			2,000							170	420	5	1	-
18	Tezagyugh									10,500			1	300				2,000		13,000	2,000			330	830	9	1	-
19	Ichavan			1							800		1	200						4,000				-	-	-	-	1
20	Iusakunq		1		1								2	200				500		2,000				431	431	5	2	-
21	Khachaghbyur												1	350					1,000	2,700	500	400		373	463	5	1	-
22	Tsaghashen	1							3,500				1	200			1,000			2,000				181	181	2	1	-
23	Tsaghkunq	2											1	200						500				106	316	4	1	-
24	Tsovagyugh	3							1,500	13,000			1	200	1	600	2,000			5,000				700	1,200	12	2	-
25	Tsovak										4,500						700	1,500		3,000	4,000			370	720	8	1	-
26	Tsovinar		2								15,000		2	500			3,000			2,000	4,000	2,000		518	1,728	18	2	-
27	Kalavan	1					4,000						1	100										28	60	1	1	-
28	Barepat	2				2,900	700						2	50			2,000							48	105	2	3	-
29	Karchaghbyur	2								4,000							4,000			8,000				320	720	8	1	-
30	Dzoragyugh												2	500				3,000		15,000	2,000			910	1,660	17	2	-
31	Dzoravanq	3				1,000	3,000						2	50			1,500	1,000						2	72	1	2	-
32	Madina	1							12,000				1	300			6,000							-	310	4	1	-
33	Maqenis	1						4,500					1	200				1,400	400					160	160	2	1	-
34	Mets Masrik	1	1						3,500		13,600		1	300	1	400	2,000	2,500		3,500	4,000			854	1,054	11	2	-
35	Norakert								13,000	2,000										6,000				-	237	3	1	1

Source: JICA Study Team 2008

Table 9.5.2 Water Supply Plan List (5/5)

No.	Communities	Intake (nos)				Transmission pipe (m)							Reservoir (nos)				Distribution pipe (m)							House connection	Water meter intallation	Public tap	Chlorination	Pump Station
		1m3	2m3	3m3	4m3	50	75	90	110	150	200	250	Q'ty	vol	Q'ty	vol	50	75	90	110	150	200	250					
36	Shatjreq												2	100										-	153	2	2	-
37	Shatvan	1							3,000				1	100	1	200					3,000			335	350	4	2	-
38	Shorzha	1								4,000			1	250			700	3,800		500				130	290	3	2	-
39	Dgaghacadzor	1					6,000						1	100			200							87	87	1	1	-
40	Semyonovka	1											1	150					1,000					32	68	1	1	-
41	Vaghashen												3	300			4,000			5,000				1,143	1,503	16	3	-
42	Vardadzor		2								5,000						800			7,000	300			90	840	9	1	-
43	Verin Getashen																15,000			2,000	3,000			737	1,537	16	1	-
44	Torfavan	1								3,500			1	150			1,500	500		1,000				111	133	2	1	-
45	Pokr Masrik										700									2,000	1,600			-	298	3	1	-
	Total	5	2	-	-	-	6,000	-	3,000	7,500	5,700	-	10	-	1	-	22,200	4,300	1,000	17,500	7,900	-	-	2,665	5,259	57	15	-
Tavush marz																												
1	Aghavnavanq	3						1,000					3	50	1	100	3,000		1,000	7,000				20	150	2	3	-
2	Gandzaqar								1,500				2	200	1	400	1,000	1,500		2,000	2,600			750	1,250	13	3	-
3	Getahovit	2						4,600	2,800				2	300			6,000			13,000	2,000	2,500		-	870	9	1	-
4	Gosh	1							11,200				2	150			3,000			8,000				199	399	4	1	-
5	Yenoqavan	2						4,000					1	200						1,000				30	184	2	1	-
6	Teghut	1							6,200				1	350			500	1,200			3,000			-	398	4	1	-
7	Itsaqar	1						2,900					1	200			2,500							113	121	2	1	-
8	lusahovit	3						2,000	3,000				1	200			3,000							25	125	2	1	-
9	lusadzor																											
10	Khachardzan	1						1,200					1	250			800		800					142	142	2	1	-
11	Hovq	4				600	500		6,000				3	50	1	100	800		500	1,000				7	187	2	3	-
12	Navur	1					300						1	100	1	150	2,000			7,000				50	300	3	2	-
	Total	19				600	800	15,700	30,700	-	-	-	18	-	4	-	22,600	2,700	2,300	39,000	7,600	2,500	-	1,336	4,126	45	18	-

Source: JICA Study Team 2008

CHAPTER 10 PROPOSED OPERATION AND MAINTENANCE ORGANIZATION

10.1 Options for Operation and Maintenance (O&M)

According to Armenia's Law on Local Self-Government, communities are responsible for drinking water and wastewater services within their geographic boundaries, unless the water sources and facilities serve more than one municipality. The local governments, however, do not allocate enough budgets for rural water supply projects. The water supply facilities in these areas are mainly based on gravity water supply systems that utilize springs as source. They are presently maintained by local residents.

This chapter presents suggestion on proper O&M organization. The following three options for O&M of water supply systems are studied for the rural communities within the JICA study area:

- Option 1 - Local Organizations in-charge of O&M in each rural community
- Option 2 - Establishment of the inter-community water utilities
- Option 3 - Transfer of O&M functions to one of the existing water supply companies (WSC).

10.2 Local Organization In-Charge of O&M in Each Rural Community (Option-1)

This option suggests that each community establish or utilize a local organization under rural community administration office, which will be in-charge of O&M of the water supply facilities, and will be responsible for provision of drinking water for the community. There are several issues, however, that need to be taken into consideration.

Establishment and operation of independent organization will require significant financial resources, which are not affordable to most of the rural communities. Such costs cannot be covered by water user fees. Thus, in order to be cost-efficient it is preferable to establish a small unit within the “gyughapetarans” (offices of rural community administration), which will be in-charge of O&M of the water supply facilities.

The unit may consist of four to five employees, of which two to three positions are paid. The following organizational structure is suggested as O&M units in the rural communities:

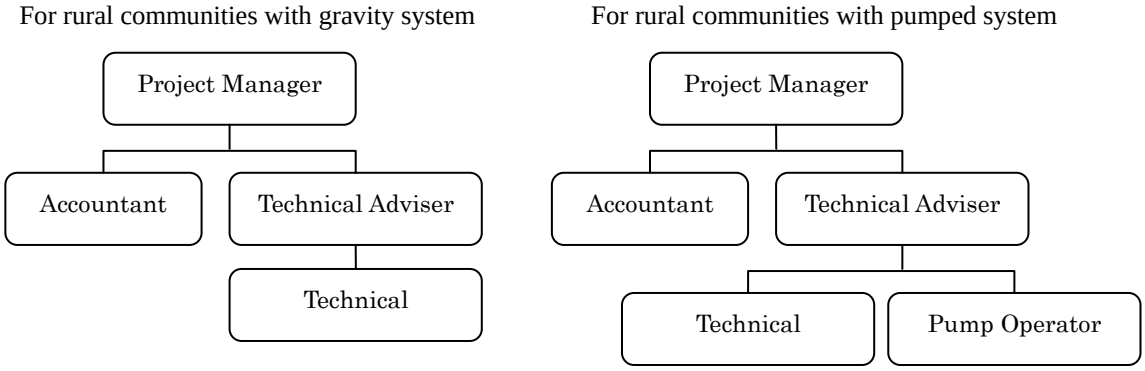


Figure 10.2.1 Suggested O&M Organization in Option-1

Source: JICA Study Team, 2008

Project Manager (managing head of the O&M office) is a non-paid position, which will be responsible for the overall management and oversight of the process. This can be either the head or deputy head of a respective community. Accountant can also be from the rural community administration office, considering the gained experience in accounting, and collection of bills and taxes. This is anticipated to be a part-time position. Technical Advisor is also a non-paid and part-time position who will provide relevant advices to project management on technical matters. Thus, the main full-time positions are the Technical Inspector and Pump Operator (for pumped systems), which will be in-charge of all technical aspects of the water supply facilities, including renovation, recovery of emergency outbreaks, water meter readings, billing and collection of water fee, proper operation of pumps, chlorination and other relevant services. In order to promote higher collection ratio of water fees, the salaries of the specialists of the O&M organization should be derived from a percentage of water fee amount collected (e.g. 50% of the fee collected is allocated for O&M of the system, including chlorination, while the remaining 50% for salaries).

10.3 Establishment of the Inter-Community Water Utilities, (Option-2)

10.3.1 Introduction

Aragatston, Shirak, Gegharkunik, and Tavush marzes were governed by several counties in the Soviet Federation Era. The communities in the county can easily form the Inter-Community Water Utilities, since these are geographically adjacent to each other. At present, there Water Users Associations (WUAs) was formed at counties to address irrigation for Inter-Community Water Utilities in the rural areas of Armenia. The present WUAs in rural areas were surveyed to determine considerations for the establishment of the Inter-Community Water Utilities related to O&M of rural water supply systems.

10.3.2 WUAs in Armenia

The “Irrigation Rehabilitation Project” supported by World Bank is being implemented in Armenia since 2001. Among other things, the project aims at creating conditions for effective O&M of the irrigation infrastructure through institutional strengthening, by supporting appropriate institutional reforms. With the support of World Bank, the National Assembly of the Republic of Armenia adopted the “Law on Water Users Associations (WUA) and Water Users Federations (WUF)” in July 2002.

As of today, 54 WUAs have been established, covering 641 communities, with a total service area of 231,866 ha. Although WUAs still receive subsidies from the Government of Armenia, their performance significantly improves every year. With the upcoming support from international organizations, particularly from Millennium Challenge Account (MCA), it is believed that WUAs will become financially sustainable in several years.

The MCA – Armenia is providing support to WUAs in terms of institutional strengthening of irrigation entities within water to market activity. The support aims at: (i) ensuring reliable and timely water delivery, (ii) promoting greater ownership of the water delivery system by water users, and (iii) creating a basis for technical and financial sustainability of the irrigation system.

10.3.3 Case Study of WUAs

(1) Ararat WUA

Ararat WUA was established in 2003 with the support of World Bank (Irrigation Rehabilitation Project) under the “Law On Water Users Associations (WUA) and Water Users Federations (WUF)”. Instead of income tax, it pays value-added tax (VAT), similar to other non-profit organizations in Armenia.

Service area of the association includes 11 communities in Ararat district of Ararat Marz, namely: Armash, Yeraskh, Sevak, Lusarat, Yeghegnavan, Vosketap, Aygavan, Avshar, Noyakert, Ararat, Surenavan. The association currently has about 7570 members. The main decision-making authority is the Administrative Council, while the main implementing unit is the Executive Body.

Administrative Council consists of 11 members, representing each community, and one chairman. This is a public council, which makes decisions on budget, approves tariffs and

performs other related tasks, taking into consideration decisions taken from the Government of the Republic of Armenia in the respective field. The Administrative Council initiates meeting every month.

The Executive Body meanwhile is the main governing body of the association. It has approximately 180 employees including eight key positions, namely, Director, Chief Engineer, Engineer-Energy specialist, Chief Mechanic, Lawyer, Head of Human Resources, Engineer for Operations, and Senior Operator. Some of its staffs are part-time employees, including the Flow-meter Readers, Local Inspectors, Ameliorators and other support staff.

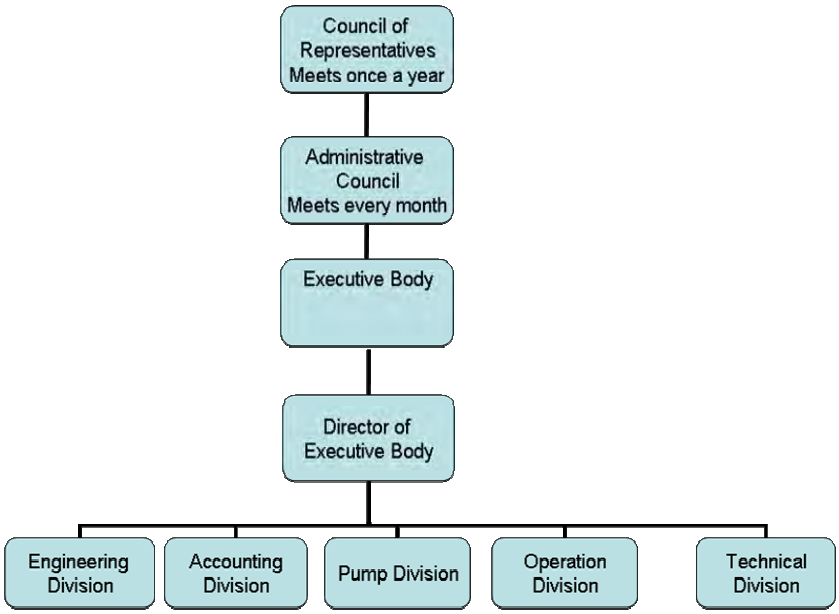


Figure 10.3.1 Organizational Management Structure of Ararat WUA

Source: Ararat WUA

Each member pays an annual membership fee of 1000 AMD. Apart from said membership fee they pay for the irrigation water consumption. In 2008, the tariff of 9 AMD/m^3 is applied, while the rest is subsidized by the government (in 2007 the actual cost of water supply in Ararat WUA was 18 AMD/m^3). According to Government of Armenia, it is planned to reduce the share of state subsidy.

The tariff is approved by the Administrative Council each year. The association's collection ratio of payments varies between 87-90%. Customers, who do not pay in a certain year, are supposed to pay debts on the succeeding year, to avoid budget deficit for the association.

The budget of association for 2007 amounted to 200 million AMD. The breakdown of the budget is as follows: Renovation – 40%; Taxes, including VAT – 30%; Salaries for the staff, office/administrative expenses – 20%; Electricity – 10%. Each year said association applies for subsidy to the Ministry of Finance, through the State Committee of Water System (SCWS), which is used for covering the electricity cost of the pumps.

The main technical problem that the association faces is the pumps which are mostly outdated (over 40 years old). Hence, it spends significant part of the budget for the renovation of the pumps every year. It is envisaged that MCA will support the replacement of seven with new ones, consequently reducing renovation costs significantly. Quantity of the supplied water is considered satisfactory, although there are some issues related to the quality of water particularly during spring time.

Contracts with members are effective for three years. In the annex of the contract, the total area of the land and types of crops processed are mentioned. Each year, the annex is revised according to the changes in agricultural practices. Irrigation season in the service area of the association usually covers the period from April to November.

(2) Ijevan WUA

Ijevan WUA was established in 2004 with the support of International Fund for Agricultural Development (IFAD), under the “Law On Water Users Associations (WUA) and Water Users Federations (WUF)”. Instead of income tax, it pays VAT, similar to other non-profit organizations in Armenia. IFAD supported the preliminary meetings to discuss the appropriateness and options for the establishment of the WUA. Subsequently, an initiative group was formed. This group formed a Council of Representatives, which lead to the establishment of the Administrative Council of the “Ijevan” WUA. Aside from technical assistance, IFAD provided a computer, office furniture and a vehicle “NIVA” to support the activities of the association.

Service area of the WUA includes 11 communities of Tavush Marz, namely, Kirantz, Berqaber, Lusahovit, Gandzaqar, Khashtarak, Ditavan, Aygehovit, Getahovit, Lusadzor, Aknaghbyur and Achajur. Currently, the association has approximately 500 members. The main decision-making authority is the Administrative Council, while the main implementing unit is the Executive Body.

The Executive Body is the main governing body of the association. It has approximately 27 staff members, which include 12 are full-time employees such as the Director, Chief

Engineer, Chief Accountant, Operator, 8 Pump Operating Technicians. All the employees have good technical skills and knowledge. The remaining 15 employees are hired on seasonal bases as support staff.

The highest management body is the Council of Representatives, which meets once a year. The organizational-management structure of association is shown below:

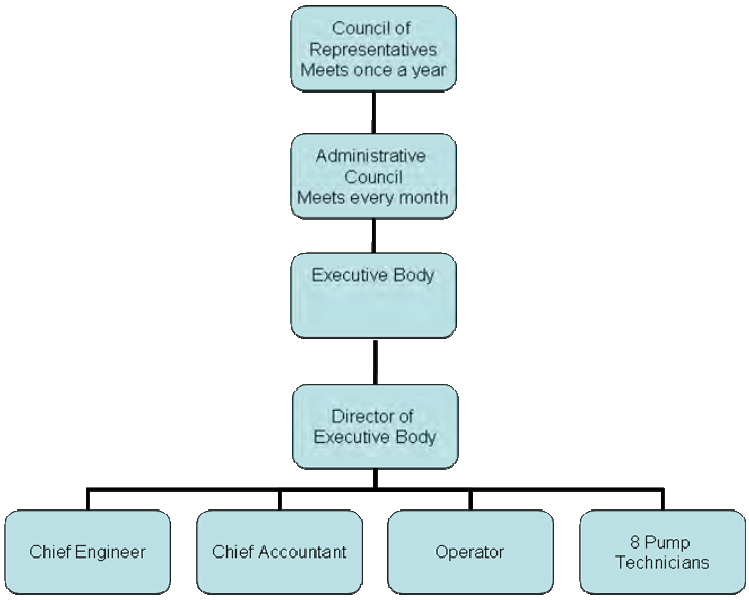


Figure 10.3.2 Organizational Management Structure of Ijevan WUA

Source: Ijevan WUA

Each member pay an annual membership fee of 1000 AMD. Apart from the membership fee, they also pay for the irrigation water consumption. In 2008, the tariff of 9 AMD/m^3 is applied. However, the actual cost according to the designated Director, is around 35-37 AMD/ m^3. The remaining amount is subsidized by the government. Government of Armenia planned to reduce the share of state subsidy, meaning that in 2011, the consumers will then have to pay 11 AMD/m^3.

The association's collection ratio of payments is almost 100%. The fees are collected based on flow-meter readings. In places without water meters, the fee is charged based on irrigation norms (Ministry of Agriculture, "The Irrigation Norms and Regimes of Agricultural Plans for Irrigative Soil in the Republic of Armenia - Manual", Yerevan 2007). No debts were recorded since 2007.

The budget of the association for 2007 is 17.5 million AMD. Out of this, 13 million AMD was from government subsidy while 3.5 million AMD was collected from water

consumption. The breakdown of the budget is as follows: Renovation and materials – 30%; Taxes, including VAT – 25%; Salaries for the staff, office/administrative expenses – 33%; Electricity – 12%. Each year the association applies for subsidy to the Ministry of Finance through the SCWS, which is directed towards covering the electricity cost of the pumps. At present, the association has no loans or debts.

The main technical problem that the association faces is the outdated pumps. It thus spends significant part of its budget on the renovation of pumps every year. It is envisaged that MCA will support the replacement of 5 pumps with the new units, which will consequently reduce renovation costs. In addition to this, it is envisaged that MCA will support the construction of Getahovit-Lusadzor pipeline system, which will improve the efficiency of the association's performance. In addition, World Bank's "Irrigation Rehabilitation" Project Implementation Unit (PIU) supports the association in terms of provision of guidelines and manuals for O&M of the system.

Quantity of the supplied water is considered satisfactory, and there are no seasonal variations. However, there are some issues related to the quality of water particularly in springs, during rainy seasons. Irrigation season in the respective service area usually covers the period from April to October.

(3) Lessons Learned

The following lessons were learned through the survey:

- Existing WUAs were established through the support of World Bank and/ IFAD under the "Law on Water Users Associations (WUA) and Water Users Federations (WUF)". The project aims at creating conditions for effective O&M of the irrigation infrastructure through institutional strengthening.
- Existing WUAs were established based on the Inter-Community Water Utilities at neighboring communities in the county level. Water sources for irrigation are common properties of the WUAs.
- WUA consists of ordinary members and selected staffs. The O&M of irrigation system is carried out by the staffs. WUA collects the water fee from members for O&M of the irrigation system. It applies for subsidy to the Ministry of Finance through the SCWS which is used to cover the insufficient O&M cost.

"Law on Water Users Associations (WUA) and Water Users Federations (WUF)" apply only to irrigation water. New law is required to establish for the Inter-Community Water

Utilities for rural water supply system. However, SCWS has no plans to create such law.

WUAs for irrigation were established by many communities according to unit of county, as Inter-Community Water Utilities is based on related Armenian laws. Most of the water for irrigation is shared by several neighboring communities, utilizing surface water. On the other hand, a rural water supply system has its own water source and supply system in each community. It is difficult to unify the existing rural water supply systems because of the independent gravity system. Therefore, it is difficult to seek participation of a large number of communities in each county to support the rural water supply project and to establish the Inter-Community Water Utilities for potable water supply.

O&M is carried out by WUA's director, chief engineers, operators and accounts who possess good technical skills and knowledge, with the support of World Bank and/or IFAD under the "Law On Water Users Associations (WUA) and Water Users Federations (WUF)". It is realized that the experience and the knowledge of the trained staffs are useful for the O&M of the rural water supply project by the local organization in each rural community (Refer to option 1 discussed above). However, WUAs still receives subsidy from the government and implies that the Inter-Community Water Utilities are financially unstable.

10.4 Transfer of O&M Functions into One of the Existing WSC (Option-3)

It is generally accepted that the greater the number of the users covered by water supply organization, the larger will be the required financial capacity of the water supply organization. With this understanding, Option-3 will have much advantage over the previous two options in terms of financial aspects.

Currently, Armenia Water Supply Company (AWSC) provides water supply services to Aragatsotn, Shirak, Gegharkunik and Tavush Marz while Shirak Water Supply Company (SWSC) serves Shirak Marz. Establishment of new water supply companies in Aragatsotn, Gegharkunik, and Tavush Marzes for the JICA project increases further financial impacts even if the existing companies still rely on government subsidies. Under this option, it is suggested to transfer the O&M functions of the rural communities to one of the existing water supply companies in Armenia.

There are two approaches in this regard. For the first approach rural communities in the entire JICA study area can be transferred to the service area of the AWSC. To do this, a signed agreement with the respective communities will be required, stating their

willingness to join AWSC. Meanwhile, AWSC will manage the rural community water supply system through two types of contract agreement: a) compressive management, b) bulk water supply. Rural water supply facilities are the property of either SCWS or the community. AWSC supplies the spare parts to its service area. Water tariff is set to 115.65 AMD/m^3 for compressive management and 51.49 AMD/m^3 for bulk water supply. Same tariff rate will be applied to all the service areas.

The second approach relates to transferring JICA study area's rural communities in Shirak Marz to the service area of SWSC, while the remaining rural communities in Aragatsotn, Gegharkunik and Tavush marzes to AWSC. In terms of cooperation with KfW, investments is provided for the improvement of water supply facilities as well as for institutional strengthening, capacity building and training. Water tariff meanwhile is set to 73.98 AMD/m^3 in SWSC service areas.

Each approach has different means of managing the communities in Shirak Marz. For the first approach, the head office of AWSC, located in Yerevan will serve ten marzes including Shirak Marz. Meanwhile for the second approach, the head office of SCWS located in Gyumri, is actually the center city of Shirak Marz. SCWS will serve 35 communities including Gyumri, and the rural communities in Shirak Marz. SCWS thus works very closely with the heads of the rural communities. In addition, water fee of SWSC is lower than that of AWSC, hence it is more affordable for the water user. Therefore, it is more appropriate to transfer the rural water supply systems in Shirak Martz to SWSC.

10.5 Comparative Analysis of the Proposed Options

The aspects that have to be considered for the comparative analysis of the proposed options are described below.

10.5.1 Technical Aspects

There should be specialized technical staff for O&M in the water supply companies. A large company can employ staffs whose task will be exclusively O&M, while small firms may not be able to maintain such specialized technical staff within their organization. Large scale O&M organizations (Option-3) will have advantages in the technical aspects over small organizations.

10.5.2 Accessibility to O&M Services

Users are generally generally more immediate and frequent services for their water supply facilities when repair teams (provided by small scale O&M organizations) are based and managed nearby. Meanwhile, large scale companies may only be able to provide minimum and limited services, particularly to remote communities. Hence, small scale O&M organizations (Options-1 and 2) will have advantages over large scale organizations with the aspect to accessibility to related services.

10.5.3 Social/Political/Legislative Aspects

There is a possibility that some rural communities may not be willing to establish joint organizations for O&M with other communities, since the activities confined within such communities may already be effective. This might be the case particularly for rural communities that already have efficient 24-hour water supply have no issues or troubles. Option-1 in this respect will have definite advantages over other options. In addition, introduction of Option 2 will require establishment of legal framework similar to irrigation WUA.

10.6 Management Arrangements for Rural Water Supplies

10.6.1 Option-1 Local Organization

The proposed O&M arrangements for the three studied options on operation models are presented in Tables 10.6.1 to 10.6.2. These tables show the advantages and disadvantages, and community conditions.

Table 10.6.1 Management Arrangements for Rural Water Supplies (Option-1 Local Organization)

Advantages	Disadvantages	Proposed community conditions
Existing community structures to be provided for suitable management; no social issues		Small and medium scale of service population; remote area from existing water company service area
	Technical skills for O&M are limited; community to be consulted on the need for external support	Simple system (Gravity system with enough water and small scale distribution system)
Operation cost is limited, Water fee set by community	Affordability is limited and may not support systems requiring payment of high water tariff	Low affordability

Source: JICA Study Team, 2008

Surveyed 153 rural communities manage their own water supply systems through community efforts. However, there are no formal O&M systems. At present, about 80 % of communities are supplied without water fee.

In order to achieve long-term sustainability of the proposed water supply systems, capacity building of the local organization need to be implemented. Therefore, it is recommended to set up an O&M organization in the rural community with the support of Community Field Officer (CFO), as mentioned in clause 10.2. The O&M management capacity would then increase in the future, and respond to the needs of rural water supply service. The following conditions are suggested for the establishment of O&M organization in rural communities.

- Small and medium scale service areas and service population: Existing community structures to be provided for suitable management; no social issues are anticipated.
- Remote areas which are far from existing WSC service areas: Management by WSC need to be more effective
- Gravity system: Simple maintenance without requiring experienced staff with technical skills
- Low Affordability: Small scale service population may not cover the O&M cost

10.6.2 Option-2 Inter-Community Water Utilities

New law is required to establish the Inter-Community Water Utilities for rural water supply system. SCWS has jurisdiction over the water supply and the irrigation water in Armenia. However, it has no plan to make a new Inter-Community Water Utilities law for rural water supply. A rural water supply system has own water source and supply system in each community. Therefore, it is difficult for a large number of communities to participate in the rural water supply project in each county, and to establish the Inter-Community Water Utilities for provision of potable water supply. However, WUA still receives the subsidy from the government and implies that the Inter-Community Water Utilities are not financially sustainable In addition, the existing water supply company has already included a part of rural water supply in the service area. Therefore, option 2 O&M organization is not recommended for rural water supply project.

10.6.3 Option-3 Water Supply Company

There are 40 rural communities covered in the JICA Study area served by the AWSC. These include 20 rural communities in Aragatsotn Marz, 3 in Shirak Marz, 12 in Gegharkunik Marz and 5 in Tavush Marz.

Table 10.6.2 Management Arrangements for Rural Water Supplies (Option-3 WSC)

Advantages	Disadvantages	Proposed community conditions
Availability of experienced staff with management and technical skills	WSC is physically remote from community and cannot perform maintenance immediately	Large scale service area and service population to respond to pump system and water sources management problems
Subsidy to WSC is provided by the government	Water fee sets by the WSC	Appropriate affordability and high willingness to pay is required
Effective water supply management		Close to existing WSC service area

Source: JICA Study Team, 2008

The following conditions are suggested in order to transfer the rural communities to the service areas of the existing WSC (AWSC, SWSC).

- Large scale service area and service population,
- Water sources management problems should concern communities that share same water sources,
- Proximity to existing WSC service area.

10.6.4 Proposed O&M Options

The proposed O&M options are presented in the following discussions. It is noted that, almost all communities are categorized under O&M of Option-1, local organization.

Local organizations serving large population are expected to transfer the O&M of the rural water supply systems to Option-3. Under said option, communities that have more than 3,000 consumers and are located close to service areas of existing WSC are listed up. In addition, six rural communities in Aragatsotn marz (Ashnak, Aragats, Arteni, Getap, Tlik, and Lusakn) are also categorized under O&M Option-3, due to management problems of water sources. These six rural communities which are suffering from water shortages are expected to rely on the existing WSC to solve issues related to re-allocation of water supply system. Meanwhile, there are no rural communities in Shirak Marz that utilize Option-3. Thus, only AWSC shall be proposed for managing the system. The total number of households in Option-3 is about 15,000 and the average household is 1000.

Table 10.6.3 Summary of O&M Options

O&M Options	Communities	Number of communities	Population	Households
Aragatsotn Marz				
Option-1	Studied communities except those already adopting Option-3	53	39,346	9,618
Option-3	14 Byurakan, 42 Dzoragyugh 4.Ashnak, 9Aragats, 11Arteni, 18Getap, 28Tlik, 33 Lusakn	8	18,573	5,558
Shirak Marz				
Option-1	All studied communities in Shirak	35	23,211	6,126
Gegharkunik Marz				
Option-1	Studied communities excepts those already adopting Option-3	40	67,977	18,555
Option-3	1 Akunq, 11Geghhovit, 24 Tsovagyugh, 30 Dzoragyugh, 43 Verin Getashen	5	26,526	8,297
Tavush Marz				
Option-1	Studied communities excepts those adopting Option-3	11	10,009	3,026
Option-3	2.Gandzar	1	3,840	1,250

Source: JICA Study Team, 2008

10.7 Long-Term Vision

In the long-term (ten year or more), local organizations might not be the best for O&M of water supply systems since there will be a need for establishment of stringent standard for service quality, and improvement of the services. Moreover, replacement costs for pump and others will periodically arise, which the local organizations will not be able to bear. Thus, it is suggested to O&M of water supply facilities will be shifted from Option-1 to Option-3 in the future.

It was observed that there might be rural communities, which would prefer to remain as local organizations. These are particularly the communities that do not have major problems with water supply, i. e., generally utilize gravity flow, have sufficient drinking water sources, and supply 24-hour drinking water without seasonal variations.

Considering above, a "Combined Approach" will be initiated based on the following principle:

(1) In the short-term, new local organizations are to be established.

The existing 153 rural communities have no experience in organized water supply management. Therefore, the above-mentioned approach had been studied in terms of implementation of pilot project activities and monitoring in the rural communities of Apnagyugh (Aragatsotn Marz) and Lchavan (Gegharkunik Marz). The results are provided in Chapter 14 of the report.

It is recommended to strengthen the capability of Option-1, local organization, through acquiring consulting services. The key points for capacity building include:

- Financial management, particularly in the tariff setting, and sustainable accounting balance;
- Enhancement of skills in repairing and maintenance of rural water supply system components such as pipes, water meters, and pumps

The PIU will assist those communities responsible for O&M of rural water supply systems, to prepare O&M plans for enhancing sustainable long-term operations. Consequently, the PIU will designate the following professionals:

1) A foreign expert (PIU consultant) who will supervise the capacity building component.

2) A CFO, appointed by the foreign expert, will work in each target rural community. The CFO's responsibilities will cover assistance to communities, including setting up of the O&M administrative organization, facilitating community planning, promoting rational water use, facilitating administrative members, and other related tasks.

(2) In the medium and long-term, O&M functions of local organizations will be transferred to Option-3 while the communities unwilling to participate, will continue functioning independently.

CHAPTER 11 IMPLEMENTATION PLAN

11.1 Phased Development

11.1.1 Alternatives for Phased Development

Firstly, a "cluster" shall be defined as the smallest unit in the arrangement of component. Hence the JICA Study Team (JST) suggests applying three clusters from different viewpoints.

Four marzes are to be considered as "Cluster A" from administrative and regional point of view. Seven zones, divided according to geographical location and complexity of construction components, are to be considered as "Cluster B" (hereinafter referred to as "Construction Zone"), as shown in Figure 11.1.1. Each Construction Zone has one town where site office can be located during construction stage. It is supposed to take less than one hour to mobilize materials or man-power from the town to every site of the zone. Fifteen districts shall be included in "Cluster C" as shown in Figure 12.1.2, considering that districts are still utilized to form organizations such as irrigation water users association (WUA). This is despite the fact that this administrative group was formed during the Soviet Union occupation and there is actually no responsible administration presently existing.

Summarized list of the defined clusters are shown in Table 11.1.1. Meanwhile, detailed list of all 153 communities is presented in Table11.1.2.

Table 11.1.1 Clusters and Component Groups

Cluster	Components and number of communities included
A. Marz (4)	Aragatsotn (61), Shirak (35), Gegharkunik(45) , Tavush (12)
B: Construction Zone (7)	Aparan (34), Talin (30), Gyumri (19), Amasia (13), Sevan (9), Martuni (31), Ijevan (17) (Listed cities / towns are centers of zones)
C : District (15)	Ashtarak (9), Aparan (18), Aragats (13), Talin (21) (Aragatsotn Marz) Akhuryan (12), Amasia (9), Ashotzq (12), Artik (2) (Shirak Marz) Gavar (2), Krasnoselsk (9), Martuni (12), Sevan (6), Vardenis (16) (Gegharkunik Marz) Ijevan (10), Taush (2) (Tavush Marz)

Source: JICA Study Team, 2008

11.1.2 Evaluation Criteria

In order to evaluate clusters from different viewpoints, practical aspects and indicators are

needed. In this step, the following two aspects for characterizing clusters are selected: (a) urgency and (b) efficiency. Since the Project requires urgent rehabilitation, "urgency" shall be selected as the first priority. Total lengths of pipelines and asbestos cement pipes exhibiting excessive leakage are taken as evaluation indicators. As for "efficiency", the number of population served is considered as the indicator. In addition to above aspects, each cluster's investment cost shall be studied to adjust the balance of the total costs for each phase. Differences of total costs for each phase shall not exceed 10%. Aspects and corresponding indicators are shown in Table 11.1.3.

Table 11.1.3 Aspects and Indicator for Evaluation

Aspect	Indicator
a. Urgency	Total length of excessive leakage pipelines and asbestos cement pipe (km)
b. Efficiency	Served population by the project (population)
c. Investment Cost	Construction cost for each community, since the main concern of phasing is cost. This indicator needs to be considered for each alternative to balance the total cost of both phases. Both phase's costs shall be balanced between 45 and 55 % of the total cost, in order not to exceed 10 % difference.

Source: JICA Study Team, 2008

11.1.3 Evaluation Result

Three alternatives for three different clusters are given in Table 11.1.4. In each alternative, a higher ranked component group in the cluster shall be included in the 1st phase preferably based on cost balancing of each phase.

Table 11.1.4 Phased Development Alternative Types

Alternative 1	Alternative 2	Alternative 3
Cluster A: Marz	Cluster B: Construction Zone	Cluster C: District

Source: JICA Study Team, 2008

Based on the rating procedure, grouping results for Alternative 1 to 3 are indicated in Table 11.1.5 to Table 11.1.7.

Gegharkunik Marz is the highest priority in Alternative 1. In order to balance the investment cost, Tavush Marz is selected in the 1st Phase. In Alternative 2, Martuni Construction Zone in Gegharkunik Marz is the highest priority while Aparan Construction Zone in Aragatsotn Marz is selected in the 1st Phase. The investment cost of these two Construction Zones reached 53%, and that these components belong to the 1st Phase. As for Alternative 3, five districts are selected in the 1st Phase. These are Marutuni District, Vardenis District, and Krasnoselsk District in Gegharkunik Marz, and Aparan District and Aragats District in Aragatsotn Marz. It is noted that Aragats District is originally included in the 2nd Phase and that Ijevan District in Tavush Marz and Talin District in Aragatsotn Marz are considered as higher priorities. However, these two

districts' investment costs are rather high, exceeding 55% of the total investment cost of 1st Phase. Thus, Aragats District was consequently selected for inclusion in the 1st Phase.

After setting up the groups, ranking evaluation for the results of the 1st Phase group has been done. In addition to "urgency" and "efficiency" aspects, evaluations from an administrative and construction viewpoint are taken into consideration for each alternative. Summarized result of evaluation is shown in Table 11.1.8.

Table 11.1.8 Comparison of Evaluation Result

Description	Evaluation of Aspects' Value in 1st Phase and Score	Total Score/ Recommendation
Alternative 1		
(ADVANTAGE) - Administrative issue is simple due to dividing by Marzes. - Construction arrangement is easier than the other alternatives due to the fact that the sites for each phase area are joined with each other. - Values of efficiency and urgency in 1st Phase are high.	Urgency : High (4pt) Efficiency : High (4pt) Investment Cost (1st /2nd Phase) : 53%/47%	16pt. **To be Adopted**
(DISADVANTAGE) - Although Aragatsotn Marz has higher urgency and efficiency, it shall be put into the 2nd Phase due to balancing of cost.	Administrative : Excellent (4pt) Construction : Excellent (4pt)	
Alternative 2		
(ADVANTAGE) - Construction arrangement is simple due to the fact that the clusters are divided by Construction Zones. - Two zones indicating higher efficiency and urgency are selected in the 1st Phase.	Urgency : Low (2pt) Efficiency : Medium (3pt) Investment Cost (1st /2nd Phase) : 53%/47%	9pt.
(DISADVANTAGE) - Administrative issues may be complex due to the fact that the construction works are to be carried out in all 4 Marzes in the 2nd Phase.	Administrative : Poor (1pt) Construction : Good (3pt)	
Alternative 3		
(ADVANTAGE) - Values of urgency and transferability in the 1st Phase are high.	Urgency : Medium (3pt) Efficiency : Low (2pt) Investment Cost (1st /2nd Phase) : 54%/46%	8pt.
(DISADVANTAGE) - Administrative issues may be complex due to the fact that the construction works are to be carried out in all 4 Marzes in the 2nd Phase. - Construction arrangement may not be efficient in both Phases due to Krasnoselsk District in Gegharkunik Marz is isolated.	Administrative : Poor (1pt) Construction : Average (2pt)	

Note: Scoring:. High or Excellent: 4 points, Medium or Good: 3 points, Low or Average: 2 points, Poor: 1 point.
Source: JICA Study Team, 2008

Based on comparative results above, Alternative 1 is found to be the best phasing for the Project. Each phase shall be divided according to combination of marzes. The phasing result is shown in Figure 11.1.3.

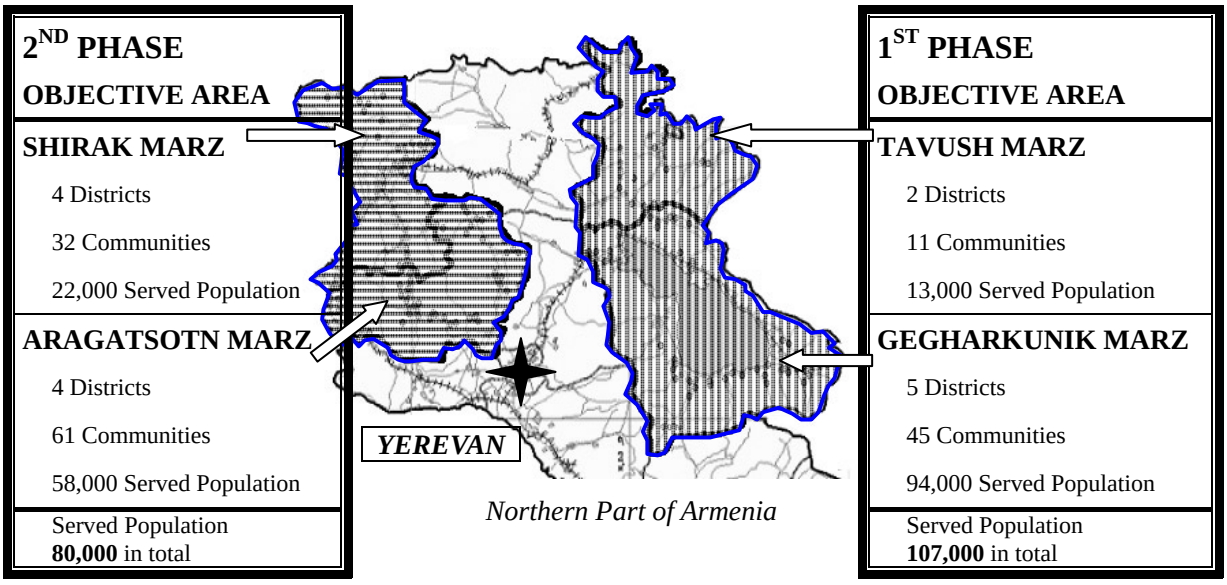


Figure 11.1.3 Objective Area of the 1st Phase and the 2nd Phase
Source: JICA Study Team, 2008

11.2 Sequence of the Project

Figure 11.2.1 shows a typical sequence of a loan project implementation. Main categories of the process are divided into four, as follows;

(1) Preparation of the Loan Request,
(2) Donor's Appraisal and Loan Agreement,
(3) Project Implementation,
(4) Completion of the Project.

Each process is discussed in the succeeding clauses.

11.2.1 Preparation of Loan Request

After completion of the Study, it is envisaged that the State Committee on Water Systems will be the main agency in Armenia to initiate further processes for the implementation of the project. This is in line with the charter of the committee whose main functions include the following:

- Management of the state organization of implementation of the investment programs in the sector,
- Support for international cooperation in the sector within its jurisdiction.

Since it is envisaged that a loan application is necessary to implement the rural water supply project, the role of the Ministry of Finance and Economy is vital. According to charter of the ministry, one of the main functions of the Ministry of Finance and Economy is the coordination of loans and grants allocated by international financial organizations and foreign countries, and the current monitoring of program implementation. In most cases, the Ministry of Finance and Economy signs the Loan Agreements, thus they have to apply officially to international financing institutions in Armenia.

As the JICA Study aims at forming an advanced study compared to typical Master Plan, this report may become the main part of the loan request documents. Fact finding (F/F) mission or another mission may be organized in order to confirm the adequacy of the loan request documents. Accomplishing said missions, if required, may take several months to a year.

11.2.2 Donor's Appraisal and Loan Agreement

In response to a loan request, donors may dispatch an appraisal mission to fully investigate the necessity, feasibility and overall preparations related to the project. They will also confirm considering various perspectives, whether proposed project is suitable for loan financing. Moreover, a loan negotiation will be conducted between the donor and the Armenian side. Loan Agreement for the 1st phase may then be signed.

11.2.3 Project Implementation Regime

After this process, it may be suggested that the Armenian side establish a Project Implementation Unit (PIU) for the project's execution and management. The PIU will hold a tender procedure to select a qualified firm for performing the consulting services, which will include detailed design, construction supervision, and management and operation support. Additionally, PIU shall seek involvement of AWSC considering that it will facilitate transfer of operation and maintenance (O&M) functions from some communities.

The role of other concerned parties during the project implementation is described as follows:

- State Hygiene and Anti-Epidemic Inspectorate (SHAEI) under Ministry of Health, RoA, is responsible for drinking water quality through periodic inspection. SHAEI

conducts water quality tests and urges rural communities to perform chlorination.

- Ministry of Nature Protection (MONP), RoA, is responsible for the assessment of environmental aspects to be considered during the detailed design.
- Water Resources Management Agency (WRMA) under the MONP, issues water use permits. According to the Water Code in Armenia, all water users have to obtain water use permits. A total of 66 out of the 149 rural communities have already obtained said permits. Prior to project implementation, rural communities, should submit a permit application to WRMA.
- Public Services Regulatory Commission (PSRC) is responsible for the setting of water tariffs. In case PSRC plans to revise the water tariffs, they request permission from the state government then hold a congress. They will then reflect the comments received from the state government and other concerned agencies.

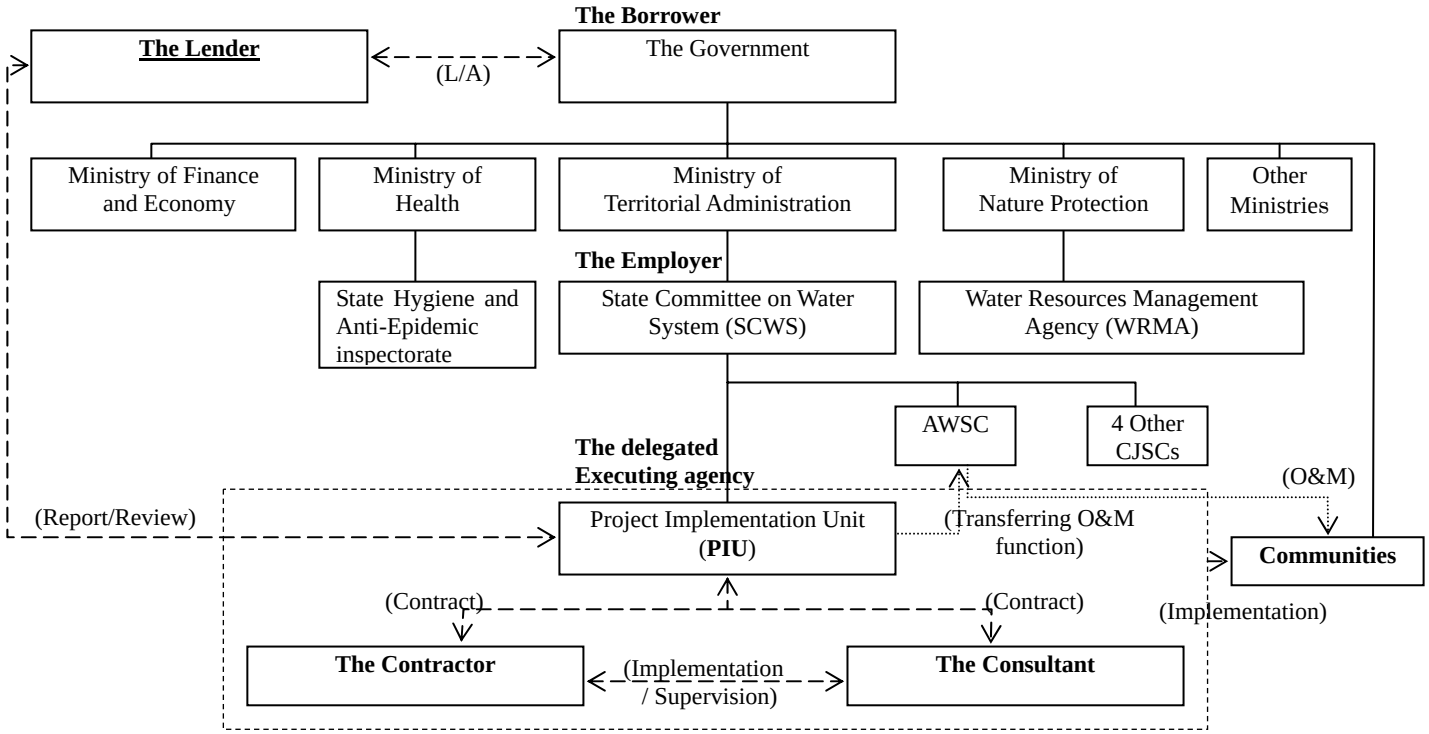


Figure 11.2.2 Diagram of the Concerned Parties

Source: JICA Study Team, 2008

Figure 11.2.3 shows the capital flow related to the project.

(1) The Ministry of Finance and Economy acting as the Borrower, signs an agreement with the Lender, and receives the project funds.

(2) PIU opens a special account for the project where funds will be transferred.

(3) The project funds are used for the construction works and consulting services.

(4) After the construction works, each rural community collects the water fees, deducts

the O&M costs, and transfers surplus cash to the PIU special account.

(5) Rural communities which do not cover O&M costs by the water fees, receive subsidy from the state government for carrying out related works.

(6) The surplus cash transferred from rural communities will be the fund source for the loan repayment. PIU repays the project funds through the account of the Ministry of Finance and Economy.

(7) The debt is repaid to the Lender. If the surplus cash is not enough as annual repayment amount, the state government provides subsidy in order for the Borrower to repay its due.

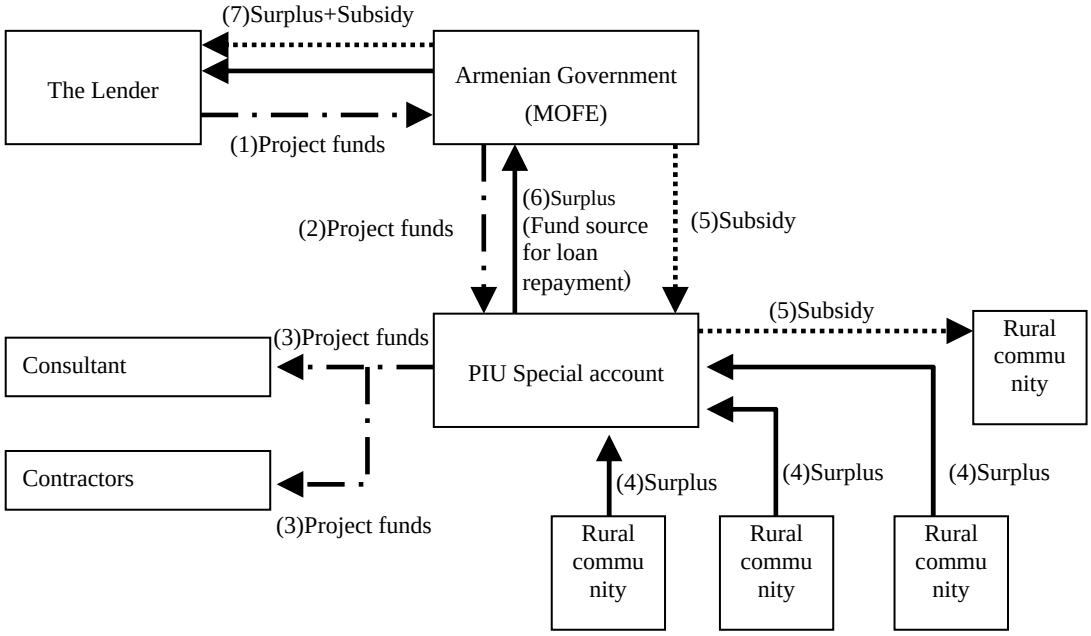


Figure 11.2.3 Capital Flow Related to the Project

Source: JICA Study Team, 2008

11.2.4 Project Implementation Method

For project implementation it is envisaged to apply so called “Design-Tender-Build” method which is widely applied by international donors for similar projects. In this method the employer takes the responsibility for carrying out the design works. Subsequently, the contractor selected through tendering will execute the construction works based on the drawings and specifications issued by the employer. Generally, design works will be performed by a consulting firm under an agreement with the employer.

(1) Detailed Design and Tendering

The consultant hired by PIU commences its works, which will include the following:

1) Field Investigation : topographic survey, water quality test, etc.
2) Detailed Design : water supply facilities, drain facilities,
3) Cost Estimates : cost estimates and contract packaging,
4) P/Q and Tendering : prequalification, tendering, evaluation and contract support

The detailed design is to be submitted to the PIU for their approval. The designs are also submitted to MONP to seek environmental expertise advice. Related work period, detailed contents, required positions and man-month are mentioned in Clause 11.3.2.

(2) Implementation (Construction Works)

The type of tendering for the construction works, either through international competitive bidding (ICB) or national competitive bidding (NCB), will be decided during the detailed design period.

During the implementation period, the consultant will carry out construction supervision works based on either donor's or FIDIC guidelines.

11.2.5 Completion of the Project

After completion of the implementation, guarantee period will commence. In addition, through the whole period of implementation and the succeeding monitoring period, the "Management and Operation Support" services will be provided by the consultant for a sustainable management and reliable water supply services. They will also develop the capacity of O&M organizations for appropriate monitoring and follow-up of the Project.

11.3 Implementation Schedule

11.3.1 Implementation Period

The total estimated project duration is 114 months after the Loan Agreement for the 1st Phase is signed, as mentioned in Figure 11.3.1. Both phases will take 54 months respectively with an assumed interval of six months. The project implementation plan will only be achieved under strict compliance to the conditions below:

- Field surveys, such as topographic surveys and existing water supply facilities inventory surveys, shall be implemented in the summer season.
- Contractors shall operate in several sites simultaneously.
- Construction of intake and transmission pipelines close to water sources shall be conducted in the mid-summer season.

Nevertheless, the period is subject to change depending on the duration of loan signing and project commencement. Initially, it is assumed that the loan for the 2nd Phase will be signed within about six months after the completion of the 1st Phase construction.

If partial taking-over of the facilities is implemented, the first taking-over period is expected within 34 months. Furthermore, the management and operation support by the consultant will be executed during the implementation period, and will continue for 24 months after the taking-over.

11.3.2 Consulting Services

The Consultant will work with PIU in providing assistance to SCWS, for efficient and proper preparation and implementation of the Project, in terms of technical and management aspects comprising the following components;

(1) Detailed design stage services

- Review of previous study and plans
- Collection of data and information
- Determination of scope of works
- Conduct topographic survey, existing facilities inventory survey, and water quality tests
- Preparation of design criteria
- Detailed design of water supply facilities and drainage facilities
- Cost estimates for the construction works and contract packaging
- Coordination with PIU on the application for evaluation and concurrence of design documents and cost estimates, in accordance with regulations/guidelines of the RoA and the donor

(2) Pre-construction stage services

- Preparation of pre-qualification (PQ) documents
- PQ proceeding and evaluation
- Preparation of tender documents
- Tendering and evaluation
- Assistance in contract negotiation and documentation

(3) Construction stage services

- Supervision of construction works
- Technical and management support for the Project
- EIA monitoring,

- Management and operation support services
- Management support for PIU
- Selection and hiring of community field officers (CFO)
- Support for establishment of O&M administrative organization in communities
- Facilitating community planning, promoting rational water use, assisting administrative members in communities
- Coordination of on-the-job-training (OJT) for communities' O&M staff during the construction works
- Project monitoring

Table 11.3.1 Expected Consultant's Assignment for Each Phase During the Detailed Design Stage

Position / Phase (See Note)	Number of man-months
Team Leader (expatriate)	7
Co-Team Leader	7
Water Supply Engineer / 1, 2	12
Civil Engineer 1, 2	12
Piping/Mechanical Engineer / 1, 2, 3	17
Electrical Engineer	2
Environmental Specialist	2
Cost Estimator / 1, 2	6
Spec. Writer	4
Survey Engineer	4
Supporting Staff (Administrator, CAD Operator, etc.)	43

Source: JICA Study Team, 2008

Table 11.3.2 Expected Consultant's Assignment for Each Phase During the Pre-Construction and Construction Supervision Stage

Position / Phase (See Note)	Number of man-months
Team Leader (expatriate)	27
Co-Team Leader	29
Chief Resident Engineer	17
Civil Engineer 1, 2	32
Material Engineer	4
Piping/Mechanical Engineer / 1, 2, 3	48
Electrical Engineer	2
Environmental Specialist	3
Quantity Surveyor / 1, 2	34
Supporting Staff (Administrator, CAD Operator, etc.)	107

Source: JICA Study Team, 2008

Table 11.3.3 Expected Consultant Assignment for Each Phase During Management and Operation Support Stage

Position / Phase (See Note)	Number of man-months
Team Leader (expatriate)	2
Organization and Management Expert / 1, 2	59
Community Field Officer (CFO)	50

Source: JICA Study Team, 2008

Note: If number of phases is not indicated in above tables, it implies that the personnel will be involved on all project phases

11.3.3 Construction Works

(1) Contract packaging

It was recommended to divide the construction works to multiple packages in order to facilitate monitoring of work quality while simultaneously implementing the works with adequate contractor's staff. In Armenia, since the contract amount of a rural water supply usually cost several millions of USD, the number of contract package for the Project may range between 10 and 15. This will be finally determined by the consultant during the detailed design stage in the Project.

(2) Non-workable Period

In Armenia, due to its meteorological condition, the period between November and March classified as winter will be considered non-workable, since construction works can not be possibly carried out during said pperiod.

(3) Site Base Location

As mentioned in clause 11.1.1, contractor's site bases are suggested to be set-up in seven towns. This idea may contribute to smooth site access and reliable construction management.

Table 11.3.4 Location of of Construction Site Bases

	Marz	Construction Base Town
1st Phase	Gegharkunik, Tavush	Martuni, Sevan, Ijevan
2nd Phase	Aragatsotn, Shirak	Aparan, Talin, Gyumri, Amasia

Source: JICA Study Team, 2008

(4) Major Construction Equipment

Construction items included in the Project are categorized as follows;

- Intake/Reservoir : Civil Works
- Pipe/Valve/Meter : Mechanical Works
- Pumping system : Mechanical / Electrical Works

From the list above it is expected that construction equipment items for general civil works will only be limited, since there are no extensive works such as large reclamation, deep well drilling, road works, large size pumps, extension of middle voltage transmission cable, etc. Thus, major construction equipments are planned as follows:

- Excavator
- Crane
- Dump truck
- Normal truck with crane equipment
- Concrete mixer

Above mentioned equipments are commonly used in Armenia.

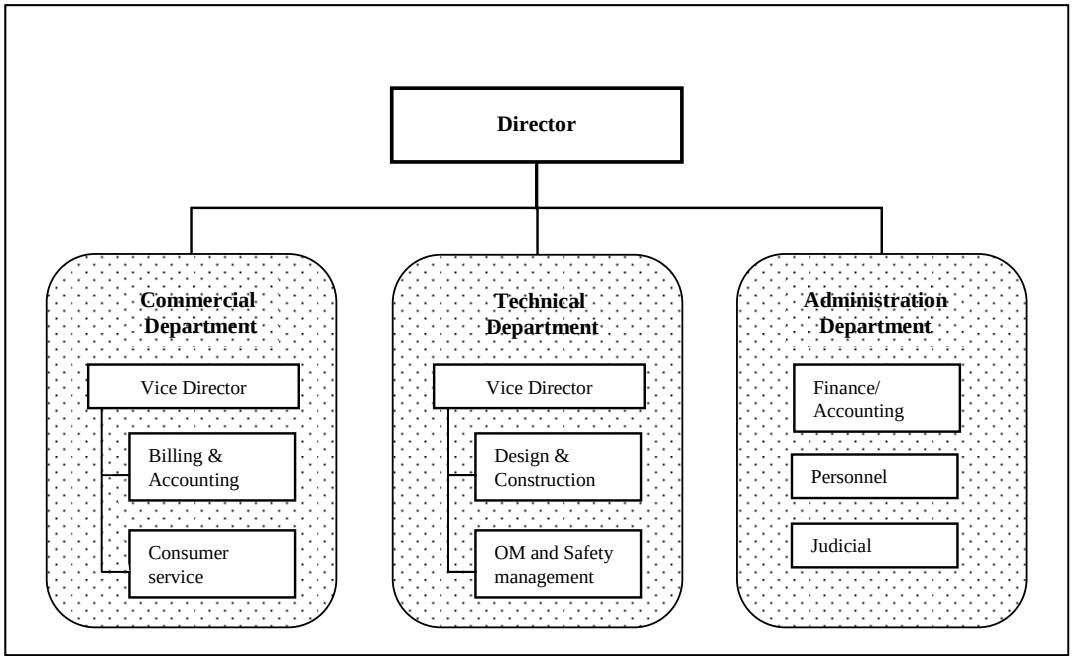
11.4 Project Implementation Organization

(1) PIU

The organization acting as executing agency such as the employer for the project shall be defined as the PIU, which shall be established prior to the implementation of the project.

PIU has two functions. One is to coordinate the project implementation and the other is to supervise the O&M activities of each rural community. Its major tasks are as follows:

- Communicating with fund donor, including periodic reporting
- Coordination and negotiations with relevant organizations
- Monitor the Consultants' and Contractors' activities
- Financial control such as the payment requests from the Consultants and Contractors, and the disbursement requests to fund donor
- Management of the surplus from each rural community and facilitate its transfer to the Ministry of Finance and Economy
- Request subsidy from the Ministry of Finance and Economy in behalf of the rural communities which do not collect enough O&M costs and distribution to those rural communities
- Provide instruction to rural communities which have low water fee collection ratio
- Technical support to rural communities which require large repair works.



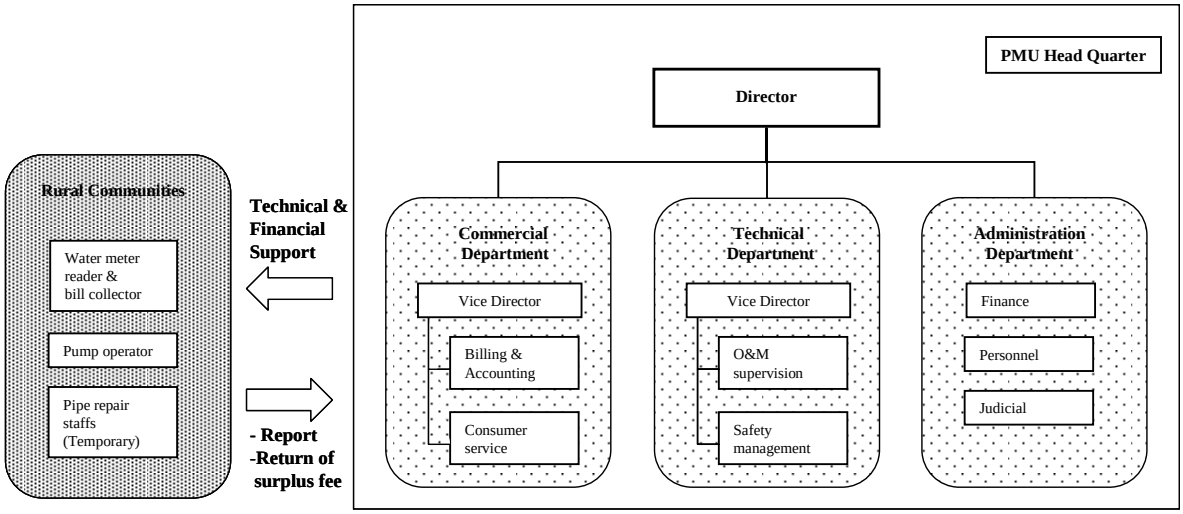
Source: JICA Study Team, 2008

Figure 11.4.1 Suggested PIU Organization

The director shall be responsible for the project implementation with support from the Consultant's expert to be hired by the PIU. The commercial department shall monitor and support the billing and collection of water tariff in all target communities based on account report to be submitted by each community. Technical department shall monitor the consultant's and contractors' activities, and support the community's water supply services for its smooth operation. They will also deal with all technical issues arising during the project implementation. Administration department shall deal with all administrative issues during the project implementation. The PIU will be disbanded after completion of the Project. Its role meanwhile will be taken over by the Project Management Unit (PMU).

(2) PMU

The PMU shall be responsible for provision of sustainable water supply services for the rural communities, implementation of the project monitoring, and managing the payment of loan to the lender. It will be disbanded upon completion of the project loan repayment.



Source: JICA Study Team, 2008

Figure 11.4.2 Role of PMU Organization and Rural Communities

Table 11.1.2 (1/3) Clusters and Component Group Details

No.	Marz	Community	District	Construction Zone	a. Urgency	b. Efficiency	c. Investment Cost
					Excessive leakage pipeline and asbestos pipe length (km)	Served Population (person)	Construction Cost (x1000 USD)
1	Aragatsotn	Akunq	Talin	Aparan	0.8	739	361
2	Aragatsotn	Akhdzq	Ashtarak	Talin	-	1,800	600
3	Aragatsotn	Antarut	Ashtarak	Talin	-	143	236
4	Aragatsotn	Ashnak	Talin	Aparan	-	1,500	245
5	Aragatsotn	Avan	Ashtarak	Talin	-	987	783
6	Aragatsotn	Avtona	Talin	Talin	-	280	82
7	Aragatsotn	Avshen	Aragats	Aparan	-	275	221
8	Aragatsotn	Aragats (Aparan)	Aparan	Aparan	36.1	3,800	2,201
9	Aragatsotn	Aragats(Talin)	Talin	Talin	1.8	5,600	1,626
10	Aragatsotn	Arayi	Aparan	Aparan	1.1	628	405
11	Aragatsotn	Arteni	Talin	Talin	15.0	3,340	961
12	Aragatsotn	Apnagyugh	Aparan	Aparan	-	705	97
13	Aragatsotn	Baysz	Talin	Talin	-	260	262
14	Aragatsotn	Byurakan	Ashtarak	Talin	-	4,950	2,376
15	Aragatsotn	Garnahovit	Talin	Talin	-	455	257
16	Aragatsotn	Geghadir	Aragats	Aparan	12.8	800	791
17	Aragatsotn	Gegharot	Aragats	Aparan	1.0	587	325
18	Aragatsotn	Getap	Talin	Aparan	-	175	386
19	Aragatsotn	Davtashen	Talin	Talin	-	870	571
20	Aragatsotn	Derek	Aragats	Aparan	-	562	284
21	Aragatsotn	Dian	Talin	Talin	-	153	248
22	Aragatsotn	Eghipartush	Aparan	Aparan	12.0	850	507
23	Aragatsotn	Eghnik	Talin	Talin	-	480	155
24	Aragatsotn	Ernjatap	Aparan	Aparan	-	702	735
25	Aragatsotn	Nor Edesia	Ashtarak	Talin	-	1,200	263
26	Aragatsotn	Zovasar	Talin	Talin	-	730	241
27	Aragatsotn	Ttujur	Aparan	Aparan	3.4	411	308
28	Aragatsotn	Tlik	Talin	Talin	-	112	220
29	Aragatsotn	Irind	Talin	Talin	2.1	976	791
30	Aragatsotn	Lernapar	Aragats	Aparan	2.9	632	353
31	Aragatsotn	Lernarot	Ashtarak	Talin	-	420	889
32	Aragatsotn	Lusagyugh	Aparan	Aparan	0.9	890	217
33	Aragatsotn	Lusakn	Talin	Talin	-	200	130
34	Aragatsotn	Tsaxkahovit	Aragats	Aparan	7.0	2,165	1,018
35	Aragatsotn	Tsaxkashen	Aparan	Aparan	6.8	815	261
36	Aragatsotn	Tsilqar	Aragats	Aparan	1.5	570	161
37	Aragatsotn	Katnaxgyur	Talin	Talin	11.1	1,347	526
38	Aragatsotn	Karmrashen	Talin	Talin	1.6	650	291
39	Aragatsotn	Kaqavadzor	Talin	Talin	6.8	1,130	708
40	Aragatsotn	Hartavan	Aparan	Aparan	18.6	1,057	530
41	Aragatsotn	Dzoraglux	Aparan	Aparan	-	370	219
42	Aragatsotn	Mastara(Dzoragyugh)	Talin	Talin	-	2,696	12
43	Aragatsotn	Meliq Gyugh	Aragats	Aparan	0.9	1,300	477
44	Aragatsotn	Miraq	Aragats	Aparan	-	132	187
45	Aragatsotn	Mulki	Aparan	Aparan	6.0	650	282
46	Aragatsotn	Nigavan	Aparan	Aparan	0.2	685	67
47	Aragatsotn	Norashen	Aparan	Aparan	-	153	344
48	Aragatsotn	Norashen (Geghadir)	Aragats	Aparan	2.3	1,180	386
49	Aragatsotn	Shenavan	Aparan	Aparan	12.3	1,700	1,001
50	Aragatsotn	Shgharshik	Talin	Talin	-	540	306

Source: JICA Study Team, 2008

Table 11.1.2 (2/3) Clusters and Component Group Details

No.	Marz	Community	District	Construction Zone	a. Urgency	b. Efficiency	c. Investment Cost
					Excessive leakage pipeline and asbestos pipe length (km)	Served Population (person)	Construction Cost (x1000 USD)
51	Aragatsotn	Vosketas	Talin	Talin	4.6	620	457
52	Aragatsotn	Chqnagh	Aparan	Aparan	-	286	84
53	Aragatsotn	Jamashlu	Aragats	Aparan	7.0	137	247
54	Aragatsotn	Saralanj	Aparan	Aparan	-	252	178
55	Aragatsotn	Sipan	Aragats	Aparan	-	325	201
56	Aragatsotn	Vardenis	Aparan	Aparan	-	750	344
57	Aragatsotn	Vardenut	Aparan	Aparan	2.1	935	461
58	Aragatsotn	Verin Sasunik	Ashtarak	Talin	-	200	42
59	Aragatsotn	Tegher	Ashtarak	Talin	-	248	297
60	Aragatsotn	Orgov	Ashtarak	Talin	10.0	560	529
61	Aragatsotn	Oratachya	Aragats	Aparan	3.1	254	239
62	Shirak	Alvar	Amasia	Amasia	-	170	207
63	Shirak	Aghvorik	Amasia	Amasia	-	117	199
64	Shirak	Ardenis	Amasia	Amasia	-	320	103
65	Shirak	Arpeni	Ashotzq	Gyumuri	-	450	298
66	Shirak	Badivan	Ashotzq	Amasia	-	580	139
67	Shirak	Bashgyugh	Ashotzq	Gyumuri	-	66	187
68	Shirak	Garnaridg+Yeghnajur	Amasia	Amasia	-	288	558
69	Shirak	Gdashen /Kamrut	Amasia	Amasia	-	293	107
70	Shirak	Zarishat	Amasia	Amasia	-	114	91
71	Shirak	Zorakert + Darik	Amasia	Amasia	-	168	194
72	Shirak	lernakert	Artik	Talin	3.0	1,500	498
73	Shirak	lernut	Akhuryan	Gyumuri	-	203	92
74	Shirak	Tsaghkut	Amasia	Amasia	-	287	248
75	Shirak	Kamo	Akhuryan	Gyumuri	-	1,563	389
76	Shirak	Karmraqar	Akhuryan	Gyumuri	-	62	37
77	Shirak	Kaqavasar	Ashotzq	Gyumuri	-	163	-
78	Shirak	Krashen	Akhuryan	Gyumuri	-	296	140
79	Shirak	Krasar	Ashotzq	Amasia	4.0	530	181
80	Shirak	Mayisyan Kayaran	Akhuryan	Gyumuri	-	49	36
81	Shirak	Hovit	Akhuryan	Gyumuri	-	570	184
82	Shirak	Dzorashen	Ashotzq	Gyumuri	-	290	-
83	Shirak	Akhuryan Kayaran	Akhuryan	Gyumuri	-	19	32
84	Shirak	Mets Sariar	Ashotzq	Gyumuri	-	475	286
85	Shirak	Musaelyan	Akhuryan	Gyumuri	10.0	1,842	624
86	Shirak	Shaghik	Amasia	Amasia	-	230	197
87	Shirak	Shirak	Akhuryan	Gyumuri	-	1,097	163
88	Shirak	Pemzashen	Akhuryan	Talin	4.7	4,200	1,106
89	Shirak	Jajur	Akhuryan	Gyumuri	-	1,160	1,008
90	Shirak	Jajuravan	Ashotzq	Gyumuri	-	293	167
91	Shirak	Jrarat	Akhuryan	Gyumuri	6.0	1,108	499
92	Shirak	Sarnaghbyur	Artik	Talin	-	3,333	830
93	Shirak	Sarapat	Ashotzq	Gyumuri	-	126	106
94	Shirak	Sizavet	Ashotzq	Amasia	2.0	400	813
95	Shirak	Tzoghamarg	Ashotzq	Amasia	-	564	287
96	Shirak	Poqr Sariar	Ashotzq	Gyumuri	-	285	-
97	Gegharkunik	Akunq	Vardenis	Martuni	11.5	4,659	1,133
98	Gegharkunik	Aghberq	Krasnoselsk	Sevan	8.0	316	407
99	Gegharkunik	Aygut	Krasnoselsk	Ijevan	28.5	1,050	1,136
100	Gegharkunik	Ayrk	Vardenis	Martuni	4.0	518	300

Source: JICA Study Team, 2008

Table 11.1.2 (3/3) Clusters and Component Group Details

No.	Marz	Community	District	Construction Zone	a. Urgency	b. Efficiency	c. Investment Cost
					Excessive leakage pipeline and asbestos pipe length (km)	Served Population (person)	Construction Cost (x1000 USD)
101	Gegharkunik	Antaramej	Krasnoselsk	Ijevan	6.0	190	214
102	Gegharkunik	Astghadzor	Martuni	Martuni	38.0	4,080	1,358
103	Gegharkunik	Artsvanist	Martuni	Martuni	11.5	3,195	929
104	Gegharkunik	Geghambak	Vardenis	Martuni	8.5	167	319
105	Gegharkunik	Geghamavan	Sevan	Sevan	6.0	1,923	753
106	Gegharkunik	Gegharkunik	Gavar	Martuni	29.5	2,083	481
107	Gegharkunik	Geghahovit	Martuni	Martuni	39.0	7,600	2,991
108	Gegharkunik	Ddmashen	Sevan	Sevan	15.0	2,814	868
109	Gegharkunik	Dprabak	Krasnoselsk	Martuni	12.0	360	445
110	Gegharkunik	Drakhtik	Krasnoselsk	Sevan	5.8	1,200	401
111	Gegharkunik	Eranos	Martuni	Martuni	22.0	5,000	1,227
112	Gegharkunik	Zolakar	Martuni	Martuni	16.7	6,900	1,283
113	Gegharkunik	Zovaber	Sevan	Sevan	9.0	1,500	659
114	Gegharkunik	Tezagyugh	Martuni	Martuni	45.5	2,840	1,475
115	Gegharkunik	lchavan	Vardenis	Martuni	4.0	700	305
116	Gegharkunik	lusakunq	Vardenis	Martuni	4.5	1,510	461
117	Gegharkunik	Khachaghbyur	Vardenis	Martuni	4.5	1,504	505
118	Gegharkunik	Tsaghashen	Gavar	Martuni	4.0	670	375
119	Gegharkunik	Tsaghkunq	Sevan	Sevan	0.5	1,132	206
120	Gegharkunik	Tsovagyugh	Sevan	Sevan	7.0	4,159	1,584
121	Gegharkunik	Tsovak	Vardenis	Martuni	15.2	2,472	927
122	Gegharkunik	Tsovinar	Martuni	Martuni	11.0	5,180	2,292
123	Gegharkunik	Kalavan	Krasnoselsk	Ijevan	-		162
124	Gegharkunik	Barepat	Krasnoselsk	Ijevan	3.5	290	216
125	Gegharkunik	Karchaghbyur	Vardenis	Martuni	12.0	2,400	827
126	Gegharkunik	Dzoragyugh	Martuni	Martuni	20.0	4,970	1,668
127	Gegharkunik	Dzoravanq	Krasnoselsk	Ijevan	7.4	226	232
128	Gegharkunik	Madina	Martuni	Martuni	6.0	1,260	699
129	Gegharkunik	Maqenis	Vardenis	Martuni	1.8	550	328
130	Gegharkunik	Mets Masrik	Vardenis	Martuni	39.6	3,527	2,119
131	Gegharkunik	Norakert	Vardenis	Martuni	6.0	990	814
132	Gegharkunik	Shatjreq	Vardenis	Martuni	-	591	129
133	Gegharkunik	Shatvan	Vardenis	Martuni	17.0	983	533
134	Gegharkunik	Shorzha	Krasnoselsk	Sevan	5.0	570	487
135	Gegharkunik	Dgaghacadzor	Vardenis	Martuni	0.2	187	233
136	Gegharkunik	Semyonovka	Sevan	Sevan	-	243	121
137	Gegharkunik	Vaghashen	Martuni	Martuni	2.0	4,220	1,244
138	Gegharkunik	Vardadzor	Martuni	Martuni	3.8	3,140	855
139	Gegharkunik	Verin Getashen	Martuni	Martuni	20.0	5,138	1,145
140	Gegharkunik	Torfavan	Vardenis	Martuni	3.0	530	362
141	Gegharkunik	Pokr Masrik	Vardenis	Martuni	1.6	801	274
142	Tavush	Aghavnavanq	Ijevan	Ijevan	13.5	448	558
143	Tavush	Gandzaqar	Ijevan	Ijevan	9.5	3,840	1,094
144	Tavush	Getahovit	Ijevan	Ijevan	27.0	2,350	1,514
145	Tavush	Gosh	Ijevan	Ijevan	11.0	1,200	994
146	Tavush	Yenoqavan	Ijevan	Ijevan	-	530	275
147	Tavush	Teghut	Ijevan	Ijevan	4.7	1,605	581
148	Tavush	Itsaqar	Taush	Ijevan	2.5	402	269
149	Tavush	lusahovit	Ijevan	Ijevan	3.0	407	334
150	Tavush	lusadzor	Ijevan	Ijevan	2.9	694	-
151	Tavush	Khachardzan	Ijevan	Ijevan	1.6	498	235
152	Tavush	Hovq	Ijevan	Ijevan	2.9	510	468
153	Tavush	Navur	Taush	Ijevan	9.0	1,365	507

Source: JICA Study Team, 2008

Table 11.1.5 Grouping of Alternative 1

No.	Marz		a. Urgency: Total excessive leakage pipeline and asbestos pipe length (km)		b. Efficiency: Total Served Population (person)	c. Investment Cost: Total Construction Cost (x1000 USD)
1	Aragatsotn		191.8	2	57,919	27,985
2	Shirak		29.7	4	23,211	10,006
3	Gegharkunik		516.1	1	94,338	35,478
4	Tavush		87.6	3	13,849	6,831
Total			825.2	-	189,317	80,299
Result of Grouping of Alternative 1						
1st Phase	Gegharkunik	1	603.7		108,187	42,309
	Tavush	3				(53%)
2nd Phase	Aragatsotn	2	221.5		81,130	37,991
	Shirak	4				(47%)
Total			825.2		189,317	80,299
Note: Gegharkunik Marz is the top prioritized. In order to balance, the investment cost Tavush Marz was selected in the 1st Phase.						

Source: JICA Study Team, 2008

Table 11.1.6 Grouping of Alternative 2

No.	Construction Zone		a. Urgency: Total excessive leakage pipeline and asbestos pipe length (km)		b. Efficiency: Total Served Population (person)	c. Investment Cost: Total Construction Cost (x1000 USD)
1	Aparan (A)		138.8	2	26,972	14,125
2	Talin (A)		60.7	4	39,980	16,294
3	Gyumri (S)		16.0	6	10,117	4,248
4	Amasia (S)		6.0	7	4,061	3,324
5	Sevan (G)		56.3	5	13,857	5,486
6	Martuni (G)		414.4	1	78,725	28,033
7	Ijevan (T)		133.0	3	15,605	8,791
Total			825.2	-	189,317	80,299
Result of Grouping of Alternative 2						
1st Phase	Martuni (G)	1	553.2		105,697	42,157
	Aparan (A)	2				(53%)
2nd Phase	Ijevan (T)	3	272.0		83,620	38,142
	Talin (A)	4				(47%)
	Sevan (G)	5				
	Gyumri (S)	6				
	Amasia (S)	7				
Total			825.2		189,317	80,299
Note: Note: (A): Aragats Marz, (S): Shirak Marz, (G) Gegharkunik Marz, (T): Tavush Marz Martuni Zone is the top prioritized. Aparan and Talin were compared for second priority, after which then Aparan was selected for the 1st Phase due to high Urgency.						

Source: JICA Study Team, 2008

Table 11.1.7 Grouping of Alternative 3

No.	District	a. Urgency: Total excessive leakage pipeline and asbestos pipe length (km)		b. Efficiency: Total Served Population (person)	c. Investment Cost: Total Construction Cost (x1000 USD)
1	Ashtarak (A)	10.0	12	10,508	6,016
2	Aparan (A)	99.5	3	15,639	8,242
3	Aragats (A)	38.5	7	8,919	4,891
4	Talin (A)	43.8	6	22,853	8,836
5	Akhuryan (S)	20.7	10	12,169	4,311
6	Amasia (S)	-	15	1,987	1,905
7	Ashotzq (S)	6.0	13	4,222	2,463
8	Artik (S)	3.0	14	4,833	1,328
9	Gavar (G)	33.5	9	2,753	855
10	Krasnoselsk (G)	76.2	4	4,202	3,700
11	Martuni (G)	235.5	1	53,523	17,164
12	Sevan (G)	37.5	8	11,771	4,191
13	Vardenis (G)	133.4	2	22,089	9,568
14	Ijevan (T)	76.1	5	12,082	6,054
15	Taush (T)	11.5	11	1,767	777
Total		825.2		189,317	80,299
Result of Grouping of Alternative 3					
1st Phase	Martuni (G)	1	583.1	95,453	43,565 (54%)
	Vardenis (G)	2			
	Aparan (A)	3			
	Krasnoselsk (G)	4			
	Aragats (A)	7			
2nd Phase	Ijevan (T)	5	242.1	93,864	36,734 (46%)
	Talin (A)	6			
	Sevan (G)	8			
	Gavar (G)	9			
	Akhuryan (S)	10			
	Taush (T)	11			
	Ashtarak (A)	12			
	Ashotzq (S)	13			
	Artik (S)	14			
	Amasia (S)	15			
Total			825.2	189,317	80,299

Note: (A): Aragatsotn Marz, (S): Shirak Marz, (G) Gegharkunik Marz, (T): Tavush Marz
- Martuni District is the top prioritized, followed by Vardenis, Aparan and Krasnoselsk.
- Aragats is ranked 7th, but it is chosen to 1st Phase to adjust the cost.
- Other districts are allocated in the 2nd Phase due to the cost balance.

Source: JICA Study Team, 2008

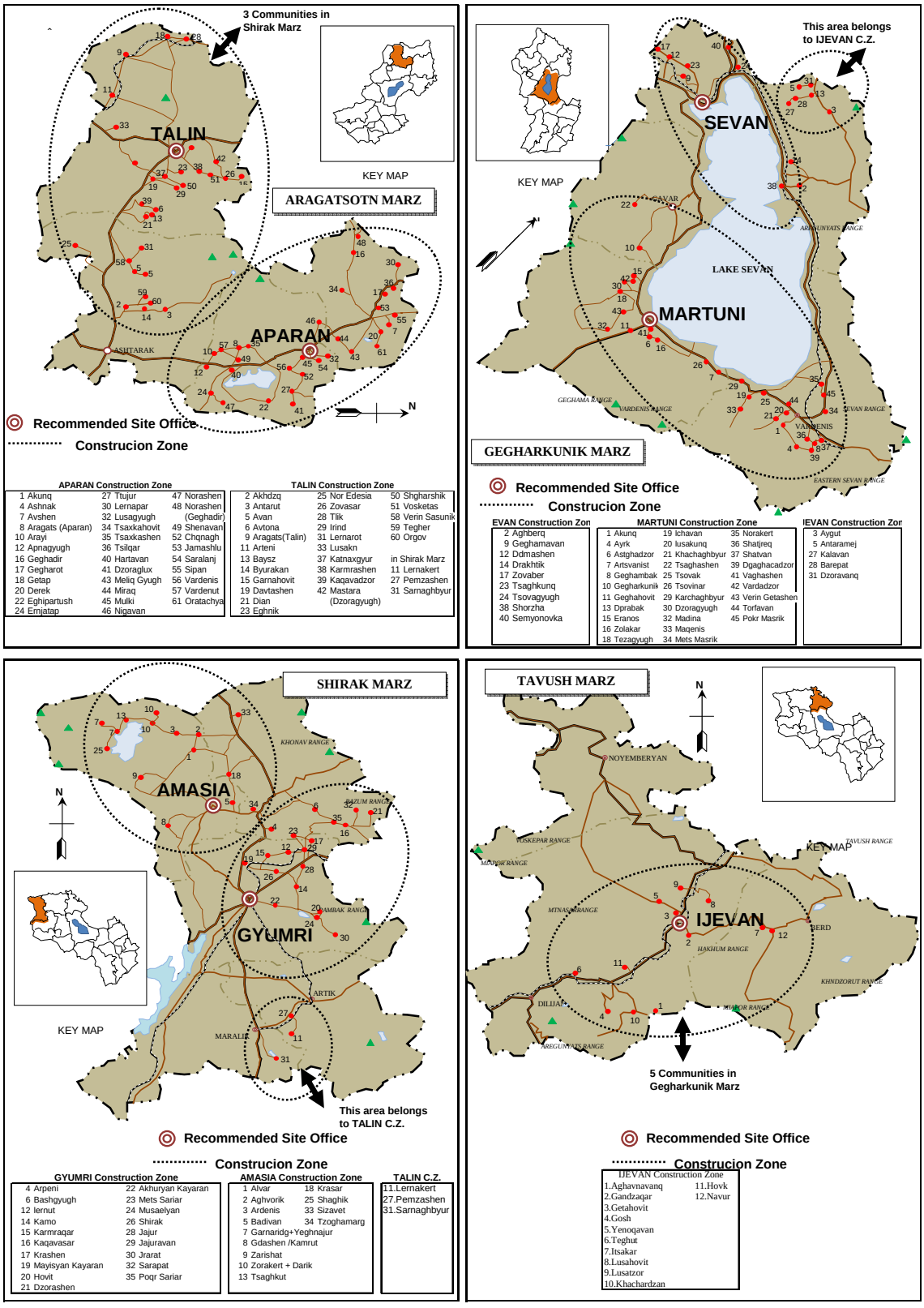


Figure 11.1.1 Group of the Target Rural Communities by Construction Zone

Source: JICA Study Team, 2008

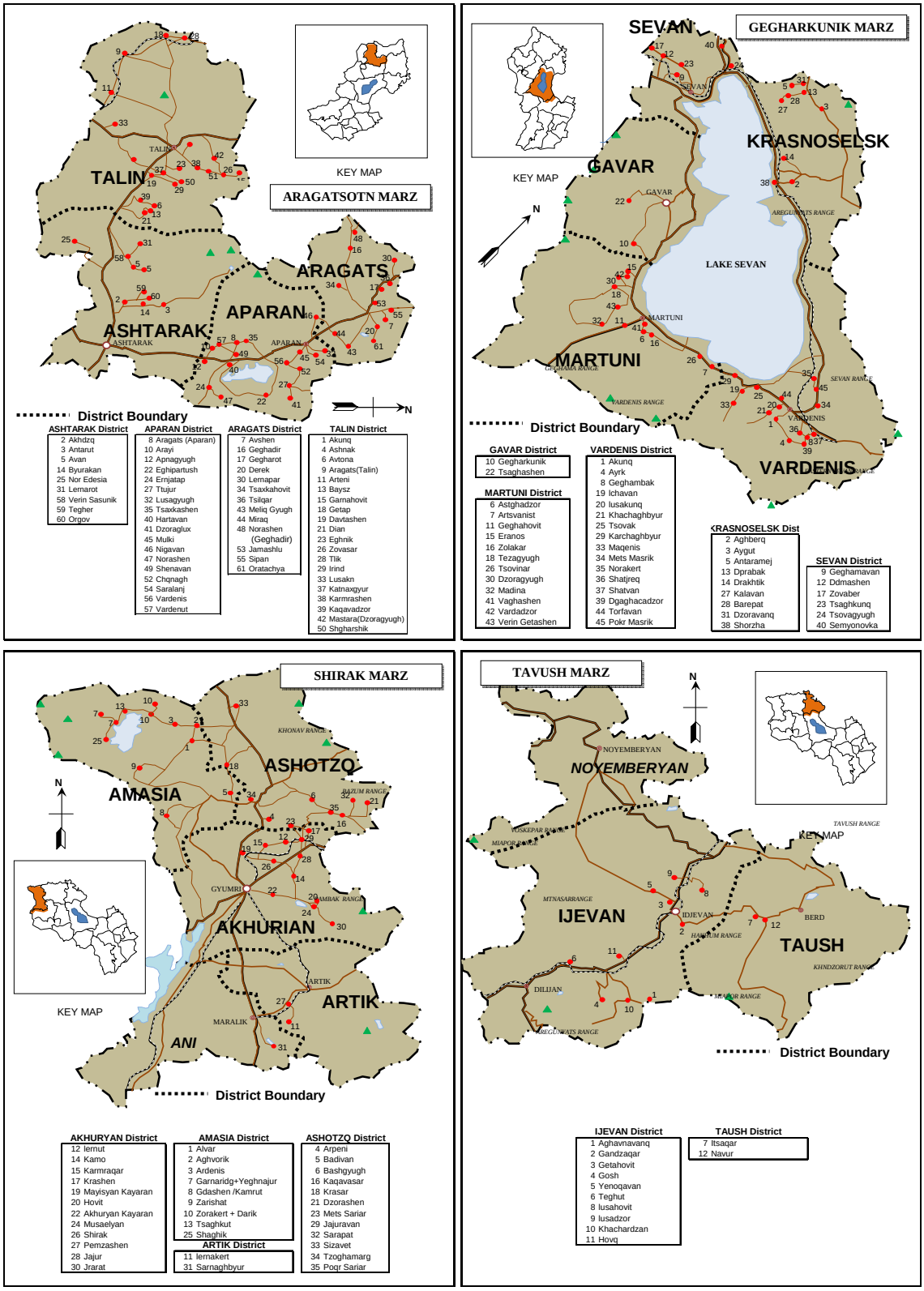


Figure 11.1.2 Group of the Target Rural Communities by District

Source: JICA Study Team, 2008

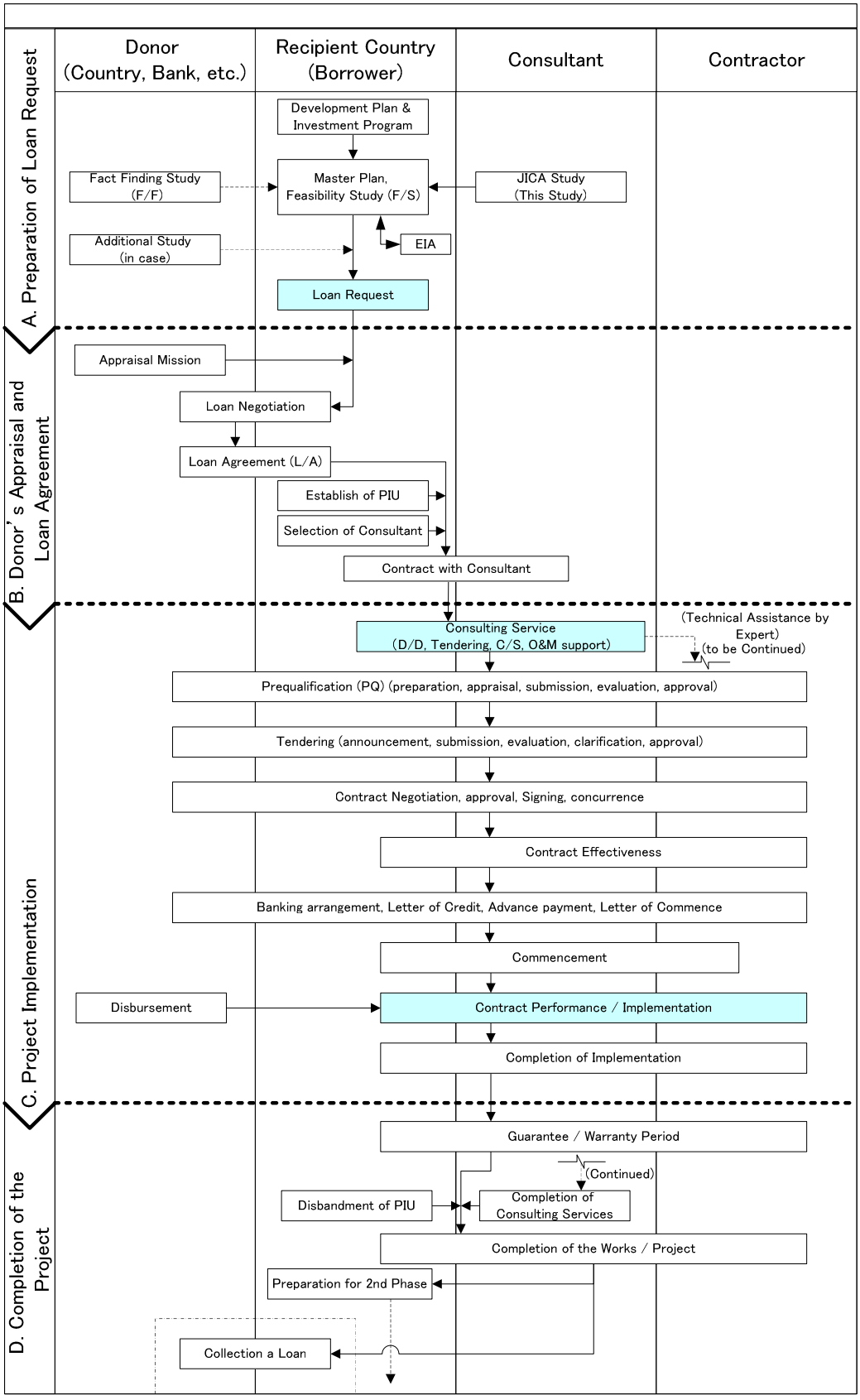
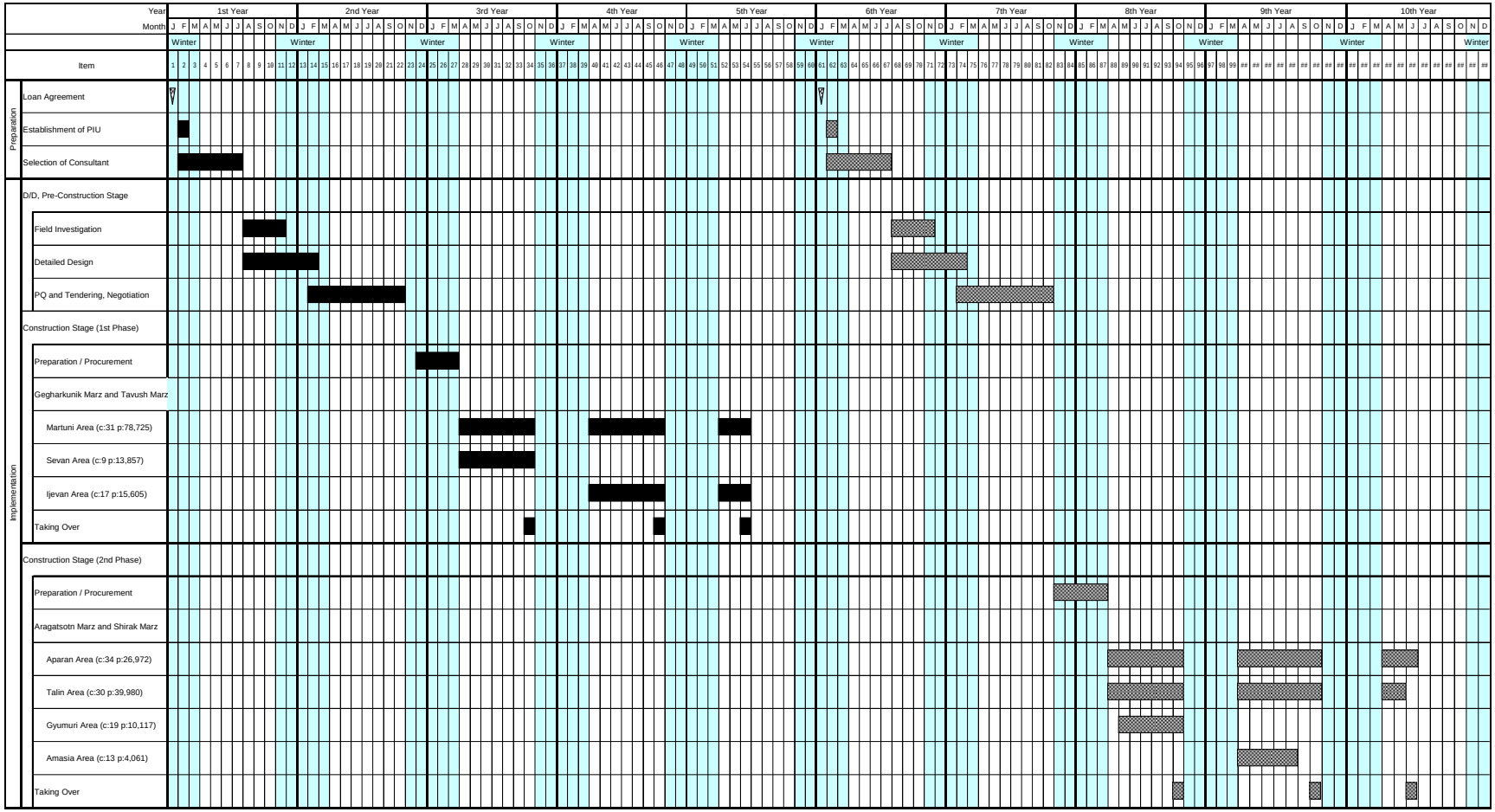


Figure 11.2.1 Sequence of the Loan Project

Source: JICA Study Team, 2008



Source: JICA Study Team 2008

Figure 11.3.1 Project implementation Schedule

CHAPTER 12 ENVIRONMENTAL EXAMINATION OF THE PROPOSED PROJECTS

12.1 Scoping Based on JICA Environmental Guidelines

According to the JICA Guidelines for Environmental and Social Considerations enacted in April 2004, JICA classifies projects under three categories according to the extent of environmental and social impacts, as shown in Table 12.1.1. In identifying such classification, JICA takes into account the project outline, scale, site conditions, and environmental impact assessment scheme in the host countries.

Table 12.1.1 Categorization by JICA Environmental Guidelines

Category A:	Projects are classified as **Category A** if they are likely to have significant adverse impacts on the environment and society.
Category B:	Projects are classified as **Category B** if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally they are site-specific; few if any are irreversible; and in most cases normal mitigation measures can be designed more readily.
Category C:	Projects are classified as **Category C** if they are likely to have minimal or little adverse impacts on the environment and society.

Source: JICA Guidelines for Environmental and Social Considerations, April 2004

The proposed projects were rated as category 'B' according to the screening and scoping of the environmental study of the preparatory study team, which were conducted following JICA's environmental guidelines. The impacts that lead to identifying the project under category B include the impacts on cultural property, water rights and rights of common, flora and fauna, etc. These are the identified components that could be possibly affected by the implementation of the proposed projects.

Based on field trips conducted to ten rural communities in May 2007, a re-scoping was conducted for the expected impacts of the project implementation, in order to identify the most favorable construction methods and mitigation measures, including alternatives. According to the scoping of the environmental and social impacts study, five social environmental factors (cultural property, water rights and rights of common, public health conditions, waste, hazards or risks) fall under category B as shown in Table 12.2.1.

12.2 Terms of Reference for Environmental and Social Considerations

12.2.1 Understanding Development Needs

The existing water supply facilities in the study area consist mainly of small-scale gravity water supply systems, with springs as the water sources. They appear deteriorated and

improperly maintained. It was commonly observed that water faucets for public taps are left open or damaged, causing a large volume of water leakage. This has caused water shortages in many rural communities, and sometimes even landslides in some areas. Improvement of the drainage facilities is urgently required.

12.2.2 Impacts to be Assessed and Study/Survey Methods

Based on environmental examination, the environmental factors related to the implementation of the proposed projects have been identified. It is noted that the project is classified as a small-scale rehabilitation project since water pipe diameter involved is less than 300 mm. Therefore, the Initial Environmental Examination (IEE) is supposed to address the following related issues. From June to September 2007, a field survey was conducted by the designated subcontractor for the study.

Table 12.2.1 Impacts to be Assessed and Corresponding Basis

Environmental Item	Rating	Basis
Social Environment		
Cultural Property	B	The new pipe installation work will be carried out along the path of existing pipes installed under the roads. Pipe diameter is less than 300mm; however cultural properties near existing water pipes should be avoided to prevent causing negative impacts due to the rehabilitation works
Water Rights and Rights of Common	B	Water rights (springs) of rural communities for their water supply facilities as confirmed by the local authorities, were recorded in the field surveys. Approximate 60% communities do not have valid water use permits.
Public Health Conditions	B	The project involves installation of new pipes to replace old asbestos cement pipes in some areas. There are possible health problem issues since workers engaged in the removal or cutting of old asbestos are susceptible to absorbing asbestos fine particles.
Waste	B	No surplus soil will be produced because pipe diameter involved is less than 300 mm the impact of waste in the form of the old pipes is to be considered especially in rehabilitation projects for asbestos cement pipes.
Hazards (Risks)	B	Leakage and/or discharge could possibly induce landslides. There are communities which are prone to landslides as identified from related JICA study.
Natural Environment		
Hydrological Situation	D	No change will be made to the river drainage system; however, information regarding drainage flow patterns in the vicinity of Lake Sevan as reported by the local authorities was confirmed in the field surveys.
Flora and Fauna	D	Flora and fauna will not be affected because diameters of new pipes are less than 300 mm and they are to be placed along the path of the old pipes under the roads. Nevertheless, during field surveys, local authorities were asked by the study team about any reserved areas located within the project sites in order to avoid or mitigate impact on the flora and fauna.

Source: JICA PR-1, 2007
Note: Evaluation categories
A: serious impact is expected, B: some impact is expected, C: Extent of the impact is unknown (Examination is needed. Impacts may become clear as study progresses), D: No impact is expected. IEE/EIA is not necessary.

12.3 Results of the IEE-Level Study

In accordance with the TOR above, the JICA study team conducted the IEE-level of environmental and social considerations study in October 2007 for the proposed and pilot projects, in cooperation with SCWS and Ministry of Natural Protection (MONP). The results of the IEE-level study are shown below.

12.3.1 Cultural Property

A list of the communities where cultural properties exist, as well as the evaluation of possible impacts on the cultural properties from the proposed projects are recorded in the data book. About 90% of the rural communities possess cultural properties. However, existing water pipes in the rural communities are located more than 5 meters from the cultural properties. Therefore, the rehabilitation works will not have any impact on the above mentioned cultural properties.

12.3.2 Water Rights and Rights of Common

Article 21 of Chapter 4 of the Water Code for the Republic of Armenia requires all water users to obtain permits (except for use that is determined negligible). Currently water use permits are issued by the Water Resources Managing Agency (WRMA) under the MONP. The permits are inheritable and non-transferable to another party. Based on the Water Code, the National Water Program (NWP) was implemented on 27 November 2006. The permits obtained prior to said date were valid for a maximum of three years. Subsequently, the permits should be updated with the water basin management plan in accordance with NWP. These updated permits will be valid for a maximum of 25 years. Through a new permit application, its holder can then modify the terms of an existing permit.

Site surveys revealed that not all of the communities hold water use permits as shown in Table 12.3.1. In total, only 43% of the 153 surveyed rural communities presently hold valid drinking water use permits, while 57% still have not obtained such permits. The most ideal is the case of Shirak Marz, where 89% of the rural communities surveyed hold valid permits. On the contrary, in Tavush Marz, only 17% of the communities surveyed hold such valid permit.

Table 12.3.1 Status of Drinking Water Use Permits

Drinking water use permit Status	Aragatsotn		Shirak		Gegharkunik		Tavush		Total	
	Communities	% of communities	Communities	% of communities	Communities	% of communities	Communities	% of communities	Communities	% of communities
Holding valid water use permit	22	36	31	89	13	29	2	17	68	44
Not holding water use permit	39	64	4	11	32	71	10	83	85	56
Total	61	100	35	100	45	100	12	100	153	100

Source: JICA Study Team, 2008

12.3.3 Public Health Conditions

A list of communities which have probable issues on public health conditions due to old asbestos cement pipes are shown in Table 12.3.2.

Table 12.3.2 List of Communities where Old Asbestos Cement Pipes Have Been Installed

Marz	Community		
ARAGATSOTN			
	No.1 Akung	No.37 Katnaghbyur	No.43 Meliqgyugh
	No.10 Arayi	No.38 Karmrashen	No.50 Shgharshik
	No.16 Geghadir	No.39 Kaqavadzor	No.53 Jamshlu
	No.29 Irind	No.40 Hartavan	
SHIRAK			
	No.24 Musaelyan	No.27 Pemzashen	No.33 Sizavet
GEGHARKUNIK			
	No.7 Artsvanist	No.18 Tazagyugh	No.34 Mets Masrik
	No.10 Gegharkunik	No.20 Lusakunq	No.37 Shatvan
	No.14 Drakhtik	No.22 Tsaghkashen	

Source: JICA Study Team, 2007

12.3.4 Wastes

No surplus soil will be produced since pipe diameter required is less than 300 mm. Old asbestos cement pipes will be left buried under the ground after new pipes are installed at locations shown in Table 12.3.2.

12.3.5 Hazards (Risks)

There is a high level of risk and/or hazard potential of landslide in some parts of the rural communities as shown in Table 12.3.3. The detailed list of communities subject to hazard (risks) potential is recorded in the data book.

Table 12.3.3 The Summary of Hazards (Risks) Potential Communities

Marz	Community Landslide Risk Management Priority Code		Total
	A	B	
Aragatsotn	-	-	0
Shirak	-	-	0
Gegharkunik	-	No.3Aygut, No.13Dprabak, No.31Dzoravanq	3
Tavush	No.4Gosh, No.11Hovq,	No.2Gandzaqar, No.3Getahovit, No.5Yenoqavan, No.10Khachardzan, No.12Navur	7
Total	2	8	10

Source: JICA Landslide Study, 2006

The evaluation was referred to the landslide inventory of the JICA Study on Landslide Disaster Management in the Republic of Armenia, done in 2006. Evaluation categories of hazard/risk level and management priority are shown in Table 12.3.4.

Table 12.3.4 Evaluation of Issues on Hazards (Risks)

Hazard Level Code	
I	Damages are progressing
II	Damages were reported or recognized in the past and effective countermeasures have not been performed
III	Landslide configurations are recognized, but damage has not been reported or recognized
Risk Level Code (Risk Object & Environmental/Economical Impact Level)	
H	Many houses, public facilities, or important infrastructures are at risk. Landslides could cause serious environmental impacts
M	Some houses, public facilities, or infrastructures are at risk. Landslides could cause serious environmental impacts
L	Landslides would have little impact on human activities
Example of Environmental/Economic Impact	
Landslides blocking and backing up a flow channel	
Flooding due to dam collapse caused by landslide	
Potential increase of debris flow	
Inconvenience due to suspension of road traffic	

Risk Management Priority Code				
Hazard / Level		I	II	III
Risk Level	H	A	B	C
Risk Level	M	B	C	C
Risk Level	L	C	C	D

Source: JICA: Study on Landslide Disaster Management in the Republic of Armenia, 2006

12.4 Possible Negative Impacts due to Rehabilitation Work

(1) Water Pollution

Water source are protected at present from pollution. There is a possibility that construction materials and wastes generated during the rehabilitation works of intakes may cause negative impacts to the water sources.

(2) Soil Erosion

No particular soil erosion is expected since no surplus water will be produced during the rehabilitation work.

(3) Noise and Vibration

During construction work concerning the pipe trenches, major construction equipment required includes hand tools, such as pickax, hoe and shovel. The expected level of noise and vibration is not hazardous to the general health of the people since it is supposed that the level of noise is just similar to that induced while cultivation during farming.

12.5 Environmental Impact Expertise (EIE) Study by MONP

In accordance with the procedures stated in the law on EIE, SCWS will submit all plans subject to assessment of MONP based on the results of the IEE-level study, incorporating reports prepared in the study process. MONP shall scrutinize the plan and notify SCWS of the examination results. This process will commence after completion of the Study reports.

In water supply and sewage sector, projects which require EIE are those that involve installation of pipe lines greater than 300 mm diameter. For the rural water supply projects, this is not necessary.

When EIE is required, the proprietor of the project submits a project evaluation report to MONP. Specialist who will examine the appropriate level of approval, i.e., “yes” if approved; “no” to imply approval with modification; or “absolutely no” indicating proposed plan is not approved. If it is judged as either “yes“ or “no,”, full-scale examination will proceed. Firstly, allocation examination and secondary construction examination will be conducted. During the construction examination stage, relevant periods are set such as notice to local communities within seven days from the submission of the evaluation report, 30 days for opinion assertion and 60 days for modification of design and negative impact mitigation plan.

12.6 Mitigation of the Social Environmental Impact

(1) Cultural Property

It will be able to avoid any impact to the cultural property by providing a work road during the construction period in order to be away from it.

(2) Water Rights and Rights of Common

It is critically important that 85 rural communities shall obtain water use permits as soon as possible. Since there are no competitive water problems in the study area, the communities will easily obtain Water Use Permits (WUP) once they apply to WRMA.

(3) Public Health Conditions

The replacement of old asbestos cement pipes should be conducted as much as possible without cutting. Old asbestos cement pipes should be left buried under the ground after new pipes are installed to replace its function. If cutting of old asbestos cement pipe is necessary, workers should use masks as protection against fine particles and spray water on the construction site in order to keep it wet during construction.

(4) Waste

Old asbestos cement pipes should be left buried under the ground after new pipes are installed.

(5) Hazard (Risks)

It is recommended that drains be constructed in the rural communities which are subject to risk as shown in Table 12.3.3, in order to reduce the risks of landslides.

(6) Consideration for Construction Work

If wastes from construction materials are generated at water intakes, these must be removed and transported to a suitable place without causing water pollution during construction.

CHAPTER 13 PROJECT EVALUATION

13.1 Preconditions for Project Evaluation

(1) Disbursement schedule

The disbursement schedule of each phase is programmed based on the implementation plan. The total cost corresponds to the project cost estimated in Chapter 9. The loan expenses are mostly in local currency, while the total expenditures shown in Chapter 10 are converted into Armenian Dram (AMD). The implementation period of each phase is seven years, including the technical advisory services after completion of construction works. Loan interest payments are from 8th to 10th years.

Table 13.1.1 Disbursement Schedule of the Projects

Unit: million AMD

Year	Phase 1				Phase 2			
	Eligible	Non-eligible	Total	1,000 USD	Eligible	Non-eligible	Total	1,000 USD
1st	211	74	285	926	211	74	285	926
2nd	165	57	222	727	165	57	222	727
3rd	6,212	2,171	8,383	27,432	6,339	2,216	8,555	27,998
4th	6,642	2,414	9,056	29,640	6,192	2,255	8,447	27,653
5th	2,989	1,202	4,191	13,715	1,804	773	2,577	8,426
6th	34	173	207	675	34	159	193	626
7th	26	170	196	642	26	156	182	593
8th~10th	0	486	486	1,596	0	441	441	1,449
Total	16,279	6,747	23,026	75,353	14,771	6,131	20,902	68,398

Source: JICA Study Team, 2008

(2) Operation and Maintenance Organization

In principle, water tariff in Armenia covers both the investment costs and operation and maintenance (O&M) costs. Thus, the local organization in charge of O&M mentioned in Chapter 10 shall conduct the operation and maintenance works after completion of construction works. The annual O&M costs and the annual water tariff revenues to be generated are analyzed vis-à-vis the capacity to repay the initial investment. In addition, it is also analyzed how much the Project Management Unit (PMU) will be able to repay the loans from the funds generated from the water fee revenues.

(3) Operation and Maintenance Costs

The annual operation and maintenance costs consist of: 1) O&M staff salaries, 2) chlorine, 3) electricity for pumps, and 4) pipe and pump repair costs. The O&M organization for each rural community is designed with the same structure as the pilot project. The monthly labor cost is calculated assuming the employment of technical inspector/s (one technical inspector assigned for every 500 households) and one pump operator managing

all the facilities. The cost of electricity is AMD 25/m^3 based on the result of the pilot project. Also, the PMU headquarter operation cost is estimated after the completion of the project. The unit prices of O&M costs are presented in Table 13.1.2 below.

Table 13.1.2 Unit Prices of Operation and Maintenance Costs

No.	Item	Price	Unit	Basis
1	Staff salary a) Technical inspector b) Pump operator	 20,000 20,000	 AMD/month AMD/month	Salary is paid to full time staff following the pilot project's case.
2	Chlorine	600	AMD/kg	Market price plus transportation to site Chlorine dosing volume is 5 g/m3.
3	Electricity for pump	25	AMD/m^3	Pilot project result
4	Repair cost a) Pump b) Pipe	 300,000 35,000	 AMD/year AMD/km	 Assumed USD 1,000 /year Estimate from socio-economic survey results
5	PMU head quarter operation cost	50,000,000	AMD/year	Estimated from the existing water supply companies' financial statements

Source: JICA Study Team, 2008

Further, pump replacement cost is estimated at every 15 years for the rural communities using pump for drinking water purposes. These are listed in Table 13.1.3.

Table 13.1.3 Rural Communities Using Pump Facilities

No.	Marz	Rural community	Pump replacement cost (AMD)
1	Aragatsotn	No.9 Aragats	12,000,000
2	Aragatsotn	No.11 Arteni	6,000,000
3	Aragatsotn	No.28 Tlik	6,000,000
4	Aragatsotn	No.45 Mulki	6,000,000
5	Gegharkunik	No.6 Astghadzor	30,000,000
6	Gegharkunik	No.19 Lchavan	6,000,000
7	Gegharkunik	No.35 Norakert	6,000,000
8	Gegharkunik	No.38 Shorzha	6,000,000

Source: JICA Study Team, 2008

13.2 Financial Evaluation

13.2.1 Cost Recovery Analysis

The cost recovery analysis is undertaken to determine whether the proposed water tariff can cover: 1) O&M cost, 2) the construction cost and O&M cost, and 3) full cost recovery including loan interest expenses. First, it was estimated whether the annual revenue can cover the O&M cost. In case when extra revenue is generated, the amounts were summed up to calculate how much of the investment cost can be repaid.

(1) Proposal of Water Tariff Setting

Based on the result of willingness-to-pay survey, AMD 500/month is the affordable monthly water fee for the population. Further, it is estimated that AMD 900/month, which is 3% of the average household income of AMD 30,000/month, is the maximum

affordable monthly water fee based on the socio-economic survey. It is also assumed that the average number of household members is four and water consumption is 12 m^3/month, which is in line with the Armenian water supply guideline that one person uses 100 liters of water per day. The monthly water fees, AMD 500/month and AMD 900/month are then divided by 12m^3, resulting to the tariff rates per m^3 (Case1: AMD 40/m^3, Case2: AMD 70/m^3). The current AWSC water tariff rate of AMD115.65/m^3 is set as Case3.

Table 13.2.1 Proposed Water Tariffs

Case	Tariff Rate	Reason
1	AMD 40/m^3	Affordable monthly water tariff (AMD 500/m) according to the willingness to pay survey result
2	AMD 70/m^3	3% the average household income (approx. AMD 30,000/m) from the socio-economic survey result (AMD 900/m)
3	AMD 115.65/m^3	Current AWSC water tariff

Source: JICA Study Team, 2008

(2) Calculation Conditions

The following conditions are applied in the calculation of revenue and cost recovery levels:

- Calculation period is 40 years, consisting of ten years grace period and 30 years loan repayment period;
- Water fee collection ratio is assumed to be 90% for each rural community;
- Water consumption is 100 L/capita/day;
- Water fee revenue is generated from the 3rd year. Annual water fee revenues from 3rd to 5th years are calculated by multiplying the assumed annual revenue based on construction progress, and the assumed annual revenue will continue after completion of the construction works until the 40th year;
- Price escalation is applied for water tariff rate and O&M costs;
- Depreciation cost is applied to construction cost and is generated from the 6th to the 40th year. Residual value is 5% of the construction cost.

(3) Cost Recovery Analysis

Table 13.2.2 (located at the end of this chapter) shows the cost recovery analysis results of the three cases. In case the water fees are not sufficient to pay the O&M and investment costs, the annual balance is deficit. The table shows such year by hatch. It is also shown that Phase 1 covers the O&M costs even the water tariff rate is only AMD 40/m^3 except on the year of pump replacement. However, all the cases have deficit years when the water tariff rates repay the investment costs. In Phase 2, Case 1, the water tariff rate of AMD 40/m^3 cannot repay the O&M costs after the 6th year. Only Case 3, water tariff rate AMD 115.65/m^3, bears surplus after the 33rd year. Annual balances of the other

two cases are deficit for the whole 40 years. Taking into consideration the present water tariff rate, it is not practical to set higher price than Case 3. Thus, it is necessary to provide subsidy for the deficit from the government in case the project will be implemented to keep the same scale.

(4) Proposal of Water Tariff Rate Schedule

Water tariff shall start from AMD 40/m^3 or at a comparably lower water tariff for gravity-type water systems. Most households are currently not paying the water fee, but they will be required to pay after the installation of water meters. In order to minimize the subsidy, it is necessary to increase the initial water tariff rate to the current AWSC tariff level on the 11th year when the project loan repayment commences. After the 7th year from the project commencement, the water tariff will be increased to AMD 70/m^3 and will be set to AMD 115.65/m^3 after the 11th year. For the rural communities which use pump, the rate will be AMD 120/m3 or the same as the pilot project case. This unit price will continue up to 11th year but price escalation will be applied after the 12th year.

(5) Cost Recovery Analysis for Each Rural Community

The results of cost recovery analysis for each rural community are presented in Table 13.2.3 located at the end of this chapter. Firstly, 1) O&M costs are deducted from the water fee revenues that each rural community collects every year. Then, 2) the construction cost and 3) interest paid are deducted respectively from the remaining balance. Positive figures mean surplus and the project costs can be recovered by the water fee revenues. Negative figures (which are shown by hatch) show deficit amount and, therefore, cannot cover for the project costs. Also, item 3) means the final accumulated amounts; the deficits of item 3) become the total subsidy amounts. The total amounts in the table indicate the total amount of the cost recovery for 40 years.

The cost recovery level for each rural community is summarized in Table 13.2.4 below. According to the analysis results, only 47 rural communities, or 32% of the total rural communities, can repay all the investment costs by the water fee collection. One hundred forty rural communities, or 94% of the target communities, can pay the annual O&M costs by water fee. It is judged that the operation of both phases can be sustained by the water fee revenues.

Table 13.2.4 Project Cost Recovery Level by Water Fee Collection

Marz	Cannot cover O&M cost	Repay O&M cost	Repay up to construction cost	Repay up to loan interest	Total
PHASE 1					
Gegharkunik	1	23	0	21	45
Tavush	0	8	1	2	11
PHASE 2					
Aragatsotn	2	38	5	16	61
Shirak	6	16	2	8	32
Total	9	85	8	47	149

Source: JICA Study Team, 2008

Breakdown of the O&M costs of the nine rural communities whose water revenues cannot cover for their O&M expenses are shown in Table 13.2.5. There are three reasons why these communities cannot pay their O&M costs.

Firstly, the rural population of these communities is too small so that water sales cannot cover for the estimated labor cost. Four rural communities in Shirak Marz (No.6 Bashgyugh, No.15 Karmaraqar, No.19 Mayisyan Kayaran, and No.22 Akhuryan Kayaran) are in this situation. Although four rural communities (No.8 Geghamabak in Gegharkunik Marz, No.21 Dian in Aragatsotn Marz, No.2 Aghvorik and No.10 Zorakert+Darik in Shirak Marz) can have enough water sales to pay for the labor cost, their water supply pipeline systems are relatively larger than their population scale. As a result, the estimated annual pipe repair costs exceed the estimated water sales and they cannot cover the annual O&M costs. It is difficult to increase water sales volume, thus reduction of the annual O&M costs will be considered. In order to save on annual O&M costs of these eight rural communities, it is recommended that labor works for water meter reading, bill collection, and technical inspection works shall be done by unpaid volunteers. In this case, the water fee collection and annual O&M costs will be balanced financially.

No.28 Tlik in Aragatsotn Marz plans to get their water from Chlkan regional water supply system. In addition, it uses pump facilities for extracting water from the river. Therefore, its annual O&M costs are much higher than the water fee collection. Currently, no water is supplied from Chlkan regional water supply system because of excessive usage by the upstream rural communities. According to the water resources survey, Tlik has been taking 2.5 L/sec of water from the pipeline of Chlkan regional water supply system and it is possible to re-allocate about 0.5 L/sec of water for Tlik. It is also reported that the river water quality is not suitable for drinking. From the financial and water quality perspectives, it is not sustainable to use pump permanently. Thus, it is perceived that the water supply from the pipeline system is necessary.

Table 13.2.5 Rural Communities that cannot Cover the Annual O&M Costs

Unit: million AMD

No.	Rural community	Revenue (A)	Expenditure (B)				Cost recovery rate (A/B)
		Water Fee	Labor cost	Pipe Repair	Others	Total	
	PHASE 1						
	Gegharkunik Marz						
1	No.8 Geghamabak	40.55	17.70	21.87	1.93	41.50	98%
	PHASE 2						
	Aragatsotn Marz						
2	No.21 Dian	36.89	17.70	17.53	1.76	36.99	100%
3	No.28 Tlik	38.58	35.40	19.75	62.35	117.50	33%
	Shirak						
4	No.2 Aghvorik	27.09	17.70	16.73	1.30	35.73	76%
5	No.6 Bashgyugh	17.78	17.70	12.59	0.89	31.18	57%
6	No.10 Zorakert+Darik	40.30	17.70	28.39	1.92	48.01	84%
7	No.15 Karmaraqar	15.32	17.70	1.47	0.74	19.91	77%
8	No.19 Mayisyan Kayaran	13.69	17.70	0.72	0.66	19.08	72%
9	No.22 Akhuryan Kayaran	4.70	17.70	3.70	0.27	21.67	22%

Source: JICA Study Team, 2008

(6) Cost Recovery Analysis for Phases 1 and 2

The cost recovery analysis for Phases 1 and 2 is based on the results of each rural community cost recovery analysis. The following preconditions are assumed for the financial analysis:

- Taxes and duties are paid after the net income is surplus;
- PMU headquarter operation cost is disbursed from the total revenue;
- Subsidy is provided for the rural communities which have annual O&M costs deficit;
- Surplus transferred from each rural community are kept in a special account and is the source of funds for debt repayment. If surplus amount is not sufficient for the repayment amount of each year, subsidy is provided.

The projected income statements and cash flow statements of both phases are shown in Tables 13.2.6 and 13.2.7. The following can be read from the cash flow statements.

1) Phase 1

- Subsidy is required for the O&M costs from 3rd to 10th year and 16th and 31st years (the pump replacement years);
- The total amount of subsidy used for the O&M costs is AMD 207.6 million. When the water tariff rate is AMD 40/m^3 from 3rd to 6th year, the subsidy amount is AMD 12.2 million and the annual average subsidy is approximately AMD 3.0 million. When it increases to AMD 70/m^3 from 7th to 10th year, the total subsidy amount is AMD 800,000 and the annual

average subsidy is approximately AMD 200,000. The subsidies on the 16th and 31st year are AMD 74.1 and AMD 120.6 million, respectively;

- The total subsidy is about 2% (=AMD 207.6 million/ AMD 9878.5 million) of the total O&M costs;
- It is estimated that the water tariff revenues (AMD 17,145.7 million) can meet 85% of the total investment cost (AMD 20,098.6 million);
- Subsidy is required to repay the investment costs from 1st to 6th year (the project construction period) and from the start of investment costs repayment on the 11th year up, to 32nd year;
- The amount of subsidy used for the investment cost is AMD 3,689.3 million. The total subsidy from 1st to 6th year is AMD 230.5 million. The subsidies for the first two years are around AMD 2~3 million. It increases to AMD 28.6 million on the 3rd year and reaches AMD 100.1 million on the 6th year. The amount of subsidy between 11th and 32nd year is AMD 3,458.8 million. The largest is AMD 281.2 million on the 11th year. The subsidy decreases by about AMD 10 million per annum except on the pump replacement years.
- Surplus cash is generated during 7th and 10th year and after 33rd year;
- The total surplus amount is AMD 736.3 million. The surplus amount from 7th to 10th year is AMD 92.2 million. It is AMD 15.8 million on the 7th year and increases by about AMD 5.0 million per annum for three years. The surplus amount for eight years after the 33rd year is AMD 644.2 million. It is AMD 14.1 million on the 33rd year and increases by around AMD 20.0 million every year.

2) Phase 2

- Subsidy is required for the O&M costs for the whole period from the start of water fee collection on the 3rd year up to 40th year;
- The total amount of subsidy used for the O&M costs is AMD 202.2 million. The annual average subsidy is AMD 3.7 million. The subsidies on the pump replacement years on the 16th and 31st year are AMD 26.3 and 42.7 million, respectively.
- Subsidy occupies about 2% (= AMD 202.2 million / AMD 9,872.6 million) of the total O&M costs;
- It is estimated that the water tariff revenues (AMD 10,542.4 million) can meet 58% of the total investment cost (AMD 18,251.9 million);
- Subsidy is required for the investment cost repayment for the whole period (40 years);

- The total amount of subsidy used for the investment cost is AMD 7709.6 million. The subsidies for the first two years are around AMD 2.0~3.0 million. It increases to AMD 44.5 million on the 3rd year and reaches AMD 128.3 million on the 6th year. When the water tariff rate is AMD 70/m^3, from 7th to 10th year, the subsidy is around AMD 50.0 million. It is the largest, AMD 363.9 million, on 11th year. The subsidy decreases about AMD 10 million per annum except the pump replacement years. The subsidy on 40th year is AMD 87.6 million.
- Surplus cash is not generated for 40 years.

13.2.2 Financial Internal Rate of Return (FIRR)

(1) Calculation of Weighted Average Cost of Capital (WACC)

The WACC is used as the discount rate in computing the present value of the financial costs and is an indicator to measure the viability of the Financial Internal Rate of Return (FIRR). If the FIRR is higher than the WACC, the project is financially viable as a normal investment. Otherwise, the project is not attractive as an investment project and government support is necessary. As mentioned in Chapter 9, the loan portion covers 75% of the total project cost while the Armenian government covers the remaining 25% in the form of administration costs, taxes and duties, etc. The WACC in real term is 1.75% and the process of its calculation is shown in Table 13.2.8.

Table 13.2.8 Calculation of WACC

Item	Investment weight (%)	Capital cost (%)	Capital cost after VAT (%)
1. Loan portion		1.00%	0.83%
WACC nominal after VAT			0.83%
Foreign currency inflation rate			2.40%
WACC real			0.00%
2. Equity			
WACC nominal (Interest rate + premium risk)		11.00%	11.00%
Domestic currency inflation rate			4.00%
WACC real			7.00%
Loan portion	75%	0.00%	0.00%
Equity	25%	7.00%	1.75%
WACC			1.75%

Source: JICA Study Team, 2008

(2) Calculation of FIRR

The FIRR is calculated taking into account the investment cost, O&M cost, water fee revenue, and subsidy. Price escalation is excluded from the calculation. The calculations for Phases 1 and 2 are shown in Tables 13.2.9 and 13.2.10, respectively. The FIRR of both phases are positive, 0.93% for Phase 1 and 0.48% for Phase 2. It is judged that the

project may have financial viability based on the results of the calculation. However, the profitability is much lower compared to other general investment projects.

Table 13.2.11 FIRR of each Phase

Marz	FIRR
Phase 1	0.93%
Gegharkunik	1.06%
Tavush	0.22%
Phase 2	0.48%
Aragatsotn	0.28%
Shirak	0.98%

Source: JICA Study Team, 2008

(3) Sensitivity Analysis

Sensitivity analysis is conducted to check which parameter contributes to the project's sustainability. The following six cases, which consider three scenarios with 10% and 20% of value changes, are analyzed:

- Capital investment cost increases by 10% and 20%;
- O&M cost increases by 10% and 20%; and
- Water fee revenue decreases by 10% and 20%.

Among the three scenarios, the one which involves revenue reduction has the most serious impact to the FIRR values. In other words, a high ratio of water fee collection is required to keep the project's financial soundness. On the other hand, FIRR values of both phases are still positive even if O&M cost is increased by up to 20%. The O&M cost increment has no serious effect to the project's viability and it says that the project will continue to be financially sustainable.

Table 13.2.12 FIRR Sensitivity Analysis Results

Analysis item	10% change	20% change
Phase1 FIRR=0.93%		
1. Capital cost	0.44	0.00
2. O&M cost	0.83	0.72
3. Water fee collection	0.28	-0.44
Phase2 FIRR=0.48%		
1. Capital cost	0.01	-0.42
2. O&M cost	0.36	0.24
3. Water fee collection	-0.17	-0.89

Source: JICA Study Team, 2008

13.3 Economic Evaluation

13.3.1 Project Economic Benefit and Cost

(1) Project Economic Benefit

There are several economic benefits to be received from the project. These are: 1) time savings for water collection and transportation; 2) reduction of drinking water purchasing

costs; 3) reduction of medical expenses with provision of hygienic water; and 4) institutional strengthening of the water supply management. Economic benefits are quantified and estimated for Items 1, 2 and 3.

1) Time savings for water collection and transportation

In the socio-economic survey, questions about the time spent for water collection and transportation were asked. The results indicate that rural communities spend between one to six hours, with an average of 3.7 hours spent per day for those activities. The current minimum wage is AMD 100/hr. This rate is multiplied by the conversion factor of 0.70 for unskilled labor resulting to AMD 70/hr. Forty percent of households that are using public tap can save time. Since the current water supply is not stable with intermittent service interruptions, the households with water service connections will no longer spend time waiting for water collection when the project is completed.

2) Cost saving for water purchasing from other water sources

According to the result of the socio-economic survey, five rural communities in Aragatsotn Marz purchase drinking water from a private water tanker, and there are 3111 households living in these rural communities. Cheaper water supply cost will be the economic benefit of the project for these communities.

3) Reduction of medical expenses with provision of hygienic water

Willingness to pay survey asked for water-related diseases in 2006, approximately 10% of community residents, excluding Shirak Marz, replied that they suffered from water-related diseases. Thus, it is assumed that 10% of the residents are infected with water-related diseases. The survey also asked for the medical expenses for the treatment of these diseases. The responses vary from each rural community ranging from AMD 20,000 to 450,000/year with average of AMD 70,000/year. The safe potable water supply to be delivered after the project's completion will drastically reduce these unnecessary expenses and these savings are estimated as an economic benefit of the project.

The annual economic benefits of both phases and their corresponding marzes are summarized in the table below.

Table 13.3.1 Annual Economic Benefits of Each Phase and Marz

Unit: 1,000 AMD

Item	Phase1			Phase2		
	Gegharkunik	Tavush	Total	Aragatsotn	Shirak	Total
1. Time saving for water collection	1,015,382	156,021	1,171,403	573,865	225,258	799,123
2. Cost saving for water purchasing	0	0	0	18,666	0	18,666
3. Reduction of medical expenses	661,521	96,943	758,464	405,433	157,311	562,744
Total	1,676,903	252,964	1,929,867	997,964	382,569	1,380,533

Source: JICA Study Team, 2008

(2) Project Economic Investment Cost

In order to calculate the economic cost of the investment works, price contingencies and loan interests are excluded from the computations since these items are not related with the real consumption of resources. The investment costs are categorized into: 1) traded components, 2) non-traded components (unskilled labor), and 3) other non-traded components. Economic costs of Items 1 and 2 are calculated by multiplying the financial costs by the conversion factors -- 1.05 for Item 1 and 0.70 for Item 2. Financial costs of Phases 1 and 2 are converted into economic costs as presented in Table 13.3.2.

Table 13.3.2 Economic Investment Costs

Unit: 1,000AMD

Item	Financial cost	Conversion factor			Economic cost
		Trade	Unskilled	Other	
		1.05	0.70	1.00	
Phase 1					
Construction cost	12,926,551	10%	30%	60%	11,827,794
Price escalation	1,691,684	-	-	-	0
Physical contingency	731,109	0%	0%	100%	731,109
Consultant fee	834,070	20%	0%	80%	842,411
Price escalation	48,727	-	-	-	0
Physical contingency	43,995	0%	0%	100%	43,995
Total	16,276,136				13,445,309
Phase 2					
Construction cost	11,700,194	10%	30%	60%	10,705,678
Price escalation	1,481,161	-	-	-	0
Physical contingency	659,312	0%	0%	100%	659,312
Consultant fee	834,070	20%	0%	80%	842,411
Price escalation	48,727	-	-	-	0
Physical contingency	43,995	0%	0%	100%	43,995
Total	14,767,459				12,251,395

Source: JICA Study Team, 2008

(3) Economics of the O&M Costs

Initially, the VAT portions of electricity, chlorine, materials, and PIU headquarter operation cost are deducted from the O&M costs. Then, the financial costs are converted into economic costs by applying the conversion factors mentioned below. The results are shown in Table 13.3.3.

Table 13.3.3 Economics of the Operation and Maintenance Costs

Item	Financial cost	Conversion factor			Economic cost
		Trade	Unskilled	Other	
		1.05	0.70	1.00	
Phase 1					
Labor	23,760	0%	100%	0%	16,630
Chlorine	18,650	80%	0%	20%	19,370
Electricity	9,490	0%	0%	100%	9,490
Pump repair	1,500	60%	20%	20%	1,460
Pipe repair	35,210	0%	30%	70%	31,980
Pump replacement	54,000	0%	0%	100%	54,000
Phase 2					
Labor	26,640	0%	100%	0%	18,650
Chlorine	13,620	80%	0%	20%	14,160
Electricity	13,120	0%	0%	100%	13,120
Pump repair	1,200	60%	20%	20%	1,160
Pipe repair	35,080	0%	30%	70%	31,920
Pump replacement	30,000	0%	0%	100%	30,000

Source: JICA Study Team, 2008

13.3.2 Economic Internal Rate of Return (EIRR)

(1) Calculation of EIRR

The EIRR is calculated based on the same conditions described for the calculation of the FIRR. The applied discount rate for the EIRR is 12%, which is the standard rate normally used for calculation of EIRR in development projects. Calculation results are shown in Table 13.3.4.

Table 13.3.4 EIRR of Both Phases and Each Marz

Marz	EIRR
Phase 1	15.71%
Gegharkunik	16.45%
Tavush	11.70%
Phase 2	11.60%
Aragatsotn	11.29%
Shirak	12.43%

Source: JICA Study Team, 2008

As shown in Table 13.3.4 table above, the EIRR of Phase 1 exceeds the 12% discount rate while Phase 2 is nearly equal to 12%.

(2) Sensitivity Analysis

The same parameters applied for the FIRR are used in the sensitivity analysis for the EIRR. Phase 1 has more than 12% EIRR value except for case of 20% decrease of water fee collection rate. However, its value is almost equal to 12% under this calculation result.

Table 13.3.5 EIRR Sensitivity Analysis Results

Analysis item	10% change	20% change
Phase1 EIRR=15.71%		
1. Capital cost	14.04	12.67
2. OM cost	15.62	15.54
3. Water fee collection	13.79	11.91
Phase2 EIRR=11.60%		
1. Capital cost	10.34	9.29
2. OM cost	11.52	11.43
3. Water fee collection	10.13	8.65

Source: JICA Study Team, 2008

13.4 Evaluation on the Organization Proposed by the Project

The SCWS has a financial and economic department within its structure. The functions of the department include the operation of the SCWS and management of the water supply companies. However, the operation of each particular water supply company is not included in their main task. Therefore, a concrete organization, which operates the project, should be required for the Phase 1 and 2 implementation. Thus, establishment of the Project Implementation Unit (PIU) is appropriate in order to conduct the O&M works of the project. The main task of PIU during the construction period is coordination among concerned organizations. Upon completion of the project it will be transformed into a Project Management Unit (PMU) whose main tasks are to support each rural community and manage the funds collected from the water fees. PIU will be the newly established organization, so that PIU shall be required to develop its management capacity during the project implementation stage.

Presently, the rural communities are handling the physical maintenance works of their own water supply facilities although these are limited due to insufficient budget. It is not additional burden on rural communities to conduct the O&M works since they still have the capacity to perform taking into consideration of the present situation. Therefore, the actual O&M works shall be the responsibility of the local organizations in charge of the O&M under rural community. Most rural communities do not collect water fees periodically and this task will have to be done by themselves after the completion of the construction works. Water fee collection is one of the preconditions for the project's sustainability, therefore, the project will implement the management and operation support for two years after completion of the construction works. Each rural community will strengthen its management and operation capacity especially water fee collection and financial management under the support by PIU.

13.5 Conclusions

The following are the results of the project evaluation:

- It is confirmed that subsidy from the state government is necessary because the annual balances have deficit even if the project applies the highest water tariff rate (AMD 115.65/m^3).
- In case that O&M is carried out starting from AMD 40/m^3 up to AMD 115.6/m^3 on the 11^{th} year, it is estimated that 140 rural communities can pay the annual O&M costs under the condition that the rural community takes charge of the O&M works. The subsidies required for the O&M costs are AMD 207.6 million in Phase 1 and AMD 202.2 million in Phase 2.
- It is estimated that the investment cost recovery ratio for 40 years is 85% in Phase 1 and 58% in Phase 2 applying to the above water tariff rate schedule. The subsidies required for the investment costs are AMD 3,689.3 million in Phase 1 and AMD 7,709.6 million in Phase 2.
- The surplus cash generated is AMD 736.3 million in Phase 1 but none in Phase 2.
- The financial benefits of Phase 1 and 2 are 0.93% and 0.48%, respectively, and their figures are positive.
- The economic benefits of Phase 1 and 2 are 15.71% and 11.60%, respectively, and their figures are almost equal to the EIRR (12%) which is normally applied to development projects.
- It is necessary to keep a high water fee collection ratio to ensure the project's viability, since water fee collection ratio is the most sensitive factor for the project's IRR values.
- The management and operation capacity of the PIU and each rural community shall be developed during the project implementation period.

Table 13.2.2 Cost Recovery Analysis of Three Water Fee Rates (1/2)

PHASE 1 — **Unit: million AMD**

Description	Unit	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A Water Sales Revenue																																											
Consumption water volume	1000m3/yr		5,006.0																																							
Case1: 40 AMD/m3					40.00	40.00	40.00	41.32	42.68	44.09	45.54	47.05	48.60	50.20	51.86	53.57	55.34	57.17	59.05	61.00	63.01	65.09	67.24	69.46	71.75	74.12	76.57	79.09	81.70	84.40	87.19	90.06	93.03	96.10	99.28	102.55	105.94	109.43	113.04	116.77	120.63	124.61
Total			0.00	0.00	64.75	145.10	180.21	186.16	192.29	198.64	205.18	211.98	218.96	226.17	233.65	241.35	249.33	257.57	266.05	274.83	283.88	293.26	302.94	312.94	323.26	333.94	344.97	356.33	368.09	380.26	392.82	405.75	419.13	432.96	447.30	462.03	477.30	493.02	509.29	526.09	543.48	561.42
Case2: 70 AMD/m3					70.00	70.00	70.00	72.31	74.70	77.17	79.71	82.34	85.06	87.87	90.77	93.76	96.86	100.05	103.35	106.76	110.29	113.93	117.69	121.57	125.58	129.73	134.01	138.43	143.00	147.72	152.59	157.63	162.83	168.20	173.75	179.49	185.41	191.53	197.85	204.38	211.12	218.09
Total			0.00	0.00	113.32	253.93	315.37	325.78	336.55	347.68	359.12	370.97	383.22	395.89	408.96	422.42	436.39	450.76	465.63	480.99	496.90	513.30	530.24	547.72	565.79	584.48	603.76	623.68	644.27	665.53	687.47	710.18	733.61	757.81	782.81	808.67	835.35	862.92	891.39	920.81	951.18	982.58
Case3: 115.65 AMD/m3					115.65	115.65	115.65	119.47	123.41	127.48	131.69	136.04	140.52	145.16	149.95	154.90	160.01	165.29	170.74	176.38	182.20	188.21	194.42	200.84	207.46	214.31	221.38	228.69	236.23	244.03	252.08	260.40	269.00	277.87	287.04	296.51	306.30	316.41	326.85	337.63	348.78	360.29
Total			0.00	0.00	187.21	419.53	521.05	538.25	556.01	574.35	593.31	612.91	633.10	654.00	675.58	697.88	720.91	744.70	769.24	794.66	820.88	847.96	875.94	904.86	934.69	965.55	997.40	1030.34	1064.31	1099.45	1135.72	1173.20	1211.94	1251.91	1293.22	1335.89	1380.00	1425.54	1472.58	1521.15	1571.38	1623.25
B Operating Costs																																										
1. Staff salary																																										
Inspectors	person				94																																					
Pump operators	person				5																																					
Base Salary	AMD/m/p				20,000	20,660	21,342	22,046	22,774	23,525	24,301	25,103	25,932	26,788	27,672	28,585	29,528	30,502	31,509	32,549	33,623	34,732	35,879	37,063	38,286	39,549	40,854	42,202	43,595	45,034	46,520	48,055	49,641	51,279	52,971	54,719	56,525	58,390	60,317	62,308	64,364	66,488
Sub-total		1752.07			23.76	24.63	25.45	26.04	26.98	27.84	28.76	29.71	30.70	31.73	32.79	33.91	34.95	36.34	37.50	38.61	39.85	41.33	42.57	43.86	45.54	46.83	48.51	50.24	51.73	53.46	55.32	57.17	59.10	61.08	63.06	65.09	67.20	69.30	71.57	74.13	76.35	79.08
2. Chlorine																																										
Dosing volume	kg/yr				236																																					
Unit rate	AMD/kg				600	620	640	661	683	706	729	753	778	804	830	858	886	915	945	976	1009	1042	1076	1112	1149	1186	1226	1266	1308	1351	1396	1442	1489	1538	1589	1642	1696	1752	1810	1869	1931	1995
Sub-total		1317.37			7.76	15.41	19.23	19.90	20.55	21.26	21.91	22.67	23.40	24.15	24.95	25.80	26.63	27.54	28.39	29.35	30.35	31.36	32.35	33.44	34.52	35.68	36.88	38.05	39.34	40.61	41.95	43.34	44.80	46.24	47.81	49.36	51.00	52.72	54.44	56.18	58.05	60.00
3. Electricity (for pump)		693.39			4.34	8.18	10.13	10.46	10.81	11.17	11.53	11.91	12.30	12.72	13.14	13.56	14.02	14.48	14.95	15.44	15.96	16.48	17.04	17.60	18.18	18.77	19.39	20.03	20.69	21.37	22.08	22.82	23.56	24.33	25.14	25.96	26.83	27.71	28.63	29.58	30.55	31.55
4. Maintenance cost		2679.68			15.28	31.21	39.18	40.50	41.80	43.19	44.60	46.06	47.60	49.16	50.79	52.50	54.19	56.00	57.84	59.74	61.74	63.75	65.85	68.00	70.22	72.59	75.00	77.48	79.99	82.70	85.38	88.24	91.14	94.13	97.24	100.45	103.74	107.15	110.71	114.34	118.15	122.05
Pump repair					0.78	1.31	1.60	1.65	1.70	1.75	1.80	1.90	1.95	2.00	2.10	2.15	2.20	2.30	2.35	2.45	2.50	2.60	2.70	2.80	2.85	2.95	3.05	3.15	3.25	3.40	3.50	3.60	3.70	3.85	3.95	4.10	4.25	4.40	4.50	4.65	4.85	5.00
Pipe repair					14.5	29.88	37.58	38.85	40.07	41.43	42.80	44.17	45.65	47.16	48.71	50.35	51.98	53.70	55.48	57.31	59.23	61.15	63.16	65.24	67.36	69.64	71.93	74.33	76.74	79.30	81.90	84.64	87.41	90.29	93.26	96.35	99.49	102.78	106.18	109.66	113.33	117.07
5. PMU Head quarter operation cost		3205.13						50.00	51.65	53.35	55.12	56.93	58.81	60.75	62.76	64.83	66.97	69.18	71.46	73.82	76.26	78.77	81.37	84.06	86.83	89.70	92.66	95.71	98.87	102.14	105.51	108.99	112.58	116.30	120.14	124.10	128.20	132.43	136.80	141.31	145.98	150.79
6. Pump replacement		230.88																87.86														143.02										
Total		9878.52	0.00	0.00	51.13	79.43	93.99	146.90	151.79	156.81	161.92	167.28	172.81	178.51	184.43	190.60	196.76	291.40	210.14	216.96	224.16	231.69	239.18	246.96	255.29	263.57	272.44	281.51	290.62	300.28	310.24	320.56	474.20	342.08	353.39	364.96	376.97	389.31	402.15	415.54	429.08	443.47
C OM Cost Recovery Amount(A-B)																																									
Case1: 40 AMD/m3		2444.16	0.00	0.00	13.62	65.67	86.22	39.26	40.50	41.83	43.26	44.70	46.15	47.66	49.22	50.75	52.57	-33.83	55.91	57.87	59.72	61.57	63.76	65.98	67.97	70.37	72.53	74.82	77.47	79.98	82.58	85.19	-55.07	90.88	93.91	97.07	100.33	103.71	107.14	110.55	114.40	117.95
Case2: 70 AMD/m3		11688.91	0.00	0.00	62.19	174.50	221.38	178.88	184.76	190.87	197.20	203.69	210.41	217.38	224.53	231.82	239.63	159.36	255.49	264.03	272.74	281.61	291.06	300.76	310.50	320.91	331.32	342.17	353.65	365.25	377.23	389.62	259.41	415.73	429.42	443.71	458.38	473.61	489.24	505.27	522.10	539.11
Case3: 115.65 AMD/m3		25751.33	0.00	0.00	136.08	340.10	427.06	391.35	404.22	417.54	431.39	445.63	460.29	475.49	491.15	507.28	524.15	453.30	559.10	577.70	596.72	616.27	636.76	657.90	679.40	701.98	724.96	748.83	773.69	799.17	825.48	852.64	737.74	909.83	939.83	970.93	1003.03	1036.23	1070.43	1105.61	1142.30	1179.78
D Total debt services																																									
1. Loan repayment		16275.66											467.90	472.59	477.31	482.07	486.90	491.78	496.65	501.64	506.68	511.71	516.87	521.98	527.26	532.53	537.84	543.24	548.64	554.17	559.65	565.25	570.90	576.62	582.38	588.20	594.11	600.04	606.01	612.13	618.24	624.37
2. Interest paid		3822.95	2.24	3.92	65.79	132.23	162.27	162.49	162.49	162.49	162.49	162.49	162.75	158.05	153.35	148.53	143.82	138.87	133.98	129.00	124.00	118.94	113.81	108.66	103.43	98.15	92.78	87.48	82.05	76.52	70.99	65.34	59.78	54.04	48.27	42.45	36.52	30.62	24.61	18.54	12.47	6.25
Sub-total		20098.61	2.24	3.92	65.79	132.23	162.27	162.49	162.49	162.49	162.49	162.49	630.65	630.64	630.66	630.60	630.72	630.65	630.63	630.64	630.68	630.65	630.68	630.64	630.69	630.68	630.62	630.72	630.69	630.69	630.64	630.59	630.68	630.66	630.65	630.65	630.63	630.66	630.62	630.67	630.71	630.62
E Investment Cost Recovery Amount(C-D)																																									
Case1: 40 AMD/m3		-17654.45	-2.24	-3.92	-52.17	-66.56	-76.05	-123.23	-121.99	-120.66	-119.23	-117.79	-584.50	-582.98	-581.44	-579.85	-578.15	-664.48	-574.72	-572.77	-570.96	-569.08	-566.92	-564.98	-562.72	-560.31	-558.09	-555.90	-553.22	-550.71	-548.06	-545.40	-685.75	-539.78	-538.74	-535.58	-530.30	-526.95	-523.48	-520.12	-516.31	-512.87
Case2: 70 AMD/m3		-8409.70	-2.24	-3.92	-3.60	42.27	59.11	16.39	22.27	28.38	34.71	41.20	-420.24	-417.26	-406.73	-398.78	-391.09	-471.29	-355.14	-366.61	-357.94	-349.04	-339.63	-329.88	-320.19	-309.77	-299.80	-288.55	-277.04	-265.44	-253.41	-240.97	-371.27	-214.95	-201.23	-186.94	-172.25	-157.05	-141.36	-125.40	-108.61	-91.51
Case3: 115.65 AMD/m3		5652.72	-2.24	-3.92	70.29	207.87	264.79	228.86	241.73	255.05	268.90	283.14	-170.36	-155.15	-139.51	-123.32	-106.57	-177.35	-71.53	-52.94	-33.96	-14.38	6.08	27.26	48.71	71.30	94.34	118.11	143.00	168.48	194.84	222.05	107.06	279.17	309.18	340.28	372.40	405.57	439.81	474.94	511.59	549.16

Note: Hatch means the decifit results.
Source: JICA Study Team 2008

Table 13.2.2 Cost Recovery Analysis of Three Water Fee Rates (2/2)

PHASE 2 — **Unit: million AMD**

Description	Unit	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A Water Sales Revenue																																											
Consumption water volume	1000m3/yr		3,659.2																																								
Case1: 40 AMD/m3					40.00	40.00	40.00	41.32	42.68	44.09	45.54	47.05	48.60	50.20	51.86	53.57	55.34	57.17	59.05	61.00	63.01	65.09	67.24	69.46	71.75	74.12	76.57	79.09	81.70	84.40	87.19	90.06	93.03	96.10	99.28	102.55	105.94	109.43	113.04	116.77	120.63	124.61
Total			0.00	0.00	55.12	110.23	131.73	136.07	140.56	145.20	149.97	154.95	160.06	165.32	170.79	176.42	182.25	188.28	194.46	200.89	207.50	214.36	221.43	228.75	236.29	244.10	252.17	260.46	269.06	277.95	287.14	296.59	306.37	316.48	326.95	337.72	348.89	360.38	372.27	384.55	397.27	410.37
Case2: 70 AMD/m3					70.00	70.00	70.00	72.31	74.70	77.17	79.71	82.34	85.06	87.87	90.77	93.76	96.86	100.05	103.35	106.76	110.29	113.93	117.69	121.57	125.58	129.73	134.01	138.43	143.00	147.72	152.59	157.63	162.83	168.20	173.75	179.49	185.41	191.53	197.85	204.38	211.12	218.09
Total			0.00	0.00	96.45	192.90	230.53	238.14	246.00	254.14	262.50	271.17	280.13	289.38	298.93	308.78	318.99	329.49	340.35	351.59	363.21	375.20	387.59	400.36	413.56	427.23	441.32	455.88	470.93	486.48	502.52	519.12	536.24	553.92	572.20	591.10	610.60	630.76	651.56	673.08	695.27	718.23
Case3: 115.65 AMD/m3					115.65	115.65	115.65	119.47	123.41	127.48	131.69	136.04	140.52	145.16	149.95	154.90	160.01	165.29	170.74	176.38	182.20	188.21	194.42	200.84	207.46	214.31	221.38	228.69	236.23	244.03	252.08	260.40	269.00	277.87	287.04	296.51	306.30	316.41	326.85	337.63	348.78	360.29
Total			0.00	0.00	159.35	318.71	380.86	393.45	406.42	419.82	433.69	448.02	462.77	478.05	493.82	510.13	526.95	544.34	562.28	580.87	600.03	619.82	640.27	661.41	683.22	705.77	729.06	753.13	777.97	803.65	830.16	857.56	885.88	915.09	945.29	976.48	1008.72	1042.01	1076.40	1111.90	1148.62	1186.53
B Operating Costs																																										
1. Staff salary																																										
Inspectors	person				107																																					
Pump operators	person				4																																					
Base Salary	AMD/m/p				20,000	20,660	21,342	22,046	22,774	23,525	24,301	25,103	25,932	26,788	27,672	28,585	29,528	30,502	31,509	32,549	33,623	34,732	35,879	37,063	38,286	39,549	40,854	42,202	43,595	45,034	46,520	48,055	49,641	51,279	52,971	54,719	56,525	58,390	60,317	62,308	64,364	66,488
Sub-total		1964.64			26.64	27.71	28.73	28.99	30.09	31.12	32.21	33.31	34.42	35.54	36.67	37.86	38.98	40.94	42.14	43.29	44.52	46.50	47.73	48.97	51.06	52.30	54.39	56.49	57.84	59.94	62.12	64.26	66.47	68.69	70.91	73.14	75.44	77.70	80.05	83.21	85.51	88.76
2. Chlorine																																										
Dozing volume	kg/yr				236																																					
Unit rate	AMD/kg				600	620	640	661	683	706	729	753	778	804	830	858	886	915	945	976	1009	1042	1076	1112	1149	1186	1226	1266	1308	1351	1396	1442	1489	1538	1589	1642	1696	1752	1810	1869	1931	1995
Sub-total		965.31			6.29	11.99	14.09	14.54	15.01	15.54	16.03	16.57	17.09	17.68	18.27	18.93	19.51	20.12	20.79	21.52	22.25	22.94	23.65	24.45	25.28	26.12	26.96	27.87	28.75	29.72	30.69	31.72	32.76	33.89	34.96	36.08	37.31	38.60	39.84	41.11	42.47	43.92
3. Electricity (for pump)		958.35			5.74	11.86	13.99	14.46	14.93	15.43	15.94	16.46	17.00	17.56	18.15	18.75	19.36	20.00	20.66	21.35	22.04	22.78	23.53	24.30	25.11	25.93	26.79	27.68	28.58	29.54	30.52	31.50	32.55	33.63	34.74	35.89	37.07	38.30	39.56	40.86	42.21	43.60
4. Maintenance cost		2650.85			15.83	32.85	38.70	40.05	41.25	42.68	44.11	45.56	47.01	48.56	50.18	51.81	53.55	55.33	57.15	59.06	60.98	62.99	65.10	67.25	69.45	71.76	74.08	76.57	79.07	81.75	84.40	87.15	90.04	93.01	96.08	99.23	102.53	105.93	109.37	113.03	116.76	120.64
Pump repair					0.51	1.06	1.28	1.32	1.36	1.40	1.44	1.52	1.56	1.60	1.68	1.72	1.76	1.84	1.88	1.96	2.00	2.08	2.16	2.24	2.28	2.36	2.44	2.52	2.60	2.72	2.80	2.88	2.96	3.08	3.16	3.28	3.40	3.52	3.60	3.72	3.88	4.00
Pipe repair					15.32	31.77	37.42	38.71	39.89	41.26	42.65	44.06	45.45	46.96	48.52	50.10	51.78	53.50	55.26	57.10	58.95	60.91	62.95	65.02	67.16	69.38	71.63	74.05	76.45	79.04	81.60	84.27	87.07	89.94	92.91	95.95	99.14	102.44	105.73	109.28	112.90	116.65
5. PMU Head quarter operation cost		3205.13						50.00	51.65	53.35	55.12	56.93	58.81	60.75	62.76	64.83	66.97	69.18	71.46	73.82	76.26	78.77	81.37	84.06	86.83	89.70	92.66	95.71	98.87	102.14	105.51	108.99	112.58	116.30	120.14	124.10	128.20	132.43	136.80	141.31	145.98	150.79
6. Pump replacement		128.26																48.81														79.45											
Total		9872.55	0.00	0.00	54.50	84.41	95.51	148.04	152.93	158.12	163.41	168.83	174.33	180.09	186.03	192.18	198.37	254.38	212.20	219.04	226.05	233.98	241.38	249.03	257.73	265.81	274.88	284.32	293.11	303.09	313.24	323.62	413.85	345.52	356.83	368.44	380.55	392.96	405.62	419.52	432.93	447.71
C OM Cost Recovery Amount(A-B)																																										
Case1: 40 AMD/m3		-853.20	0.00	0.00	0.62	25.82	36.22	-11.97	-12.37	-12.92	-13.44	-13.88	-14.27	-14.77	-15.24	-15.76	-16.12	-66.10	-17.74	-18.15	-18.55	-19.62	-19.95	-20.28	-21.44	-21.71	-22.71	-23.86	-24.05	-25.14	-26.10	-27.03	-107.48	-29.04	-29.88	-30.72	-31.66	-32.58	-33.35	-34.97	-35.66	-37.34
Case2: 70 AMD/m3		5913.28	0.00	0.00	41.95	108.49	135.02	90.10	93.07	96.02	99.09	102.34	105.80	109.29	112.90	116.60	120.62	75.11	128.15	132.55	137.16	141.22	146.21	151.33	155.83	161.42	166.44	171.56	177.82	183.39	189.28	195.50	122.39	208.40	215.37	222.66	230.05	237.80	245.94	253.56	262.34	270.52
Case3: 115.65 AMD/m3		16205.95	0.00	0.00	104.85	234.30	285.35	245.41	253.49	261.70	270.28	279.19	288.44	297.96	307.79	317.95	328.58	289.96	350.08	361.83	373.98	385.84	398.89	412.38	425.49	439.96	454.18	468.81	484.86	500.56	516.92	533.94	472.03	569.57	588.46	608.04	628.17	649.05	670.78	692.38	715.69	738.82
D Total debt services																																										
1. Loan repayment		14766.64											424.52	428.77	433.00	437.39	441.76	446.20	450.64	455.09	459.67	464.30	468.91	473.62	478.42	483.11	487.93	492.84	497.78	502.76	507.74	512.87	517.99	523.18	528.40	533.69	539.01	544.40	549.89	555.35	560.91	566.50
2. Interest paid		3485.28	1.86	3.72	66.78	128.96	146.65	147.74	147.74	147.74	147.74	147.74	147.65	143.40	139.14	134.82	130.42	126.03	121.57	117.06	112.51	107.92	103.28	98.53	93.81	89.05	84.21	79.28	74.41	69.38	64.39	59.24	54.24	49.02	43.79	38.48	33.15	27.74	22.26	16.85	11.29	5.69
Sub-total		18251.92	1.86	3.72	66.78	128.96	146.65	147.74	147.74	147.74	147.74	147.74	572.17	572.17	572.14	572.21	572.18	572.23	572.21	572.15	572.18	572.22	572.19	572.15	572.23	572.16	572.14	572.12	572.19	572.14	572.13	572.11	572.23	572.20	572.19	572.17	572.16	572.14	572.15	572.20	572.20	572.19
E Investment Cost Recovery Amount(C-D)																																										
Case1: 40 AMD/m3		-19105.12	-1.86	-3.72	-66.16	-103.14	-110.43	-159.71	-160.11	-160.66	-161.18	-161.62	-586.44	-588.94	-587.38	-587.97	-588.30	-638.33	-589.95	-590.30	-590.73	-591.84	-592.14	-592.43	-593.67	-593.87	-594.85	-595.98	-596.24	-597.28	-598.23	-599.14	-679.71	-601.28	-602.07	-602.89	-603.82	-604.72	-605.30	-607.17	-607.86	-609.33
Case2: 70 AMD/m3		-12338.64	-1.86	-3.72	-24.83	-20.47	-11.63	-57.64	-54.67	-51.72	-48.65	-45.40	-466.37	-462.88	-459.24	-455.61	-451.56	-497.12	-441.06	-436.60	-435.02	-431.00	-425.98	-420.82	-416.40	-410.74	-405.70	-400.56	-394.37	-388.75	-382.85	-376.61	-449.84	-363.80	-356.82	-349.51	-343.11	-334.34	-326.21	-318.34	-309.86	-301.67
Case3: 115.65 AMD/m3		-2045.97	-1.86	-3.72	38.07	105.34	138.70	97.67	105.75	113.96	122.54	131.45	-283.73	-274.21	-264.35	-254.26	-243.60	-282.27	-222.13	-210.32	-198.28	-186.28	-173.30	-159.77	-146.74	-132.20	-117.96	-103.31	-87.33	-71.58	-55.21	-38.17	-109.20	-2.63	16.27	35.87	56.01	76.91	98.63	120.18	143.49	166.63

Note: Hatch means the decifit results.
Source: JICA Study Team

Table 13.2.3 Cost Recovery Analysis Results (1/10)

PHASE 1 GEGHARKUNIK MARZ

Unit: million AMD

Description	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No 1 Akunq																					
1 Difference between Water sales revenue and O&M Cost	1041.04	0.00	0.00	1.92	4.50	5.59	5.78	11.15	11.52	11.91	12.31	19.55	20.19	20.85	21.54	22.26	22.98	23.75	24.53	25.34	26.18
2 Difference between No.1 and Construction repayment	548.52											7.25	7.77	8.30	8.87	9.46	10.05	10.70	11.34	12.02	12.73
3 Difference between No.2 and Interest repayment	512.72	-0.04	-0.07	0.17	1.02	1.32	1.51	6.88	7.25	7.64	8.04	2.97	3.62	4.27	4.96	5.68	6.40	7.18	7.95	8.76	9.60
4 Required subsidy amount	0.11	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 2 Aghberq																					
1 Difference between Water sales revenue and O&M Cost	25.90	0.00	0.00	-0.22	-0.24	-0.28	-0.28	0.07	0.07	0.08	0.08	0.53	0.55	0.57	0.59	0.61	0.62	0.65	0.67	0.69	0.71
2 Difference between No.1 and Construction repayment	-133.75											-4.08	-4.11	-4.13	-4.16	-4.19	-4.23	-4.24	-4.27	-4.30	-4.33
3 Difference between No.2 and Interest repayment	-173.33	-0.04	-0.07	-1.76	-1.82	-1.88	-1.88	-1.53	-1.53	-1.52	-1.52	-5.68	-5.67	-5.64	-5.62	-5.61	-5.60	-5.56	-5.54	-5.52	-5.50
4 Required subsidy amount	173.33	0.04	0.07	1.76	1.82	1.88	1.88	1.53	1.53	1.52	1.52	5.68	5.67	5.64	5.62	5.61	5.60	5.56	5.54	5.52	5.50
No 3 Aygut																					
1 Difference between Water sales revenue and O&M Cost	172.28	0.00	0.00	-0.24	0.12	0.24	0.25	1.48	1.54	1.58	1.64	3.32	3.43	3.54	3.66	3.78	3.89	4.03	4.17	4.30	4.45
2 Difference between No.1 and Construction repayment	-270.03											-9.21	-9.22	-9.24	-9.25	-9.25	-9.27	-9.27	-9.26	-9.26	-9.25
3 Difference between No.2 and Interest repayment	-363.58	-0.04	-0.07	-0.34	-2.92	-4.11	-4.10	-2.87	-2.81	-2.77	-2.71	-13.57	-13.45	-13.35	-13.23	-13.10	-12.99	-12.86	-12.71	-12.58	-12.43
4 Required subsidy amount	363.58	0.04	0.07	0.34	2.92	4.11	4.10	2.87	2.81	2.77	2.71	13.57	13.45	13.35	13.23	13.10	12.99	12.86	12.71	12.58	12.43
No 4 Ayrq																					
1 Difference between Water sales revenue and O&M Cost	37.79	0.00	0.00	-0.30	-0.41	-0.48	-0.48	0.06	0.05	0.05	0.06	0.78	0.81	0.84	0.86	0.90	0.93	0.95	0.99	1.02	1.05
2 Difference between No.1 and Construction repayment	-85.87											-2.82	-2.82	-2.83	-2.85	-2.84	-2.85	-2.87	-2.87	-2.87	-2.88
3 Difference between No.2 and Interest repayment	-116.81	-0.04	-0.07	-0.84	-1.43	-1.72	-1.73	-1.19	-1.20	-1.20	-1.19	-4.07	-4.04	-4.01	-3.99	-3.95	-3.92	-3.90	-3.86	-3.82	-3.79
4 Required subsidy amount	116.81	0.04	0.07	0.84	1.43	1.72	1.73	1.19	1.20	1.20	1.19	4.07	4.04	4.01	3.99	3.95	3.92	3.90	3.86	3.82	3.79
No 5 Antaramej																					
1 Difference between Water sales revenue and O&M Cost	14.90	0.00	0.00	-0.24	-0.19	-0.20	-0.19	0.02	0.02	0.02	0.03	0.32	0.33	0.33	0.34	0.36	0.36	0.38	0.40	0.41	0.42
2 Difference between No.1 and Construction repayment	-80.10											-2.43	-2.45	-2.48	-2.50	-2.50	-2.53	-2.54	-2.55	-2.57	-2.59
3 Difference between No.2 and Interest repayment	-102.98	-0.04	-0.07	-0.34	-0.88	-1.15	-1.14	-0.93	-0.93	-0.93	-0.92	-3.39	-3.38	-3.38	-3.37	-3.35	-3.35	-3.33	-3.31	-3.30	-3.29
4 Required subsidy amount	102.98	0.04	0.07	0.34	0.88	1.15	1.14	0.93	0.93	0.93	0.92	3.39	3.38	3.38	3.37	3.35	3.35	3.33	3.31	3.30	3.29
No 6 Astghadzor																					
1 Difference between Water sales revenue and O&M cost	364.20	0.00	0.00	4.04	8.58	10.34	10.05	9.74	9.44	9.13	8.79	8.46	8.74	9.01	9.32	9.63	-38.88	10.28	10.62	10.96	11.32
2 Difference between No.1 and Construction repayment	-214.86											-6.17	-6.04	-5.92	-5.75	-5.60	-54.26	-5.25	-5.07	-4.88	-4.68
3 Difference between No.2 and Interest repayment	-264.23	-0.04	-0.07	1.97	4.44	5.26	4.97	4.66	4.36	4.05	3.71	-11.26	-10.98	-10.72	-10.40	-10.10	-58.60	-9.44	-9.10	-8.76	-8.40
4 Required subsidy amount	301.45	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.26	10.98	10.72	10.40	10.10	58.60	9.44	9.10	8.76	8.40
No 7 Artsvanist																					
1 Difference between Water sales revenue and O&M cost	630.34	0.00	0.00	0.92	2.25	2.79	2.88	6.44	6.66	6.87	7.10	11.90	12.30	12.71	13.11	13.55	13.99	14.45	14.93	15.43	15.95
2 Difference between No.1 and Construction repayment	240.74											1.73	2.03	2.34	2.63	2.97	3.30	3.66	4.03	4.42	4.83
3 Difference between No.2 and Interest repayment	193.60	-0.04	-0.07	-0.53	-0.63	-0.74	-0.65	2.91	3.13	3.34	3.57	-1.81	-1.41	-0.99	-0.60	-0.15	0.28	0.75	1.23	1.73	2.25
4 Required subsidy amount	7.62	0.04	0.07	0.53	0.63	0.74	0.65	0.00	0.00	0.00	0.00	1.81	1.41	0.99	0.60	0.15	0.00	0.00	0.00	0.00	0.00
No 8 Geghamabak																					
1 Difference between Water sales revenue and O&M cost	-0.95	0.00	0.00	-0.26	-0.31	-0.35	-0.35	-0.18	-0.19	-0.19	-0.21	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.04	0.02
2 Difference between No.1 and Construction repayment	-130.89											-3.76	-3.81	-3.85	-3.89	-3.92	-3.97	-4.00	-4.04	-4.07	-4.13
3 Difference between No.2 and Interest repayment	-164.07	-0.04	-0.07	-0.83	-1.39	-1.66	-1.67	-1.50	-1.51	-1.51	-1.53	-5.08	-5.09	-5.09	-5.10	-5.09	-5.10	-5.09	-5.09	-5.08	-5.09
4 Required subsidy amount	164.07	0.04	0.07	0.83	1.39	1.66	1.67	1.50	1.51	1.51	1.53	5.08	5.09	5.09	5.10	5.09	5.10	5.09	5.09	5.08	5.09
No 9 Geghamavan																					
1 Difference between Water sales revenue and O&M cost	411.92	0.00	0.00	2.02	1.98	1.94	2.00	4.25	4.40	4.55	4.70	7.72	7.99	8.26	8.51	8.80	9.10	9.39	9.71	10.01	10.35
2 Difference between No.1 and Construction repayment	103.31											-0.41	-0.22	-0.03	0.13	0.34	0.56	0.76	0.99	1.21	1.46
3 Difference between No.2 and Interest repayment	60.59	-0.04	-0.07	-0.75	-0.82	-0.88	-0.82	1.43	1.58	1.73	1.88	-3.24	-2.97	-2.69	-2.45	-2.16	-1.85	-1.57	-1.25	-0.94	-0.61
4 Required subsidy amount	23.38	0.04	0.07	0.75	0.82	0.88	0.82	0.00	0.00	0.00	0.00	3.24	2.97	2.69	2.45	2.16	1.85	1.57	1.25	0.94	0.61
No 10 Gegharkunik																					
1 Difference between Water sales revenue and O&M cost	388.60	0.00	0.00	0.57	1.33	1.63	1.70	3.93	4.05	4.19	4.33	7.34	7.59	7.84	8.10	8.37	8.63	8.93	9.22	9.52	9.83
2 Difference between No.1 and Construction repayment	176.02											1.85	2.05	2.24	2.45	2.66	2.86	3.11	3.34	3.58	3.83
3 Difference between No.2 and Interest repayment	152.89	-0.04	-0.07	-0.23	-0.22	-0.27	-0.20	2.03	2.15	2.29	2.43	-0.06	0.20	0.44	0.71	0.97	1.23	1.54	1.83	2.13	2.44
4 Required subsidy amount	1.09	0.04	0.07	0.23	0.22	0.27	0.20	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 11 Geghhovit																					
1 Difference between Water sales revenue and O&M cost	1704.64	0.00	0.00	2.64	6.57	8.18	8.45	17.76	18.35	18.96	19.58	32.10	33.17	34.27	35.40	36.57	37.76	39.02	40.31	41.63	43.01
2 Difference between No.1 and Construction repayment	503.07											0.45	1.20	1.98	2.79	3.63	4.49	5.42	6.37	7.35	8.39
3 Difference between No.2 and Interest repayment	345.16	-0.04	-0.07	-1.80	-2.38	-2.82	-2.56	6.75	7.34	7.95	8.57	-10.56	-9.49	-8.39	-7.26	-6.10	-4.91	-3.64	-2.36	-1.04	0.34
4 Required subsidy amount	63.42	0.04	0.07	1.80	2.38	2.82	2.56	0.00	0.00	0.00	0.00	10.56	9.49	8.39	7.26	6.10	4.91	3.64	2.36	1.04	0.00
No 12 Ddmashen																					
1 Difference between Water sales revenue and O&M cost	574.43	0.00	0.00	2.69	2.63	2.57	2.64	5.87	6.06	6.26	6.47	10.80	11.16	11.53	11.89	12.29	12.70	13.11	13.54	13.99	14.46
2 Difference between No.1 and Construction repayment	215.97											1.51	1.77	2.05	2.32	2.62	2.93	3.25	3.58	3.93	4.30
3 Difference between No.2 and Interest repayment	172.79	-0.04	-0.07	-0.48	-0.57	-0.65	-0.59	2.64	2.83	3.03	3.24	-1.72	-1.37	-1.00	-0.63	-0.24	0.17	0.59	1.02	1.47	1.94
4 Required subsidy amount	7.36	0.04	0.07	0.48	0.57	0.65	0.59	0.00	0.00	0.00	0.00	1.72	1.37	1.00	0.63	0.24	0.00	0.00	0.00	0.00	0.00
No 13 Dprabak																					
1 Difference between Water sales revenue and O&M cost	58.35	0.00	0.00	-0.17	-0.14	-0.14	-0.14	0.40	0.40	0.41	0.43	1.15	1.19	1.22	1.27	1.30	1.35	1.40	1.44	1.49	1.53
2 Difference between No.1 and Construction repayment	-120.00											-3.95	-3.96	-3.98	-3.98	-4.00	-4.01	-4.01	-4.02	-4.03	-4.04
3 Difference between No.2 and Interest repayment	-160.66	-0.04	-0.07	-0.92	-1.59	-1.90	-1.91	-1.37	-1.37	-1.36	-1.34	-5.72	-5.68	-5.65	-5.60	-5.57	-5.52	-5.47	-5.42	-5.38	-5.34
4 Required subsidy amount	160.66	0.04	0.07	0.92	1.59	1.90	1.91	1.37	1.37	1.36	1.34	5.72	5.68	5.65	5.60	5.57	5.52	5.47	5.42	5.38	5.34
No 14 Drakhtik																					
1 Difference between Water sales revenue and O&M cost	273.17	0.00	0.00	1.44	1.42	1.39	1.45	2.89	2.98	3.08	3.17	5.12	5.29	5.46	5.64	5.83	6.01	6.21	6.42	6.64	6.85
2 Difference between No.1 and Construction repayment	97.08											0.57	0.69	0.82	0.95	1.10	1.23	1.38	1.54	1.71	1.87
3 Difference between No.2 and Interest repayment	76.53	-0.04	-0.07	-0.08	-0.13	-0.18	-0.13	1.31	1.40	1.50	1.59	-1.01	-0.85	-0.67	-0.49	-0.30	-0.12	0.08	0.29	0.50	0.71
4 Required subsidy amount	4.07	0.04	0.07	0.08	0.13	0.18	0.13	0.00	0.00	0.00	0.00	1.01	0.85	0.67	0.49	0.30	0.12	0.00	0.00	0.00	0.00
No 15 Yerenos																					
1 Difference between Water sales revenue and O&M cost	1048.07	0.00	0.00	1.73	4.10	5.07	5.25	10.94	11.30	11.69	12.06	19.74	20.39	21.06	21.75	22.48	23.20	23.98	24.77	25.59	26.44
2 Difference between No.1 and Construction repayment	524.23											6.47	6.98	7.52	8.08	8.67	9.25	9.89	10.54	11.22	11.92
3 Difference between No.2 and Interest repayment	477.98	-0.04	-0.07	-0.15	0.34	0.46	0.64	6.33	6.69	7.08	7.45	1.85	2.50	3.17	3.87	4.59	5.31	6.09	6.88	7.70	8.55
4 Required subsidy amount	0.26	0.04	0.07	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 16 Zolaqar																					
1 Difference between Water sales revenue and O&M cost	1486.38	0.00	0.00	2.99	6.63	8.17	8.44	16.03	16.56	17.11	17.68	27.89	28.80	29.74	30.73	31.75	32.79	33.88	35.00	36.15	37.35
2 Difference between No.1 and Construction repayment	911.31											14.05	14.82	15.62	16.47	17.35	18.24	19.19	20.16	21.16	22.21
3 Difference between No.2 and Interest repayment	891.84	-0.04	-0.07	1.03	2.71	3.36	3.63	11.22	11.75	12.30	12.87	9.24	10.14	11.08	12.08	13.10	14.13	15.23	16.34	17.49	18.69
4 Required subsidy amount	0.11	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Description	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 1 Akunq																				
1 Difference between Water sales revenue and O&M Cost	27.03	27.94	28.86	29.81	30.78	31.80	32.86	33.95	35.07	36.21	37.41	38.65	39.91	41.25	42.61	44.01	45.45	46.96	48.51	50.12
2 Difference between No.1 and Construction repayment	13.44	14.22	15.00	15.81	16.64	17.52	18.44	19.38	20.36	21.35	22.40	23.49	24.60	25.79	26.99	28.24	29.52	30.87	32.26	33.71
3 Difference between No.2 and Interest repayment	10.45	11.36	12.28	13.23	14.20	15.22	16.28	17.37	18.49	19.63	20.83	22.07	23.33	24.67	26.03	27.44	28.87	30.38	31.93	33.55
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 2 Aghberq																				
1 Difference between Water sales revenue and O&M Cost	0.74	0.76	0.79	0.82	0.83	0.86	0.90	0.92	0.96	0.99	1.02	1.05	1.08	1.13	1.16	1.21	1.24	1.28	1.32	1.37
2 Difference between No.1 and Construction repayment	-4.35	-4.38	-4.41	-4.43	-4.47	-4.49	-4.51	-4.54	-4.56	-4.58	-4.61	-4.63	-4.66	-4.67	-4.69	-4.70	-4.73	-4.75	-4.77	-4.78
3 Difference between No.2 and Interest repayment	-5.47	-5.45	-5.43	-5.40	-5.38	-5.35	-5.32	-5.29	-5.26	-5.22	-5.20	-5.16	-5.14	-5.09	-5.05	-5.00	-4.97	-4.93	-4.89	-4.84
4 Required subsidy amount	5.47	5.45	5.43	5.40	5.38	5.35	5.32	5.29	5.26	5.22	5.20	5.16	5.14	5.09	5.05	5.00	4.97	4.93	4.89	4.84
No 3 Aygut																				
1 Difference between Water sales revenue and O&M Cost	4.60	4.74	4.89	5.06	5.23	5.39	5.57	5.76	5.95	6.14	6.34	6.56	6.77	6.99	7.23	7.46	7.71	7.97	8.24	8.50
2 Difference between No.1 and Construction repayment	-9.24	-9.23	-9.22	-9.20	-9.17	-9.15	-9.12	-9.07	-9.03	-8.99	-8.94	-8.88	-8.82	-8.76	-8.67	-8.60	-8.51	-8.42	-8.31	-8.22
3 Difference between No.2 and Interest repayment	-12.29	-12.14	-11.99	-11.83	-11.65	-11.49	-11.32	-11.12	-10.93	-10.74	-10.54	-10.33	-10.11	-9.90	-9.65	-9.42	-9.17	-8.92	-8.64	-8.39
4 Required subsidy amount	12.29	12.14	11.99	11.83	11.65	11.49	11.32	11.12	10.93	10.74	10.54	10.33	10.11	9.90	9.65	9.42	9.17	8.92	8.64	8.39
No 4 Ayrq																				
1 Difference between Water sales revenue and O&M Cost	1.08	1.13	1.16	1.20	1.23	1.27	1.32	1.37	1.41	1.45	1.51	1.55	1.60	1.66	1.71	1.77	1.83	1.89	1.96	2.01
2 Difference between No.1 and Construction repayment	-2.89	-2.88	-2.89	-2.89	-2.90	-2.91	-2.90	-2.89	-2.89	-2.90	-2.88	-2.88	-2.88	-2.86	-2.86	-2.84	-2.83	-2.82	-2.79	-2.79
3 Difference between No.2 and Interest repayment	-3.76	-3.72	-3.68	-3.64	-3.61	-3.58	-3.53	-3.48	-3.44	-3.40	-3.34	-3.30	-3.25	-3.19	-3.14	-3.08	-3.02	-2.96	-2.89	-2.84
4 Required subsidy amount	3.76	3.72	3.68	3.64	3.61	3.58	3.53	3.48	3.44	3.40	3.34	3.30	3.25	3.19	3.14	3.08	3.02	2.96	2.89	2.84
No 5 Antaramej																				
1 Difference between Water sales revenue and O&M Cost	0.43	0.45	0.47	0.47	0.49	0.51	0.53	0.55	0.55	0.58	0.60	0.62	0.63	0.66	0.69	0.70	0.73	0.75	0.77	0.80
2 Difference between No.1 and Construction repayment	-2.61	-2.62	-2.63	-2.66	-2.67	-2.69	-2.70	-2.71	-2.74	-2.75	-2.76	-2.77	-2.80	-2.80	-2.80	-2.83	-2.83	-2.85	-2.87	-2.87
3 Difference between No.2 and Interest repayment	-3.28	-3.26	-3.24	-3.24	-3.22	-3.20	-3.18	-3.16	-3.16	-3.13	-3.11	-3.09	-3.08	-3.05	-3.01	-3.01	-2.97	-2.96	-2.94	-2.91
4 Required subsidy amount	3.28	3.26	3.24	3.24	3.22	3.20	3.18	3.16	3.16	3.13	3.11	3.09	3.08	3.05	3.01	3.01	2.97	2.96	2.94	2.91
No 6 Astghadzor																				
1 Difference between Water sales revenue and O&M cost	11.70	12.08	12.48	12.90	13.32	13.76	14.22	14.69	15.17	15.67	-63.29	16.72	17.26	17.85	18.43	19.04	19.66	20.32	20.97	21.68
2 Difference between No.1 and Construction repayment	-4.46	-4.24	-4.01	-3.75	-3.50	-3.23	-2.94	-2.64	-2.33	-2.01	-81.14	-1.31	-0.95	-0.54	-0.15	0.28	0.71	1.18	1.64	2.15
3 Difference between No.2 and Interest repayment	-8.02	-7.64	-7.24	-6.82	-6.40	-5.96	-5.50	-5.03	-4.55	-4.05	-83.01	-3.00	-2.46	-1.87	-1.29	-0.68	-0.06	0.60	1.25	1.95
4 Required subsidy amount	8.02	7.64	7.24	6.82	6.40	5.96	5.50	5.03	4.55	4.05	83.01	3.00	2.46	1.87	1.29	0.68	0.06	0.00	0.00	0.00
No 7 Artsvanist																				
1 Difference between Water sales revenue and O&M cost	16.47	17.01	17.57	18.15	18.74	19.37	19.99	20.67	21.34	22.05	22.78	23.54	24.30	25.11	25.93	26.79	27.67	28.59	29.54	30.50
2 Difference between No.1 and Construction repayment	5.24	5.67	6.11	6.58	7.05	7.56	8.07	8.63	9.18	9.77	10.37	11.01	11.64	12.33	13.02	13.75	14.50	15.29	16.10	16.93
3 Difference between No.2 and Interest repayment	2.77	3.31	3.86	4.45	5.03	5.66	6.29	6.97	7.64	8.35	9.07	9.84	10.59	11.41	12.23	13.08	13.97	14.89	15.83	16.79
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 8 Geghamabak																				
1 Difference between Water sales revenue and O&M cost	0.03	0.03	0.04	0.04	0.04	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.05	0.05	0.04	0.06	0.06	0.06	0.05
2 Difference between No.1 and Construction repayment	-4.16	-4.20	-4.24	-4.28	-4.32	-4.38	-4.41	-4.46	-4.50	-4.54	-4.59	-4.65	-4.68	-4.72	-4.77	-4.83	-4.86	-4.90	-4.95	-5.01
3 Difference between No.2 and Interest repayment	-5.08	-5.08	-5.08	-5.08	-5.07	-5.09	-5.08	-5.08	-5.08	-5.07	-5.07	-5.09	-5.07	-5.06	-5.07	-5.08	-5.06	-5.05	-5.05	-5.06
4 Required subsidy amount	5.08	5.08	5.08	5.08	5.07	5.09	5.08	5.08	5.08	5.07	5.07	5.09	5.07	5.06	5.07	5.08	5.06	5.05	5.05	5.06
No 9 Geghamavan																				
1 Difference between Water sales revenue and O&M cost	10.69	11.05	11.41	11.79	12.17	12.58	12.99	13.42	13.86	14.32	14.79	15.29	15.79	16.31	16.84	17.40	17.97	18.57	19.19	19.81
2 Difference between No.1 and Construction repayment	1.71	1.98	2.25	2.54	2.83	3.14	3.46	3.79	4.14	4.50	4.87	5.27	5.67	6.09	6.52	6.97	7.44	7.94	8.45	8.96
3 Difference between No.2 and Interest repayment	-0.27	0.09	0.45	0.83	1.22	1.62	2.04	2.46	2.91	3.36	3.83	4.33	4.83	5.35	5.88	6.44	7.01	7.62	8.23	8.85
4 Required subsidy amount	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 10 Gegharkunik																				
1 Difference between Water sales revenue and O&M cost	10.17	10.50	10.85	11.21	11.57	11.94	12.35	12.76	13.17	13.60	14.05	14.52	15.00	15.49	16.00	16.53	17.09	17.65	18.23	18.82
2 Difference between No.1 and Construction repayment	4.11	4.38	4.67	4.97	5.26	5.57	5.92	6.26	6.61	6.97	7.36	7.76	8.17	8.59	9.03	9.49	9.98	10.47	10.98	11.50
3 Difference between No.2 and Interest repayment	2.78	3.11	3.46	3.82	4.17	4.54	4.96	5.36	5.78	6.20	6.66	7.13	7.60	8.09	8.60	9.13	9.69	10.25	10.83	11.43
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 11 Geghhovit																				
1 Difference between Water sales revenue and O&M cost	44.43	45.90	47.41	48.96	50.60	52.25	53.99	55.77	57.60	59.50	61.48	63.50	65.60	67.76	69.99	72.31	74.69	77.15	79.70	82.32
2 Difference between No.1 and Construction repayment	9.46	10.58	11.74	12.93	14.21	15.50	16.87	18.28	19.74	21.26	22.86	24.49	26.20	27.97	29.80	31.72	33.69	35.74	37.88	40.08
3 Difference between No.2 and Interest repayment	1.76	3.23	4.74	6.29	7.93	9.58	11.32	13.10	14.94	16.84	18.82	20.84	22.94	25.10	27.33	29.65	32.03	34.49	37.04	39.66
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 12 Ddmashen																				
1 Difference between Water sales revenue and O&M cost	14.94	15.43	15.93	16.46	17.00	17.57	18.14	18.75	19.36	20.01	20.66	21.34	22.05	22.79	23.53	24.31	25.10	25.93	26.79	27.68
2 Difference between No.1 and Construction repayment	4.67	5.06	5.46	5.88	6.32	6.78	7.24	7.74	8.24	8.78	9.32	9.89	10.48	11.11	11.73	12.39	13.06	13.77	14.51	15.28
3 Difference between No.2 and Interest repayment	2.41	2.90	3.41	3.93	4.48	5.04	5.61	6.22	6.83	7.48	8.13	8.82	9.52	10.27	11.00	11.78	12.57	13.40	14.26	15.16
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 13 Dprabak																				
1 Difference between Water sales revenue and O&M cost	1.59	1.64	1.70	1.75	1.81	1.86	1.93	1.99	2.06	2.12	2.19	2.27	2.34	2.41	2.50	2.58	2.67	2.76	2.85	2.94
2 Difference between No.1 and Construction repayment	-4.04	-4.05	-4.04	-4.05	-4.05	-4.06	-4.05	-4.05	-4.04	-4.04	-4.03	-4.01	-4.00	-4.00	-3.97	-3.96	-3.93	-3.91	-3.88	-3.86
3 Difference between No.2 and Interest repayment	-5.28	-5.23	-5.17	-5.12	-5.06	-5.01	-4.94	-4.88	-4.81	-4.75	-4.68	-4.60	-4.53	-4.46	-4.37	-4.29	-4.20	-4.11	-4.02	-3.93
4 Required subsidy amount	5.28	5.23	5.17	5.12	5.06	5.01	4.94	4.88	4.81	4.75	4.68	4.60	4.53	4.46	4.37	4.29	4.20	4.11	4.02	3.93
No 14 Drakhtik																				
1 Difference between Water sales revenue and O&M cost	7.07	7.31	7.54	7.80	8.05	8.31	8.60	8.87	9.17	9.47	9.78	10.11	10.43	10.78	11.14	11.50	11.89	12.27	12.69	13.10
2 Difference between No.1 and Construction repayment	2.04	2.23	2.41	2.62	2.82	3.03	3.27	3.48	3.73	3.97	4.23	4.50	4.77	5.06	5.36	5.67	6.00	6.32	6.68	7.03
3 Difference between No.2 and Interest repayment	0.93	1.17	1.40	1.67	1.92	2.18	2.47	2.74	3.04	3.33	3.65	3.97	4.30	4.65	5.00	5.37	5.76	6.14	6.56	6.97
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 15 Yerenos																				
1 Difference between Water sales revenue and O&M cost	27.31	28.21	29.13	30.10	31.08	32.12	33.17	34.28	35.41	36.57	37.78	39.02	40.31	41.65	43.03	44.44	45.91	47.43	48.97	50.61
2 Difference between No.1 and Construction repayment	12.65	13.40	14.17	14.99	15.82	16.71	17.61	18.56	19.53	20.54	21.58	22.66	23.79	24.96	26.18	27.42	28.72	30.07	31.43	32.90
3 Difference between No.2 and Interest repayment	9.42	10.32	11.24	12.21	13.19	14.23	15.28	16.39	17.52	18.69	19.89	21.13	22.42	23.76	25.14	26.55	28.02	29.54	31.08	32.72
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 16 Zolaqar																				
1 Difference between Water sales revenue and O&M cost	38.57	39.85	41.16	42.52	43.92	45.38	46.86	48.42	50.02	51.65	53.37	55.12	56.95	58.83	60.77	62.78	64.85	66.99	69.19	71.49
2 Difference between No.1 and Construction repayment	23.28	24.41	25.56	26.77	28.01	29.31	30.63	32.03	33.47	34.93	36.48	38.06	39.72	41.43	43.20	45.03	46.92	48.88	50.90	53.02
3 Difference between No.2 and Interest repayment	19.91	21.20	22.50	23.87	25.26	26.72	28.20	29.77	31.37	33.00	34.71	36.46	38.29	40.17	42.12	44.12	46.19	48.33	50.53	52.84
4 Required subsidy amount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (2/10)

PHASE 1 GEGHARKUNIK MARZ

Unit: million AMD

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 17 Zovaber																																									
1 Difference between Water sales revenue and O&M cost	242.71	0.00	0.00	0.52	0.45	0.38	0.42	2.13	2.19	2.26	2.33	4.64	4.80	4.97	5.12	5.29	5.46	5.64	5.83	6.02	6.22	6.42	6.65	6.86	7.09	7.32	7.55	7.82	8.07	8.33	8.60	8.88	9.18	9.49	9.80	10.13	10.46	10.81	11.15	11.53	11.90
2 Difference between No.1 and Construction repayment	-17.59											-2.54	-2.45	-2.35	-2.27	-2.18	-2.08	-1.98	-1.86	-1.75	-1.63	-1.51	-1.36	-1.23	-1.08	-0.93	-0.78	-0.59	-0.43	-0.25	-0.07	0.12	0.34	0.56	0.78	1.02	1.26	1.52	1.76	2.05	2.32
3 Difference between No.2 and Interest repayment	-67.41	-0.04	-0.07	-1.91	-2.02	-2.11	-2.07	-0.36	-0.30	-0.23	-0.16	-5.04	-4.87	-4.70	-4.55	-4.38	-4.21	-4.03	-3.84	-3.65	-3.45	-3.26	-3.03	-2.82	-2.59	-2.35	-2.12	-1.85	-1.60	-1.34	-1.07	-0.80	-0.49	-0.18	0.13	0.46	0.79	1.14	1.48	1.86	2.22
4 Required subsidy amount	75.49	0.04	0.07	1.91	2.02	2.11	2.07	0.36	0.30	0.23	0.16	5.04	4.87	4.70	4.55	4.38	4.21	4.03	3.84	3.65	3.45	3.26	3.03	2.82	2.59	2.35	2.12	1.85	1.60	1.34	1.07	0.80	0.49	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 18 Tazagyugh																																									
1 Difference between Water sales revenue and O&M cost	577.47	0.00	0.00	0.77	1.96	2.43	2.50	5.83	6.03	6.23	6.43	10.92	11.27	11.65	12.03	12.43	12.83	13.26	13.71	14.15	14.62	15.10	15.60	16.12	16.65	17.20	17.77	18.34	18.96	19.57	20.23	20.90	21.59	22.30	23.03	23.79	24.58	25.38	26.23	27.10	27.98
2 Difference between No.1 and Construction repayment	-6.89											-4.95	-4.76	-4.54	-4.33	-4.09	-3.85	-3.59	-3.31	-3.04	-2.74	-2.43	-2.11	-1.77	-1.42	-1.05	-0.66	-0.27	0.16	0.58	1.05	1.53	2.03	2.54	3.07	3.63	4.22	4.82	5.46	6.13	6.80
3 Difference between No.2 and Interest repayment	-104.37	-0.04	-0.07	-1.47	-2.53	-3.08	-3.02	0.31	0.51	0.71	0.91	-10.47	-10.12	-9.74	-9.37	-8.97	-8.56	-8.14	-7.69	-7.25	-6.77	-6.29	-5.80	-5.28	-4.75	-4.20	-3.63	-3.05	-2.44	-1.83	-1.17	-0.50	0.20	0.90	1.63	2.39	3.18	3.99	4.83	5.71	6.59
4 Required subsidy amount	136.23	0.04	0.07	1.47	2.53	3.08	3.02	0.00	0.00	0.00	0.00	10.47	10.12	9.74	9.37	8.97	8.56	8.14	7.69	7.25	6.77	6.29	5.80	5.28	4.75	4.20	3.63	3.05	2.44	1.83	1.17	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 19 Lchavan																																									
1 Difference between Water sales revenue and O&M cost	14.96	0.00	0.00	0.23	0.88	1.13	1.05	0.98	0.92	0.84	0.77	0.68	0.70	0.72	0.75	0.76	-8.97	0.82	0.85	0.87	0.91	0.94	0.96	1.00	1.03	1.07	1.11	1.14	1.17	1.21	1.26	-14.59	1.33	1.39	1.43	1.47	1.53	1.56	1.63	1.69	1.74
2 Difference between No.1 and Construction repayment	-118.90											-2.97	-2.99	-3.01	-3.01	-3.04	-12.81	-3.06	-3.07	-3.09	-3.08	-3.09	-3.11	-3.12	-3.13	-3.13	-3.13	-3.14	-3.16	-3.16	-3.15	-19.05	-3.17	-3.16	-3.16	-3.17	-3.15	-3.17	-3.15	-3.14	-3.13
3 Difference between No.2 and Interest repayment	-142.05	-0.04	-0.07	-0.32	-0.15	-0.13	-0.22	-0.29	-0.35	-0.43	-0.50	-4.24	-4.22	-4.21	-4.17	-4.16	-13.89	-4.11	-4.08	-4.06	-4.01	-3.98	-3.96	-3.93	-3.90	-3.85	-3.81	-3.78	-3.76	-3.71	-3.66	-19.52	-3.59	-3.54	-3.49	-3.46	-3.39	-3.36	-3.29	-3.24	-3.18
4 Required subsidy amount	142.05	0.04	0.07	0.32	0.15	0.13	0.22	0.29	0.35	0.43	0.50	4.24	4.22	4.21	4.17	4.16	13.89	4.11	4.08	4.06	4.01	3.98	3.96	3.93	3.90	3.85	3.81	3.78	3.76	3.71	3.66	19.52	3.59	3.54	3.49	3.46	3.39	3.36	3.29	3.24	3.18
No 20 Lusakunq																																									
1 Difference between Water sales revenue and O&M cost	341.78	0.00	0.00	0.63	1.46	1.81	1.88	3.66	3.77	3.90	4.03	6.41	6.63	6.85	7.08	7.31	7.55	7.80	8.06	8.33	8.59	8.88	9.17	9.47	9.79	10.11	10.44	10.79	11.14	11.52	11.90	12.29	12.69	13.11	13.54	13.99	14.46	14.94	15.42	15.94	16.45
2 Difference between No.1 and Construction repayment	137.80											1.15	1.32	1.49	1.66	1.84	2.03	2.22	2.42	2.64	2.84	3.07	3.31	3.55	3.81	4.07	4.34	4.63	4.91	5.23	5.55	5.88	6.21	6.57	6.93	7.32	7.72	8.13	8.54	8.99	9.43
3 Difference between No.2 and Interest repayment	115.93	-0.04	-0.07	-0.14	-0.03	-0.01	0.06	1.84	1.95	2.08	2.21	-0.68	-0.46	-0.23	-0.01	0.22	0.47	0.71	0.97	1.25	1.50	1.79	2.09	2.39	2.71	3.03	3.36	3.71	4.05	4.43	4.82	5.21	5.60	6.03	6.45	6.91	7.38	7.85	8.33	8.85	9.36
4 Required subsidy amount	1.68	0.04	0.07	0.14	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.68	0.46	0.23	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 21 Khachaghbyur																																									
1 Difference between Water sales revenue and O&M cost	343.13	0.00	0.00	0.63	1.47	1.81	1.87	3.67	3.78	3.91	4.03	6.45	6.66	6.88	7.11	7.34	7.58	7.83	8.09	8.36	8.63	8.92	9.22	9.52	9.83	10.15	10.49	10.84	11.19	11.56	11.94	12.33	12.74	13.16	13.60	14.04	14.51	15.00	15.48	16.00	16.52
2 Difference between No.1 and Construction repayment	121.54											0.69	0.84	1.00	1.17	1.34	1.52	1.71	1.91	2.12	2.33	2.56	2.79	3.03	3.27	3.53	3.80	4.08	4.37	4.67	4.98	5.30	5.64	5.99	6.36	6.72	7.12	7.54	7.94	8.39	8.83
3 Difference between No.2 and Interest repayment	95.56	-0.04	-0.07	-0.21	-0.16	-0.19	-0.13	1.67	1.78	1.91	2.03	-1.31	-1.11	-0.89	-0.66	-0.43	-0.19	0.06	0.32	0.59	0.87	1.16	1.45	1.76	2.06	2.39	2.72	3.07	3.43	3.80	4.17	4.56	4.97	5.40	5.84	6.27	6.74	7.24	7.71	8.24	8.75
4 Required subsidy amount	5.40	0.04	0.07	0.21	0.16	0.19	0.13	0.00	0.00	0.00	0.00	1.31	1.11	0.89	0.66	0.43	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 22 Tsaghkashen																																									
1 Difference between Water sales revenue and O&M cost	127.48	0.00	0.00	0.06	0.36	0.46	0.50	1.26	1.30	1.35	1.38	2.42	2.50	2.59	2.67	2.77	2.83	2.94	3.04	3.14	3.23	3.34	3.47	3.57	3.70	3.81	3.93	4.07	4.20	4.33	4.47	4.62	4.78	4.93	5.10	5.27	5.45	5.64	5.81	6.00	6.19
2 Difference between No.1 and Construction repayment	-31.80											-1.97	-1.93	-1.89	-1.85	-1.80	-1.78	-1.72	-1.66	-1.61	-1.57	-1.51	-1.42	-1.37	-1.29	-1.23	-1.16	-1.07	-1.00	-0.92	-0.83	-0.73	-0.63	-0.53	-0.42	-0.30	-0.18	-0.04	0.07	0.20	0.34
3 Difference between No.2 and Interest repayment	-61.07	-0.04	-0.07	-0.59	-0.89	-1.06	-1.02	-0.26	-0.22	-0.17	-0.14	-3.50	-3.41	-3.33	-3.24	-3.15	-3.08	-2.98	-2.87	-2.77	-2.69	-2.58	-2.44	-2.34	-2.21	-2.10	-1.98	-1.84	-1.72	-1.59	-1.44	-1.29	-1.14	-0.98	-0.82	-0.64	-0.47	-0.27	-0.10	0.08	0.28
4 Required subsidy amount	61.43	0.04	0.07	0.59	0.89	1.06	1.02	0.26	0.22	0.17	0.14	3.50	3.41	3.33	3.24	3.15	3.08	2.98	2.87	2.77	2.69	2.58	2.44	2.34	2.21	2.10	1.98	1.84	1.72	1.59	1.44	1.29	1.14	0.98	0.82	0.64	0.47	0.27	0.10	0.00	0.00
No 23 Tsaghkunq																																									
1 Difference between Water sales revenue and O&M cost	253.40	0.00	0.00	1.35	1.34	1.31	1.36	2.69	2.77	2.86	2.97	4.74	4.90	5.06	5.22	5.40	5.56	5.76	5.95	6.15	6.34	6.56	6.77	7.00	7.23	7.47	7.71	7.96	8.23	8.50	8.78	9.08	9.37	9.67	10.00	10.33	10.67	11.03	11.39	11.77	12.15
2 Difference between No.1 and Construction repayment	147.53											2.18	2.31	2.44	2.58	2.73	2.86	3.04	3.20	3.37	3.54	3.73	3.91	4.11	4.31	4.52	4.73	4.95	5.19	5.43	5.68	5.95	6.21	6.48	6.78	7.07	7.38	7.71	8.03	8.38	8.73
3 Difference between No.2 and Interest repayment	142.56	-0.04	-0.07	0.52	0.48	0.43	0.47	1.80	1.88	1.97	2.08	1.29	1.44	1.60	1.77	1.94	2.10	2.31	2.49	2.69	2.89	3.11	3.31	3.54	3.77	4.01	4.25	4.50	4.77	5.04	5.32	5.62	5.91	6.22	6.55	6.87	7.21	7.58	7.93	8.31	8.70
4 Required subsidy amount	0.11	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 24 Tsovagyugh																																									
1 Difference between Water sales revenue and O&M cost	993.32	0.00	0.00	5.02	4.94	4.85	5.01	10.36	10.70	11.07	11.42	18.63	19.23	19.86	20.51	21.20	21.90	22.62	23.37	24.14	24.94	25.76	26.61	27.48	28.39	29.33	30.30	31.29	32.33	33.39	34.49	35.62	36.81	38.02	39.28	40.58	41.92	43.30	44.72	46.20	47.73
2 Difference between No.1 and Construction repayment	353.54											2.06	2.49	2.96	3.44	3.96	4.48	5.03	5.60	6.20	6.82	7.46	8.12	8.81	9.53	10.28	11.06	11.86	12.70	13.57	14.47	15.40	16.39	17.39	18.45	19.54	20.67	21.84	23.04	24.30	25.62
3 Difference between No.2 and Interest repayment	277.18	-0.04	-0.07	-0.68	-0.80	-0.91	-0.75	4.60	4.94	5.31	5.66	-3.70	-3.11	-2.47	-1.82	-1.13	-0.44	0.29	1.03	1.81	2.61	3.43	4.27	5.15	6.05	6.99	7.96	8.96	9.99	11.06	12.15	13.28	14.48	15.68	16.95	18.25	19.59	20.97	22.38	23.86	25.40
4 Required subsidy amount	15.92	0.04	0.07	0.68	0.80	0.91	0.75	0.00	0.00	0.00	0.00	3.70	3.11	2.47	1.82	1.13	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 25 Tsovak																																									
1 Difference between Water sales revenue and O&M cost	506.44	0.00	0.00	0.66	1.74	2.18	2.23	5.14	5.31	5.49	5.67	9.57	9.89	10.22	10.54	10.90	11.26	11.62	12.01	12.40	12.82	13.25	13.67	14.13	14.59	15.07	15.58	16.09	16.62	17.16	17.74	18.31	18.92	19.54	20.20	20.86	21.55	22.25	22.99	23.75	24.52
2 Difference between No.1 and Construction repayment	124.99											-0.58	-0.36	-0.13	0.08	0.34	0.59	0.85	1.13	1.41	1.72	2.04	2.35	2.69	3.04	3.40	3.80	4.19	4.60	5.02	5.48	5.93	6.41	6.91	7.44	7.97	8.54	9.10	9.71	10.34	10.98
3 Difference between No.2 and Interest repayment	70.45	-0.04	-0.07	-0.79	-1.13	-1.34	-1.30	1.61	1.78	1.96	2.14	-4.11	-3.79	-3.46	-3.14	-2.78	-2.42	-2.06	-1.67	-1.28	-0.86	-0.43	-0.01	0.45	0.91	1.39	1.90	2.41	2.94	3.48	4.06	4.63	5.24	5.86	6.52	7.18	7.88	8.57	9.31	10.07	10.84
4 Required subsidy amount	30.68	0.04	0.07	0.79	1.13	1.34	1.30	0.00	0.00	0.00	0.00	4.11	3.79	3.46	3.14	2.78	2.42	2.06	1.67	1.28	0.86	0.43	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 26 Tsovinar																																									
1 Difference between Water sales revenue and O&M cost	1110.20	0.00	0.00	1.58	4.01	4.98	5.14	11.39	11.75	12.15	12.55	20.96	21.64	22.35	23.10	23.85	24.64	25.46	26.30	27.16	28.06	29.00	29.94	30.94	31.95	33.00	34.09	35.22	36.39	37.59	38.82	40.10	41.43	42.81	44.21	45.68	47.18	48.73	50.34	52.00	53.72
2 Difference between No.1 and Construction repayment	199.83											-3.39	-2.95	-2.48	-1.98	-1.48	-0.95	-0.38	0.20	0.80	1.43	2.11	2.78	3.51	4.24	5.02	5.83	6.67	7.56	8.47	9.41	10.39	11.43	12.51	13.60	14.77	15.96	17.20	18.49	19.83	21.23
3 Difference between No.2 and Interest repayment	64.62	-0.04	-0.07	-1.85	-2.88	-3.48	-3.32	2.93	3.29	3.69	4.09	-11.86	-11.17	-10.46	-9.71	-8.96	-8.18	-7.35	-6.51	-5.65	-4.76	-3.81	-2.87	-1.87	-0.87	0.19	1.28	2.40	3.58	4.78	6.01	7.28	8.62	10.00	11.39	12.87	14.37	15.92	17.52	19.18	20.91
4 Required subsidy amount	105.68	0.04	0.07	1.85	2.88	3.48	3.32	0.00	0.00	0.00	0.00	11.86	11.17	10.46	9.71	8.96	8.18	7.35	6.51	5.65	4.76	3.81	2.87	1.87	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 27 Kalavan																																									
1 Difference between Water sales revenue and O&M cost	11.80	0.00	0.00	-0.24	-0.20	-0.19	-0.19	0.01	0.00	-0.01	-0.01	0.26	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.36	0.37	0.37	0.38	0.40	0.41	0.44	0.43	0.45	0.47	0.48	0.49	0.51	0.53	0.55	0.56	0.59	0.61	0.63	0.64
2 Difference between No.1 and Construction repayment	-63.78											-1.94	-1.96	-1.97	-1.98	-2.00	-2.01	-2.02	-2.03	-2.05	-2.06	-2.07	-2.08	-2.11	-2.12	-2.12	-2.14	-2.14	-2.17	-2.18	-2.18	-2.20	-2.22	-2.22	-2.23	-2.24	-2.26	-2.26	-2.26	-2.27	-2.29
3 Difference between No.2 and Interest repayment	-82.34	-0.04	-0.07	-0.34	-0.75	-0.95	-0.95	-0.75	-0.76	-0.77	-0.77	-2.70	-2.70	-2.69	-2.68	-2.67	-2.66	-2.65	-2.64	-2.63	-2.62	-2.60	-2.59	-2.60	-2.58	-2.56	-2.55	-2.52	-2.53	-2.51	-2.49	-2.48	-2.47	-2.45	-2.43	-2.41	-2.40	-2.38	-2.35	-2.33	-2.32
4 Required subsidy amount	82.34	0.04	0.07	0.34	0.75	0.95	0.95	0.75	0.76	0.77	0.77	2.70	2.70	2.69	2.68	2.67	2.66	2.65	2.64	2.63	2.62	2.60	2.59	2.60	2.58	2.56	2.55	2.52	2.53	2.51	2.49	2.48	2.47	2.45	2.43	2.41	2.40	2.38	2.35	2.33	2.32
No 28 Barepat																																									
1 Difference between Water sales revenue and O&M cost	43.27	0.00	0.00	-0.24	-0.07	0.00	-0.01	0.34	0.36	0.37	0.38	0.84	0.87	0.90	0.94	0.96	0.98	1.02	1.06	1.09	1.12	1.17	1.22	1.25	1.29	1.33	1.37	1.43	1.47	1.51	1.56	1.61	1.66	1.72	1.77	1.84	1.90	1.97	2.02	2.10	2.16
2 Difference between No.1 and Construction repayment	-54.35											-1.93	-1.93	-1.93	-1.92	-1.93	-1.94	-1.92	-1.91	-1.91	-1.91	-1.89	-1.87	-1.88	-1.87	-1.86	-1.85	-1.82	-1.82	-1.81	-1.79	-1.77	-1.76	-1.73	-1.72	-1.68	-1.66	-1.62	-1.61	-1.57	-1.54
3 Difference between No.2 and Interest repayment	-75.54	-0.04	-0.07	-0.34	-0.76	-0.96	-0.97	-0.62	-0.60	-0.59	-0.58	-2.89	-2.87	-2.84	-2.80	-2.78	-2.76	-2.71	-2.67	-2.65	-2.62	-2.56	-2.51	-2.49	-2.45	-2.41	-2.37	-2.31	-2.27	-2.23	-2.18	-2.12	-2.08	-2.02	-1.97	-1.90	-1.84	-1.77	-1.72	-1.64	-1.58
4 Required subsidy amount	75.54	0.04	0.07	0.34	0.76	0.96	0.97	0.62	0.60	0.59	0.58	2.89	2.87	2.84	2.80	2.78	2.76	2.71	2.67	2.65	2.62	2.56	2.51	2.49	2.45	2.41	2.37	2.31	2.27	2.23	2.18	2.12	2.08	2.02	1.97	1.90	1.84	1.77	1.72	1.64	1.58
No 29 Karchaghbyur																																									
1 Difference between Water sales revenue and O&M cost	507.78	0.00	0.00	0.72	1.84	2.31	2.38	5.22	5.40	5.58	5.76	9.59	9.90	10.23	10.55	10.91	11.27	11.63	12.03	12.42	12.83	13.25	13.69	14.14	14.61	15.09	15.60	16.11	16.63	17.18	17.76	18.34	18.94	19.57	20.22	20.88	21.57	22.28	23.01	23.79	24.56
2 Difference between No.1 and Construction repayment	161.79											0.48	0.70	0.94	1.17	1.43	1.70	1.96	2.27	2.56	2.87	3.19	3.53	3.88	4.24	4.62	5.03	5.43	5.84	6.29	6.76	7.23	7.72	8.23	8.77	9.32	9.89	10.48	11.09	11.76	12.41
3 Difference between No.2 and Interest repayment	116.58	-0.04	-0.07	-0.58	-0.74	-0.85	-0.78	2.06	2.24	2.42	2.60	-2.69	-2.38	-2.05	-1.72	-1.37	-1.00	-0.65	-0.24	0.15	0.56	0.97	1.42	1.87	2.33	2.81	3.33	3.83	4.35	4.91	5.49	6.07	6.67	7.29	7.94	8.61	9.29	10.00	10.73	11.52	12.29
4 Required subsidy amount	15.17	0.04	0.07	0.58	0.74	0.85	0.78	0.00	0.00	0.00	0.00	2.69	2.38	2.05	1.72	1.37	1.00	0.65	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 30 Dzoragyugh																																									
1 Difference between Water sales revenue and O&M cost	1112.94	0.00	0.00	1.74	4.34	5.42	5.59	11.64	12.02	12.41	12.83	20.96	21.64	22.36	23.10	23.86	24.65	25.46	26.30	27.18	28.07	28.99	29.95	30.95	31.96	33.02	34.10	35.24	36.40	37.60	38.83	40.12	41.45	42.81	44.22	45.68	47.19	48.74	50.36	52.02	53.74
2 Difference between No.1 and Construction repayment	425.97											3.11	3.61	4.15	4.71	5.28	5.89	6.51	7.16	7.85	8.54	9.27	10.03	10.83	11.64	12.50	13.37	14.31	15.26	16.25	17.26	18.34	19.45	20.59	21.78	23.01	24.30	25.62	27.00	28.43	29.92
3 Difference between No.2 and Interest repayment	346.15	-0.04	-0.07	-0.78	-0.71	-0.78	-0.62	5.43	5.81	6.20	6.62	-3.10	-2.42	-1.70	-0.96	-0.21	0.59	1.40	2.24	3.12	4.00	4.93	5.88	6.88	7.90	8.96	10.03	11.18	12.34	13.54	14.77	16.06	17.39	18.75	20.16	21.62	23.13	24.68	26.29	27.96	29.68
4 Required subsidy amount	11.39	0.04	0.07	0.78	0.71	0.78	0.62	0.00	0.00	0.00	0.00	3.10	2.42	1.70	0.96	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 31 Dzoravanq																																									
1 Difference between Water sales revenue and O&M cost	19.52	0.00	0.00	-0.24	-0.20	-0.20	-0.20	0.06	0.05	0.05	0.06	0.40	0.42	0.44	0.45	0.46	0.47	0.49	0.51	0.53	0.54	0.55	0.58	0.60	0.62	0.64	0.65	0.68	0.69	0.73	0.75	0.76	0.79	0.82	0.84	0.88	0.91	0.94	0.97	1.00	1.03
2 Difference between No.1 and Construction repayment	-81.91											-2.53	-2.54	-2.55	-2.57	-2.59	-2.61	-2.62	-2.64	-2.65	-2.67	-2.69	-2.69	-2.71	-2.72	-2.73	-2.76	-2.76	-2.78	-2.78	-2.79	-2.82	-2.83	-2.83	-2.85	-2.85	-2.85	-2.86	-2.87	-2.88	-2.89
3 Difference between No.2 and Interest repayment	-106.16	-0.04	-0.07	-0.34	-0.93	-1.21	-1.22	-0.96	-0.97	-0.97	-0.96	-3.55	-3.53	-3.51	-3.50	-3.49	-3.48	-3.46	-3.45	-3.43	-3.42	-3.40	-3.37	-3.36	-3.34	-3.31	-3.31	-3.27	-3.26	-3.23	-3.20	-3.19	-3.17	-3.13	-3.12	-3.08	-3.04	-3.01	-2.99	-2.96	-2.93
4 Required subsidy amount	106.16	0.04	0.07	0.34	0.93	1.21	1.22	0.96	0.97	0.97	0.96	3.55	3.53	3.51	3.50	3.49	3.48	3.46	3.45	3.43	3.42	3.40	3.37	3.36	3.34	3.31	3.31	3.27	3.26	3.23	3.20	3.19	3.17	3.13	3.12	3.08	3.04	3.01	2.99	2.96	2.93
No 32 Madina																																									
1 Difference between Water sales revenue and O&M cost	263.73	0.00	0.00	0.41	1.02	1.27	1.33	2.76	2.84	2.94	3.03	4.97	5.14	5.31	5.48	5.66	5.84	6.03	6.24	6.45	6.65	6.87	7.10	7.33	7.59	7.82	8.08	8.36	8.62	8.91	9.20	9.50	9.82	10.14	10.47	10.82	11.18	11.56	11.93	12.33	12.73
2 Difference between No.1 and Construction repayment	-21.70											-2.79	-2.69	-2.60	-2.51	-2.41	-2.31	-2.20	-2.08	-1.95	-1.83	-1.70	-1.55	-1.41	-1.24	-1.10	-0.93	-0.74	-0.57	-0.37	-0.17	0.04	0.26	0.48	0.72	0.97	1.23	1.51	1.78	2.08	2.38
3 Difference between No.2 and Interest repayment	-69.51	-0.04	-0.07	-0.71	-1.18	-1.42	-1.36	0.07	0.15	0.25	0.34	-5.49	-5.31	-5.14	-4.97	-4.79	-4.61	-4.42	-4.22	-4.01	-3.80	-3.59	-3.35	-3.12	-2.87	-2.64	-2.38	-2.10	-1.84	-1.55	-1.25	-0.95	-0.64	-0.32	0.02	0.36	0.72	1.10	1.47	1.87	2.28
4 Required subsidy amount	78.14	0.04	0.07	0.71	1.18	1.42	1.36	0.00	0.00	0.00	0.00	5.49	5.31	5.14	4.97	4.79	4.61	4.42	4.22	4.01	3.80	3.59	3.35	3.12	2.87	2.64	2.38	2.10	1.84	1.55	1.25	0.95	0.64	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (3/10)

PHASE 1 GEGHARKUNIK MARZ

Unit: million AMD

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 33 Maqenis																																									
1 Difference between Water sales revenue and O&M cost	103.30	0.00	0.00	0.02	0.25	0.35	0.37	1.00	1.03	1.08	1.10	1.97	2.03	2.09	2.17	2.23	2.30	2.38	2.46	2.54	2.63	2.71	2.82	2.90	3.00	3.09	3.20	3.30	3.41	3.52	3.64	3.75	3.88	4.01	4.14	4.28	4.43	4.58	4.72	4.88	5.04
2 Difference between No.1 and Construction repayment	-36.97											-1.91	-1.89	-1.87	-1.85	-1.81	-1.78	-1.74	-1.70	-1.67	-1.62	-1.58	-1.51	-1.48	-1.42	-1.37	-1.31	-1.25	-1.19	-1.13	-1.05	-0.99	-0.91	-0.82	-0.74	-0.63	-0.55	-0.43	-0.36	-0.25	-0.14
3 Difference between No.2 and Interest repayment	-63.56	-0.04	-0.07	-0.56	-0.85	-0.99	-0.98	-0.35	-0.32	-0.27	-0.25	-3.26	-3.20	-3.14	-3.06	-3.00	-2.93	-2.85	-2.77	-2.70	-2.61	-2.52	-2.41	-2.34	-2.23	-2.14	-2.04	-1.93	-1.83	-1.72	-1.59	-1.49	-1.36	-1.22	-1.09	-0.95	-0.80	-0.65	-0.51	-0.35	-0.19
4 Required subsidy amount	63.56	0.04	0.07	0.56	0.85	0.99	0.98	0.35	0.32	0.27	0.25	3.26	3.20	3.14	3.06	3.00	2.93	2.85	2.77	2.70	2.61	2.52	2.41	2.34	2.23	2.14	2.04	1.93	1.83	1.72	1.59	1.49	1.36	1.22	1.09	0.95	0.80	0.65	0.51	0.35	0.19
No 34 Mets Masrik																																									
1 Difference between Water sales revenue and O&M cost	735.20	0.00	0.00	0.99	2.63	3.28	3.39	7.53	7.78	8.04	8.31	13.87	14.34	14.80	15.30	15.81	16.32	16.86	17.42	17.99	18.58	19.20	19.84	20.49	21.17	21.86	22.57	23.33	24.10	24.90	25.71	26.56	27.44	28.35	29.28	30.25	31.25	32.28	33.35	34.44	35.59
2 Difference between No.1 and Construction repayment	-91.75											-8.70	-8.45	-8.22	-7.95	-7.67	-7.40	-7.10	-6.78	-6.45	-6.10	-5.73	-5.34	-4.94	-4.51	-4.08	-3.63	-3.13	-2.63	-2.09	-1.55	-0.98	-0.37	0.26	0.91	1.60	2.31	3.05	3.83	4.62	5.47
3 Difference between No.2 and Interest repayment	-234.09	-0.04	-0.07	-2.19	-3.75	-4.56	-4.46	-0.32	-0.07	0.19	0.46	-16.55	-16.07	-15.62	-15.12	-14.60	-14.10	-13.56	-13.00	-12.43	-11.84	-11.22	-10.58	-9.93	-9.24	-8.56	-7.85	-7.09	-6.32	-5.51	-4.70	-3.86	-2.98	-2.07	-1.14	-0.16	0.83	1.86	2.94	4.02	5.17
4 Required subsidy amount	249.56	0.04	0.07	2.19	3.75	4.56	4.46	0.32	0.07	0.00	0.00	16.55	16.07	15.62	15.12	14.60	14.10	13.56	13.00	12.43	11.84	11.22	10.58	9.93	9.24	8.56	7.85	7.09	6.32	5.51	4.70	3.86	2.98	2.07	1.14	0.16	0.00	0.00	0.00	0.00	0.00
No 35 Norakert																																									
1 Difference between Water sales revenue and O&M cost	27.47	0.00	0.00	0.50	1.37	1.66	1.53	1.41	1.28	1.15	1.01	0.87	0.89	0.93	0.95	0.98	-8.74	1.04	1.09	1.12	1.17	1.20	1.24	1.28	1.31	1.35	1.41	1.45	1.50	1.55	1.61	-14.23	1.72	1.76	1.83	1.88	1.94	2.01	2.07	2.16	2.21
2 Difference between No.1 and Construction repayment	-294.60											-8.10	-8.17	-8.22	-8.30	-8.36	-18.17	-8.49	-8.53	-8.60	-8.65	-8.71	-8.77	-8.83	-8.90	-8.97	-9.01	-9.07	-9.13	-9.18	-9.23	-25.18	-9.34	-9.41	-9.45	-9.51	-9.57	-9.61	-9.67	-9.70	-9.77
3 Difference between No.2 and Interest repayment	-358.02	-0.04	-0.07	-0.78	-1.17	-1.45	-1.59	-1.71	-1.84	-1.97	-2.11	-11.22	-11.20	-11.16	-11.15	-11.12	-20.83	-11.06	-11.00	-10.98	-10.93	-10.89	-10.85	-10.81	-10.78	-10.75	-10.69	-10.64	-10.60	-10.54	-10.48	-26.33	-10.38	-10.34	-10.26	-10.21	-10.16	-10.08	-10.03	-9.94	-9.89
4 Required subsidy amount	358.02	0.04	0.07	0.78	1.17	1.45	1.59	1.71	1.84	1.97	2.11	11.22	11.20	11.16	11.15	11.12	20.83	11.06	11.00	10.98	10.93	10.89	10.85	10.81	10.78	10.75	10.69	10.64	10.60	10.54	10.48	26.33	10.38	10.34	10.26	10.21	10.16	10.08	10.03	9.94	9.89
No 36 Shatjreq																																									
1 Difference between Water sales revenue and O&M cost	94.32	0.00	0.00	0.05	0.10	0.16	0.17	0.83	0.87	0.88	0.91	1.81	1.87	1.94	2.00	2.07	2.12	2.20	2.27	2.35	2.42	2.51	2.59	2.68	2.77	2.85	2.94	3.04	3.14	3.25	3.35	3.47	3.57	3.69	3.82	3.95	4.08	4.21	4.35	4.50	4.64
2 Difference between No.1 and Construction repayment	27.52											0.00	0.04	0.09	0.14	0.19	0.22	0.28	0.33	0.39	0.44	0.51	0.57	0.64	0.71	0.77	0.84	0.92	1.00	1.09	1.16	1.26	1.34	1.44	1.55	1.65	1.76	1.87	1.98	2.11	2.23
3 Difference between No.2 and Interest repayment	16.52	-0.04	-0.07	-0.34	-0.42	-0.46	-0.45	0.21	0.25	0.26	0.29	-0.63	-0.57	-0.50	-0.43	-0.37	-0.32	-0.24	-0.17	-0.09	-0.02	0.07	0.15	0.24	0.33	0.41	0.50	0.60	0.70	0.82	0.91	1.03	1.13	1.25	1.39	1.51	1.64	1.77	1.91	2.06	2.21
4 Required subsidy amount	5.12	0.04	0.07	0.34	0.42	0.46	0.45	0.00	0.00	0.00	0.00	0.63	0.57	0.50	0.43	0.37	0.32	0.24	0.17	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 37 Shatvan																																									
1 Difference between Water sales revenue and O&M cost	178.78	0.00	0.00	0.08	0.36	0.46	0.47	1.65	1.71	1.77	1.83	3.41	3.52	3.64	3.77	3.90	4.01	4.14	4.28	4.42	4.56	4.72	4.88	5.04	5.21	5.38	5.56	5.74	5.92	6.12	6.32	6.53	6.74	6.97	7.20	7.44	7.68	7.94	8.20	8.47	8.74
2 Difference between No.1 and Construction repayment	-39.82											-2.63	-2.58	-2.53	-2.48	-2.39	-2.34	-2.28	-2.20	-2.13	-2.05	-1.96	-1.86	-1.77	-1.67	-1.57	-1.46	-1.35	-1.24	-1.11	-0.98	-0.85	-0.71	-0.55	-0.40	-0.23	-0.07	0.11	0.29	0.48	0.67
3 Difference between No.2 and Interest repayment	-80.94	-0.04	-0.07	-0.80	-1.35	-1.63	-1.63	-0.45	-0.39	-0.33	-0.27	-4.73	-4.62	-4.51	-4.38	-4.25	-4.13	-4.01	-3.87	-3.73	-3.59	-3.43	-3.26	-3.11	-2.94	-2.77	-2.59	-2.41	-2.23	-2.03	-1.82	-1.62	-1.41	-1.17	-0.95	-0.70	-0.47	-0.21	0.05	0.32	0.59
4 Required subsidy amount	81.90	0.04	0.07	0.80	1.35	1.63	1.63	0.45	0.39	0.33	0.27	4.73	4.62	4.51	4.38	4.25	4.13	4.01	3.87	3.73	3.59	3.43	3.26	3.11	2.94	2.77	2.59	2.41	2.23	2.03	1.82	1.62	1.41	1.17	0.95	0.70	0.47	0.21	0.00	0.00	0.00
No 38 Shorzha																																									
1 Difference between Water sales revenue and O&M cost	1.59	0.00	0.00	1.07	1.00	0.92	0.85	0.77	0.69	0.61	0.51	0.42	0.43	0.45	0.45	0.47	-9.27	0.51	0.52	0.54	0.57	0.57	0.60	0.61	0.64	0.66	0.68	0.70	0.72	0.75	0.77	-15.09	0.83	0.85	0.88	0.90	0.94	0.97	0.99	1.04	1.07
2 Difference between No.1 and Construction repayment	-193.64											-5.01	-5.05	-5.09	-5.14	-5.18	-14.97	-5.25	-5.30	-5.34	-5.37	-5.43	-5.46	-5.51	-5.54	-5.58	-5.62	-5.66	-5.71	-5.74	-5.79	-21.71	-5.86	-5.91	-5.94	-5.99	-6.02	-6.06	-6.11	-6.13	-6.17
3 Difference between No.2 and Interest repayment	-232.97	-0.04	-0.07	-0.76	-0.86	-0.96	-1.03	-1.11	-1.19	-1.27	-1.37	-6.90	-6.88	-6.87	-6.86	-6.85	-16.58	-6.80	-6.80	-6.78	-6.75	-6.75	-6.72	-6.71	-6.68	-6.66	-6.63	-6.61	-6.60	-6.56	-6.55	-22.40	-6.49	-6.47	-6.43	-6.41	-6.38	-6.35	-6.33	-6.27	-6.24
4 Required subsidy amount	232.97	0.04	0.07	0.76	0.86	0.96	1.03	1.11	1.19	1.27	1.37	6.90	6.88	6.87	6.86	6.85	16.58	6.80	6.80	6.78	6.75	6.75	6.72	6.71	6.68	6.66	6.63	6.61	6.60	6.56	6.55	22.40	6.49	6.47	6.43	6.41	6.38	6.35	6.33	6.27	6.24
No 39 Jaghatzadzor																																									
1 Difference between Water sales revenue and O&M cost	22.17	0.00	0.00	0.19	0.13	0.12	0.12	0.12	0.12	0.13	0.13	0.44	0.46	0.48	0.49	0.51	0.53	0.54	0.56	0.58	0.59	0.62	0.63	0.65	0.68	0.70	0.72	0.75	0.77	0.80	0.82	0.84	0.88	0.91	0.93	0.97	1.01	1.04	1.07	1.12	1.14
2 Difference between No.1 and Construction repayment	-79.98											-2.50	-2.51	-2.52	-2.54	-2.55	-2.56	-2.58	-2.59	-2.60	-2.62	-2.63	-2.65	-2.66	-2.66	-2.68	-2.69	-2.70	-2.71	-2.71	-2.73	-2.74	-2.74	-2.75	-2.76	-2.76	-2.76	-2.77	-2.77	-2.76	-2.78
3 Difference between No.2 and Interest repayment	-104.12	-0.04	-0.07	-0.63	-0.96	-1.13	-1.14	-0.90	-0.90	-0.89	-0.89	-3.52	-3.50	-3.48	-3.47	-3.45	-3.43	-3.42	-3.40	-3.38	-3.37	-3.34	-3.33	-3.31	-3.28	-3.26	-3.24	-3.21	-3.19	-3.16	-3.14	-3.12	-3.08	-3.05	-3.03	-2.99	-2.95	-2.92	-2.89	-2.84	-2.82
4 Required subsidy amount	104.12	0.04	0.07	0.63	0.96	1.13	1.14	0.90	0.90	0.89	0.89	3.52	3.50	3.48	3.47	3.45	3.43	3.42	3.40	3.38	3.37	3.34	3.33	3.31	3.28	3.26	3.24	3.21	3.19	3.16	3.14	3.12	3.08	3.05	3.03	2.99	2.95	2.92	2.89	2.84	2.82
No 40 Semyonovka																																									
1 Difference between Water sales revenue and O&M cost	38.99	0.00	0.00	0.08	0.07	0.06	0.08	0.33	0.35	0.36	0.38	0.75	0.78	0.79	0.82	0.85	0.88	0.91	0.93	0.97	1.00	1.04	1.07	1.10	1.14	1.18	1.21	1.25	1.30	1.35	1.37	1.43	1.48	1.51	1.57	1.62	1.68	1.74	1.79	1.86	1.91
2 Difference between No.1 and Construction repayment	-22.12											-0.96	-0.95	-0.95	-0.94	-0.93	-0.92	-0.90	-0.90	-0.88	-0.87	-0.85	-0.84	-0.82	-0.80	-0.78	-0.77	-0.75	-0.72	-0.69	-0.69	-0.65	-0.62	-0.62	-0.58	-0.55	-0.51	-0.47	-0.44	-0.40	-0.37
3 Difference between No.2 and Interest repayment	-34.82	-0.04	-0.07	-0.45	-0.50	-0.53	-0.51	-0.26	-0.24	-0.23	-0.21	-1.55	-1.53	-1.51	-1.48	-1.45	-1.43	-1.39	-1.37	-1.33	-1.30	-1.27	-1.24	-1.20	-1.16	-1.12	-1.09	-1.05	-1.00	-0.95	-0.93	-0.87	-0.82	-0.80	-0.73	-0.68	-0.62	-0.56	-0.51	-0.45	-0.39
4 Required subsidy amount	34.82	0.04	0.07	0.45	0.50	0.53	0.51	0.26	0.24	0.23	0.21	1.55	1.53	1.51	1.48	1.45	1.43	1.39	1.37	1.33	1.30	1.27	1.24	1.20	1.16	1.12	1.09	1.05	1.00	0.95	0.93	0.87	0.82	0.80	0.73	0.68	0.62	0.56	0.51	0.45	0.39
No 41 Vaghashen																																									
1 Difference between Water sales revenue and O&M cost	992.72	0.00	0.00	1.63	4.15	5.22	5.38	10.58	10.92	11.29	11.67	18.67	19.26	19.90	20.56	21.24	21.95	22.67	23.41	24.18	24.98	25.81	26.67	27.54	28.46	29.40	30.35	31.36	32.39	33.47	34.56	35.71	36.88	38.10	39.36	40.67	42.01	43.38	44.82	46.30	47.83
2 Difference between No.1 and Construction repayment	464.05											5.22	5.68	6.18	6.70	7.24	7.81	8.39	8.99	9.62	10.27	10.95	11.67	12.39	13.15	13.94	14.74	15.59	16.46	17.38	18.31	19.30	20.31	21.36	22.45	23.59	24.76	25.96	27.23	28.53	29.88
3 Difference between No.2 and Interest repayment	415.04	-0.04	-0.07	-0.28	0.34	0.55	0.71	5.91	6.25	6.62	7.00	0.54	1.14	1.77	2.43	3.11	3.82	4.54	5.28	6.06	6.85	7.68	8.55	9.42	10.33	11.27	12.23	13.23	14.26	15.34	16.43	17.58	18.76	19.97	21.23	22.54	23.88	25.25	26.70	28.17	29.70
4 Required subsidy amount	0.39	0.04	0.07	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 42 Vardadzor																																									
1 Difference between Water sales revenue and O&M cost	693.39	0.00	0.00	1.24	2.91	3.61	3.72	7.37	7.62	7.87	8.12	13.03	13.46	13.91	14.36	14.84	15.33	15.84	16.36	16.89	17.45	18.02	18.62	19.24	19.87	20.52	21.21	21.90	22.63	23.37	24.15	24.95	25.77	26.62	27.50	28.40	29.34	30.30	31.31	32.35	33.40
2 Difference between No.1 and Construction repayment	324.15											3.64	3.97	4.33	4.68	5.06	5.46	5.87	6.29	6.72	7.18	7.64	8.14	8.65	9.18	9.72	10.30	10.88	11.50	12.13	12.80	13.49	14.19	14.93	15.69	16.47	17.29	18.13	19.02	19.94	20.86
3 Difference between No.2 and Interest repayment	289.85	-0.04	-0.07	-0.10	0.25	0.35	0.46	4.11	4.36	4.61	4.86	0.37	0.80	1.25	1.70	2.17	2.67	3.18	3.70	4.23	4.79	5.36	5.96	6.57	7.21	7.86	8.54	9.23	9.96	10.70	11.49	12.29	13.11	13.96	14.84	15.74	16.68	17.64	18.65	19.69	20.73
4 Required subsidy amount	0.21	0.04	0.07	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 43 Verin Getashen																																									
1 Difference between Water sales revenue and O&M cost	1092.35	0.00	0.00	1.58	4.04	5.02	5.19	11.26	11.63	12.02	12.42	20.61	21.27	21.98	22.71	23.46	24.24	25.04	25.86	26.71	27.60	28.51	29.45	30.42	31.42	32.45	33.52	34.64	35.78	36.96	38.17	39.44	40.74	42.09	43.47	44.90	46.39	47.91	49.50	51.13	52.82
2 Difference between No.1 and Construction repayment	597.27											8.19	8.73	9.31	9.92	10.54	11.19	11.86	12.55	13.26	14.02	14.79	15.60	16.43	17.29	18.18	19.10	20.08	21.07	22.11	23.17	24.29	25.44	26.63	27.86	29.13	30.47	31.83	33.26	34.72	36.25
3 Difference between No.2 and Interest repayment	559.04	-0.04	-0.07	-0.18	0.53	0.71	0.88	6.95	7.32	7.71	8.11	3.87	4.54	5.24	5.98	6.73	7.50	8.30	9.13	9.97	10.86	11.77	12.72	13.69	14.69	15.72	16.78	17.90	19.04	20.23	21.43	22.70	24.01	25.35	26.73	28.16	29.66	31.18	32.77	34.39	36.08
4 Required subsidy amount	0.29	0.04	0.07	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 44 Torfavan																																									
1 Difference between Water sales revenue and O&M cost	90.96	0.00	0.00	-0.02	0.19	0.25	0.28	0.86	0.88	0.92	0.94	1.73	1.80	1.85	1.92	1.97	2.04	2.11	2.18	2.25	2.32	2.41	2.48	2.56	2.65	2.74	2.81	2.92	3.01	3.11	3.22	3.32	3.42	3.53	3.66	3.78	3.91	4.04	4.16	4.31	4.45
2 Difference between No.1 and Construction repayment	-61.36											-2.53	-2.50	-2.49	-2.46	-2.46	-2.43	-2.41	-2.38	-2.36	-2.33	-2.29	-2.27	-2.24	-2.19	-2.15	-2.13	-2.07	-2.03	-1.98	-1.92	-1.87	-1.82	-1.77	-1.69	-1.62	-1.55	-1.47	-1.41	-1.31	-1.23
3 Difference between No.2 and Interest repayment	-91.93	-0.04	-0.07	-0.65	-1.02	-1.22	-1.20	-0.62	-0.60	-0.56	-0.54	-4.01	-3.94	-3.88	-3.81	-3.77	-3.69	-3.63	-3.55	-3.49	-3.41	-3.33	-3.26	-3.18	-3.08	-2.99	-2.93	-2.82	-2.73	-2.63	-2.51	-2.41	-2.31	-2.21	-2.08	-1.95	-1.83	-1.69	-1.56	-1.42	-1.29
4 Required subsidy amount	91.93	0.04	0.07	0.65	1.02	1.22	1.20	0.62	0.60	0.56	0.54	4.01	3.94	3.88	3.81	3.77	3.69	3.63	3.55	3.49	3.41	3.33	3.26	3.18	3.08	2.99	2.93	2.82	2.73	2.63	2.51	2.41	2.31	2.21	2.08	1.95	1.83	1.69	1.58	1.42	1.29
No 45 Pokr Masrik																																									
1 Difference between Water sales revenue and O&M cost	52.17	0.00	0.00	0.54	1.47	1.85	1.76	1.67	1.60	1.52	1.42	1.33	1.37	1.41	1.46	1.50	-8.22	1.61	1.67	1.70	1.77	1.83	1.89	1.95	2.01	2.08	2.15	2.22	2.29	2.37	2.45	-13.36	2.62	2.70	2.79	2.87	2.98	3.07	3.17	3.28	3.39
2 Difference between No.1 and Construction repayment	-75.81											-2.01	-2.00	-2.00	-1.98	-1.97	-11.73	-1.93	-1.91	-1.92	-1.88	-1.86	-1.84	-1.81	-1.79	-1.76	-1.73	-1.70	-1.66	-1.62	-1.58	-17.43	-1.50	-1.46	-1.41	-1.37	-1.30	-1.26	-1.20	-1.13	-1.07
3 Difference between No.2 and Interest repayment	-91.38	-0.04	-0.07	0.04	0.52	0.70	0.60	0.51	0.44	0.36	0.26	-3.17	-3.13	-3.09	-3.04	-3.00	-12.72	-2.89	-2.83	-2.80	-2.73	-2.67	-2.62	-2.55	-2.49	-2.42	-2.35	-2.29	-2.21	-2.13	-2.05	-17.06	-1.89	-1.80	-1.71	-1.63	-1.52	-1.44	-1.33	-1.22	-1.11
4 Required subsidy amount	94.80	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.17	3.13	3.09	3.04	3.00	12.72	2.89	2.83	2.80	2.73	2.67	2.62	2.55	2.49	2.42	2.35	2.29	2.21	2.13	2.05	17.06	1.89	1.80	1.71	1.63	1.52	1.44	1.33	1.22	1.11

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (4/10)

PHASE 1 TAVUSH MARZ — **Unit: million AMD**

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 1 Aghavnavanq																																									
1 Difference between Water sales revenue and O&M cost	54.94	0.00	0.00	-0.24	-0.17	-0.17	-0.18	0.35	0.36	0.38	0.38	1.08	1.13	1.16	1.20	1.24	1.27	1.32	1.36	1.41	1.46	1.50	1.56	1.60	1.66	1.71	1.77	1.83	1.89	1.95	2.00	2.07	2.13	2.22	2.29	2.36	2.44	2.53	2.61	2.70	2.78
2 Difference between No.1 and Construction repayment	-168.46											-5.32	-5.34	-5.37	-5.40	-5.42	-5.46	-5.48	-5.50	-5.52	-5.54	-5.57	-5.58	-5.61	-5.63	-5.65	-5.66	-5.68	-5.69	-5.71	-5.73	-5.74	-5.76	-5.75	-5.76	-5.77	-5.77	-5.76	-5.77	-5.76	-5.76
3 Difference between No.2 and Interest repayment	-219.05	-0.04	-0.07	-0.34	-1.74	-2.39	-2.40	-1.87	-1.86	-1.84	-1.84	-7.55	-7.50	-7.47	-7.43	-7.39	-7.36	-7.31	-7.27	-7.22	-7.17	-7.13	-7.07	-7.03	-6.97	-6.92	-6.86	-6.80	-6.74	-6.68	-6.62	-6.56	-6.50	-6.41	-6.34	-6.27	-6.19	-6.10	-6.02	-5.93	-5.85
4 Required subsidy amount	219.05	0.04	0.07	0.34	1.74	2.39	2.40	1.87	1.86	1.84	1.84	7.55	7.50	7.47	7.43	7.39	7.36	7.31	7.27	7.22	7.17	7.13	7.07	7.03	6.97	6.92	6.86	6.80	6.74	6.68	6.62	6.56	6.50	6.41	6.34	6.27	6.19	6.10	6.02	5.93	5.85
No 2 Gandzaqar																																									
1 Difference between Water sales revenue and O&M cost	879.41	0.00	0.00	-0.72	3.04	4.60	4.75	9.39	9.70	10.02	10.35	16.58	17.13	17.68	18.27	18.88	19.50	20.16	20.81	21.50	22.21	22.93	23.70	24.48	25.29	26.12	26.98	27.88	28.79	29.75	30.72	31.74	32.78	33.86	34.98	36.14	37.34	38.56	39.85	41.15	42.52
2 Difference between No.1 and Construction repayment	408.44											4.51	4.94	5.37	5.83	6.32	6.81	7.35	7.87	8.43	9.01	9.60	10.23	10.88	11.55	12.25	12.97	13.73	14.50	15.31	16.14	17.01	17.91	18.84	19.81	20.81	21.86	22.93	24.06	25.20	26.41
3 Difference between No.2 and Interest repayment	363.09	-0.04	-0.07	-0.82	0.11	0.41	0.56	5.20	5.51	5.83	6.16	0.31	0.86	1.41	2.00	2.61	3.23	3.89	4.54	5.23	5.94	6.66	7.43	8.21	9.02	9.86	10.71	11.61	12.53	13.48	14.45	15.47	16.52	17.60	18.72	19.87	21.07	22.30	23.58	24.88	26.25
4 Required subsidy amount	0.93	0.04	0.07	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 3 Getahovit																																									
1 Difference between Water sales revenue and O&M cost	481.54	0.00	0.00	-0.48	1.18	1.84	1.89	4.78	4.94	5.10	5.27	9.15	9.45	9.77	10.08	10.42	10.76	11.11	11.49	11.85	12.25	12.66	13.08	13.51	13.95	14.42	14.89	15.37	15.89	16.41	16.96	17.51	18.09	18.69	19.31	19.94	20.60	21.27	21.97	22.72	23.45
2 Difference between No.1 and Construction repayment	-117.66											-7.37	-7.24	-7.08	-6.94	-6.77	-6.60	-6.43	-6.22	-6.04	-5.82	-5.59	-5.35	-5.11	-4.85	-4.57	-4.29	-4.00	-3.68	-3.35	-3.00	-2.63	-2.27	-1.87	-1.46	-1.04	-0.59	-0.13	0.36	0.89	1.40
3 Difference between No.2 and Interest repayment	-225.17	-0.04	-0.07	-0.58	-2.83	-3.90	-3.85	-0.96	-0.80	-0.64	-0.47	-13.12	-12.82	-12.49	-12.19	-11.85	-11.50	-11.16	-10.77	-10.42	-10.02	-9.61	-9.19	-8.76	-8.32	-7.85	-7.38	-6.90	-6.38	-5.86	-5.31	-4.76	-4.18	-3.57	-2.96	-2.33	-1.67	-1.00	-0.29	0.45	1.18
4 Required subsidy amount	226.80	0.04	0.07	0.58	2.83	3.90	3.85	0.96	0.80	0.64	0.47	13.12	12.82	12.49	12.19	11.85	11.50	11.16	10.77	10.42	10.02	9.61	9.19	8.76	8.32	7.85	7.38	6.90	6.38	5.86	5.31	4.76	4.18	3.57	2.96	2.33	1.67	1.00	0.29	0.00	0.00
No 4 Gosh																																									
1 Difference between Water sales revenue and O&M cost	234.25	0.00	0.00	-0.24	0.53	0.83	0.86	2.30	2.38	2.45	2.52	4.45	4.60	4.76	4.92	5.09	5.24	5.42	5.60	5.77	5.96	6.16	6.37	6.58	6.80	7.02	7.25	7.49	7.74	7.99	8.26	8.52	8.81	9.10	9.40	9.71	10.04	10.37	10.71	11.07	11.42
2 Difference between No.1 and Construction repayment	-160.28											-6.56	-6.52	-6.47	-6.42	-6.36	-6.33	-6.26	-6.20	-6.15	-6.08	-6.00	-5.91	-5.82	-5.73	-5.63	-5.53	-5.42	-5.30	-5.18	-5.04	-4.91	-4.75	-4.60	-4.44	-4.27	-4.08	-3.89	-3.69	-3.47	-3.27
3 Difference between No.2 and Interest repayment	-236.69	-0.04	-0.07	-0.34	-2.15	-2.99	-2.96	-1.52	-1.44	-1.37	-1.30	-10.39	-10.24	-10.08	-9.92	-9.74	-9.60	-9.41	-9.23	-9.07	-8.88	-8.68	-8.47	-8.25	-8.04	-7.81	-7.59	-7.35	-7.10	-6.85	-6.58	-6.32	-6.02	-5.74	-5.44	-5.13	-4.80	-4.47	-4.13	-3.76	-3.42
4 Required subsidy amount	236.69	0.04	0.07	0.34	2.15	2.99	2.96	1.52	1.44	1.37	1.30	10.39	10.24	10.08	9.92	9.74	9.60	9.41	9.23	9.07	8.88	8.68	8.47	8.25	8.04	7.81	7.59	7.35	7.10	6.85	6.58	6.32	6.02	5.74	5.44	5.13	4.80	4.47	4.13	3.76	3.42
No 5 Yenoqavan																																									
1 Difference between Water sales revenue and O&M cost	100.11	0.00	0.00	-0.24	0.15	0.30	0.33	0.96	0.99	1.03	1.05	1.92	1.98	2.04	2.12	2.18	2.24	2.32	2.40	2.48	2.56	2.64	2.75	2.82	2.93	3.01	3.11	3.22	3.32	3.43	3.54	3.65	3.77	3.90	4.03	4.17	4.31	4.46	4.59	4.75	4.90
2 Difference between No.1 and Construction repayment	-21.82											-1.45	-1.43	-1.40	-1.36	-1.33	-1.30	-1.26	-1.22	-1.17	-1.13	-1.09	-1.01	-0.98	-0.91	-0.87	-0.81	-0.74	-0.67	-0.60	-0.54	-0.47	-0.39	-0.30	-0.21	-0.11	-0.02	0.09	0.18	0.29	0.40
3 Difference between No.2 and Interest repayment	-44.39	-0.04	-0.07	-0.34	-0.69	-0.87	-0.89	-0.21	-0.18	-0.14	-0.12	-2.62	-2.57	-2.51	-2.43	-2.37	-2.31	-2.23	-2.15	-2.06	-1.99	-1.91	-1.79	-1.73	-1.62	-1.54	-1.44	-1.33	-1.22	-1.11	-1.01	-0.90	-0.78	-0.65	-0.52	-0.37	-0.24	-0.09	0.05	0.20	0.35
4 Required subsidy amount	44.99	0.04	0.07	0.34	0.69	0.87	0.84	0.21	0.18	0.14	0.12	2.62	2.57	2.51	2.43	2.37	2.31	2.23	2.15	2.06	1.99	1.91	1.79	1.73	1.62	1.54	1.44	1.33	1.22	1.11	1.01	0.90	0.78	0.65	0.52	0.37	0.24	0.09	0.00	0.00	0.00
No 6 Teghut																																									
1 Difference between Water sales revenue and O&M cost	334.74	0.00	0.00	-0.24	1.08	1.62	1.68	3.50	3.62	3.74	3.87	6.32	6.53	6.75	6.97	7.20	7.43	7.68	7.94	8.20	8.47	8.74	9.04	9.34	9.65	9.96	10.28	10.63	10.99	11.35	11.71	12.10	12.50	12.91	13.34	13.79	14.24	14.71	15.19	15.69	16.22
2 Difference between No.1 and Construction repayment	85.31											-0.31	-0.16	0.01	0.14	0.30	0.46	0.64	0.83	1.02	1.22	1.42	1.65	1.87	2.11	2.34	2.59	2.86	3.14	3.42	3.70	4.01	4.33	4.66	5.01	5.37	5.74	6.13	6.52	6.93	7.38
3 Difference between No.2 and Interest repayment	51.09	-0.04	-0.07	-0.34	-0.54	-0.68	-0.62	1.20	1.32	1.44	1.57	-2.62	-2.40	-2.18	-1.96	-1.74	-1.51	-1.26	-1.00	-0.74	-0.46	-0.19	0.11	0.41	0.72	1.03	1.35	1.70	2.06	2.41	2.77	3.16	3.56	3.98	4.41	4.85	5.31	5.78	6.26	6.75	7.29
4 Required subsidy amount	18.35	0.04	0.07	0.34	0.54	0.68	0.62	0.00	0.00	0.00	0.00	2.62	2.40	2.18	1.96	1.74	1.51	1.26	1.00	0.74	0.46	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 7 Itsakar																																									
1 Difference between Water sales revenue and O&M cost	67.81	0.00	0.00	-0.24	0.03	0.14	0.16	0.61	0.64	0.66	0.67	1.30	1.35	1.40	1.44	1.49	1.53	1.58	1.64	1.70	1.74	1.81	1.87	1.93	1.99	2.05	2.12	2.20	2.26	2.34	2.41	2.49	2.57	2.66	2.74	2.84	2.94	3.04	3.13	3.24	3.34
2 Difference between No.1 and Construction repayment	-50.08											-2.01	-2.00	-1.98	-1.97	-1.96	-1.95	-1.94	-1.91	-1.89	-1.88	-1.85	-1.83	-1.80	-1.78	-1.76	-1.73	-1.68	-1.66	-1.62	-1.59	-1.55	-1.51	-1.46	-1.42	-1.37	-1.31	-1.26	-1.20	-1.14	-1.08
3 Difference between No.2 and Interest repayment	-74.03	-0.04	-0.07	-0.34	-0.79	-1.00	-0.99	-0.54	-0.51	-0.49	-0.48	-3.16	-3.12	-3.07	-3.02	-2.98	-2.93	-2.89	-2.82	-2.77	-2.72	-2.66	-2.60	-2.53	-2.47	-2.42	-2.35	-2.26	-2.20	-2.12	-2.05	-1.97	-1.89	-1.80	-1.72	-1.63	-1.53	-1.42	-1.33	-1.23	-1.12
4 Required subsidy amount	74.03	0.04	0.07	0.34	0.79	1.00	0.99	0.54	0.51	0.49	0.48	3.16	3.12	3.07	3.02	2.98	2.93	2.89	2.82	2.77	2.72	2.66	2.60	2.53	2.47	2.42	2.35	2.26	2.20	2.12	2.05	1.97	1.89	1.80	1.72	1.63	1.53	1.42	1.33	1.23	1.12
No 8 Lusahovit																																									
1 Difference between Water sales revenue and O&M cost	59.16	0.00	0.00	-0.24	-0.06	0.00	0.01	0.47	0.49	0.51	0.52	1.15	1.19	1.22	1.27	1.31	1.35	1.39	1.44	1.50	1.54	1.60	1.65	1.70	1.76	1.82	1.86	1.94	2.00	2.06	2.13	2.20	2.26	2.35	2.43	2.50	2.60	2.67	2.77	2.86	2.94
2 Difference between No.1 and Construction repayment	-82.58											-2.88	-2.88	-2.89	-2.88	-2.88	-2.88	-2.88	-2.88	-2.86	-2.86	-2.85	-2.84	-2.84	-2.82	-2.81	-2.81	-2.78	-2.77	-2.76	-2.73	-2.71	-2.70	-2.66	-2.63	-2.61	-2.56	-2.54	-2.50	-2.46	-2.43
3 Difference between No.2 and Interest repayment	-113.21	-0.04	-0.07	-0.34	-1.05	-1.39	-1.39	-0.93	-0.91	-0.89	-0.88	-4.28	-4.24	-4.21	-4.16	-4.12	-4.08	-4.03	-3.99	-3.93	-3.88	-3.83	-3.77	-3.73	-3.66	-3.61	-3.56	-3.49	-3.43	-3.37	-3.29	-3.22	-3.16	-3.08	-3.00	-2.92	-2.82	-2.75	-2.66	-2.57	-2.48
4 Required subsidy amount	113.21	0.04	0.07	0.34	1.05	1.39	1.39	0.93	0.91	0.89	0.88	4.28	4.24	4.21	4.16	4.12	4.08	4.03	3.99	3.93	3.88	3.83	3.77	3.73	3.66	3.61	3.56	3.49	3.43	3.37	3.29	3.22	3.16	3.08	3.00	2.92	2.82	2.75	2.66	2.57	2.48
No 10 Khachardzan																																									
1 Difference between Water sales revenue and O&M cost	95.19	0.00	0.00	-0.24	0.18	0.34	0.37	0.94	0.97	1.00	1.04	1.81	1.88	1.93	2.00	2.07	2.12	2.21	2.27	2.35	2.43	2.51	2.60	2.67	2.77	2.85	2.95	3.06	3.15	3.26	3.36	3.47	3.59	3.70	3.82	3.94	4.09	4.22	4.36	4.50	4.65
2 Difference between No.1 and Construction repayment	-12.38											-1.15	-1.11	-1.09	-1.05	-1.01	-0.99	-0.93	-0.90	-0.86	-0.81	-0.76	-0.70	-0.67	-0.60	-0.55	-0.49	-0.41	-0.36	-0.28	-0.22	-0.14	-0.06	0.02	0.10	0.18	0.29	0.39	0.49	0.59	0.70
3 Difference between No.2 and Interest repayment	-31.58	-0.04	-0.07	-0.34	-0.56	-0.68	-0.65	-0.08	-0.05	-0.02	0.02	-2.18	-2.11	-2.06	-1.99	-1.92	-1.87	-1.78	-1.73	-1.64	-1.56	-1.48	-1.39	-1.32	-1.22	-1.14	-1.04	-0.93	-0.84	-0.73	-0.63	-0.53	-0.40	-0.29	-0.17	-0.05	0.10	0.23	0.37	0.51	0.66
4 Required subsidy amount	33.47	0.04	0.07	0.34	0.56	0.68	0.65	0.08	0.05	0.02	0.00	2.18	2.11	2.06	1.99	1.92	1.87	1.78	1.72	1.64	1.56	1.48	1.39	1.32	1.22	1.14	1.04	0.93	0.84	0.73	0.63	0.52	0.40	0.29	0.17	0.05	0.00	0.00	0.00	0.00	0.00
No 11 Hovq																																									
1 Difference between Water sales revenue and O&M cost	89.27	0.00	0.00	-0.24	0.07	0.17	0.18	0.80	0.82	0.85	0.88	1.72	1.77	1.84	1.89	1.96	2.02	2.09	2.15	2.23	2.29	2.38	2.45	2.54	2.62	2.71	2.79	2.89	2.98	3.08	3.18	3.28	3.39	3.50	3.61	3.74	3.87	3.99	4.12	4.26	4.40
2 Difference between No.1 and Construction repayment	-104.39											-3.75	-3.75	-3.74	-3.74	-3.73	-3.72	-3.71	-3.71	-3.69	-3.69	-3.66	-3.65	-3.62	-3.60	-3.57	-3.56	-3.52	-3.49	-3.46	-3.42	-3.39	-3.35	-3.30	-3.26	-3.20	-3.14	-3.09	-3.03	-2.96	-2.89
3 Difference between No.2 and Interest repayment	-144.70	-0.04	-0.07	-0.34	-1.27	-1.72	-1.72	-1.10	-1.08	-1.05	-1.02	-5.65	-5.60	-5.53	-5.48	-5.41	-5.34	-5.27	-5.22	-5.14	-5.08	-4.99	-4.92	-4.83	-4.75	-4.66	-4.58	-4.48	-4.38	-4.29	-4.18	-4.09	-3.98	-3.86	-3.76	-3.63	-3.50	-3.38	-3.25	-3.11	-2.96
4 Required subsidy amount	144.70	0.04	0.07	0.34	1.27	1.72	1.72	1.10	1.08	1.05	1.02	5.65	5.60	5.53	5.48	5.41	5.34	5.27	5.22	5.14	5.08	4.99	4.92	4.83	4.75	4.65	4.58	4.48	4.38	4.29	4.18	4.09	3.98	3.86	3.76	3.63	3.50	3.38	3.25	3.11	2.96
No 12 Navur																																									
1 Difference between Water sales revenue and O&M cost	248.88	0.00	0.00	-0.24	0.59	0.90	0.94	2.45	2.52	2.61	2.69	4.73	4.89	5.05	5.22	5.39	5.57	5.75	5.94	6.13	6.33	6.55	6.77	6.98	7.23	7.46	7.70	7.96	8.22	8.48	8.77	9.06	9.35	9.66	9.99	10.32	10.66	11.01	11.37	11.75	12.13
2 Difference between No.1 and Construction repayment	32.58											-1.13	-1.03	-0.93	-0.82	-0.71	-0.59	-0.47	-0.34	-0.22	-0.08	0.08	0.23	0.38	0.56	0.72	0.90	1.09	1.28	1.47	1.69	1.91	2.13	2.37	2.62	2.88	3.15	3.42	3.70	4.01	4.31
3 Difference between No.2 and Interest repayment	-1.92	-0.04	-0.07	-0.34	-0.84	-1.13	-1.09	0.42	0.49	0.58	0.66	-3.17	-3.04	-2.85	-2.68	-2.51	-2.33	-2.15	-1.96	-1.77	-1.57	-1.35	-1.13	-0.92	-0.67	-0.44	-0.20	0.06	0.32	0.58	0.87	1.16	1.45	1.77	2.09	2.42	2.77	3.11	3.47	3.85	4.23
4 Required subsidy amount	32.22	0.04	0.07	0.34	0.84	1.13	1.09	0.00	0.00	0.00	0.00	3.17	3.01	2.85	2.68	2.51	2.33	2.15	1.96	1.77	1.57	1.35	1.13	0.92	0.67	0.44	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (5/10)

PHASE 2 ARAGATSOTN MARZ

Unit: million AMD

Description	Total	Year																																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 1 Akunq																																									
1 Difference between Water sales revenue and O&M cost	151.27	0.00	0.00	0.13	0.48	0.63	0.65	1.53	1.57	1.63	1.68	2.86	2.96	3.06	3.16	3.26	3.36	3.47	3.59	3.71	3.83	3.97	4.09	4.23	4.36	4.50	4.66	4.82	4.97	5.14	5.30	5.47	5.66	5.85	6.04	6.24	6.44	6.66	6.87	7.11	7.33
2 Difference between No.1 and Construction repayment	2.08											-1.19	-1.13	-1.07	-1.01	-0.96	-0.90	-0.83	-0.75	-0.68	-0.60	-0.50	-0.43	-0.33	-0.25	-0.16	-0.04	0.07	0.17	0.29	0.41	0.53	0.67	0.81	0.95	1.10	1.25	1.41	1.57	1.76	1.92
3 Difference between No.2 and Interest repayment	-22.76	-0.02	-0.04	-0.45	-0.67	-0.77	-0.76	0.12	0.16	0.22	0.27	-2.60	-2.50	-2.40	-2.30	-2.20	-2.10	-1.99	-1.87	-1.75	-1.63	-1.49	-1.37	-1.23	-1.10	-0.96	-0.80	-0.64	-0.49	-0.32	-0.16	0.01	0.20	0.39	0.58	0.78	0.99	1.20	1.41	1.65	1.87
4 Required subsidy amount	32.61	0.02	0.04	0.45	0.67	0.77	0.76	0.00	0.00	0.00	0.00	2.60	2.50	2.40	2.30	2.20	2.10	1.99	1.87	1.75	1.63	1.49	1.37	1.23	1.10	0.96	0.80	0.64	0.49	0.32	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 2 Aghdzq																																									
1 Difference between Water sales revenue and O&M cost	392.38	0.00	0.00	0.77	1.75	2.01	2.06	4.15	4.29	4.42	4.58	7.38	7.61	7.87	8.13	8.39	8.67	8.96	9.26	9.56	9.87	10.20	10.54	10.88	11.26	11.62	12.00	12.41	12.81	13.23	13.66	14.11	14.57	15.06	15.55	16.07	16.61	17.15	17.71	18.30	18.91
2 Difference between No.1 and Construction repayment	141.50											0.86	1.02	1.22	1.41	1.60	1.82	2.04	2.27	2.50	2.74	3.00	3.26	3.53	3.84	4.12	4.43	4.76	5.09	5.43	5.78	6.15	6.53	6.94	7.35	7.79	8.25	8.70	9.18	9.68	10.21
3 Difference between No.2 and Interest repayment	112.04	-0.02	-0.04	-0.22	-0.23	-0.25	-0.21	1.88	2.02	2.15	2.31	-1.41	-1.18	-0.92	-0.66	-0.40	-0.12	0.17	0.47	0.77	1.08	1.41	1.75	2.09	2.47	2.83	3.21	3.62	4.02	4.44	4.87	5.32	5.78	6.27	6.76	7.28	7.82	8.36	8.92	9.51	10.12
4 Required subsidy amount	5.66	0.02	0.04	0.22	0.23	0.25	0.21	0.00	0.00	0.00	0.00	1.41	1.18	0.92	0.66	0.40	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 3 Antarut																																									
1 Difference between Water sales revenue and O&M cost	19.59	0.00	0.00	-0.20	-0.17	-0.17	-0.17	0.07	0.07	0.07	0.07	0.39	0.42	0.43	0.45	0.47	0.46	0.48	0.50	0.52	0.54	0.56	0.57	0.59	0.61	0.64	0.65	0.68	0.69	0.71	0.74	0.76	0.80	0.81	0.84	0.88	0.90	0.94	0.96	0.99	1.03
2 Difference between No.1 and Construction repayment	-75.20											-2.35	-2.34	-2.36	-2.37	-2.38	-2.42	-2.43	-2.43	-2.44	-2.45	-2.46	-2.48	-2.49	-2.51	-2.51	-2.53	-2.53	-2.55	-2.56	-2.57	-2.58	-2.57	-2.60	-2.60	-2.60	-2.61	-2.61	-2.62	-2.63	-2.62
3 Difference between No.2 and Interest repayment	-98.10	-0.02	-0.04	-0.63	-1.00	-1.11	-1.12	-0.88	-0.88	-0.88	-0.88	-3.30	-3.26	-3.26	-3.24	-3.22	-3.23	-3.21	-3.18	-3.17	-3.15	-3.13	-3.12	-3.10	-3.08	-3.05	-3.04	-3.01	-3.00	-2.98	-2.95	-2.93	-2.89	-2.88	-2.85	-2.81	-2.79	-2.75	-2.73	-2.70	-2.66
4 Required subsidy amount	98.10	0.02	0.04	0.63	1.00	1.11	1.12	0.88	0.88	0.88	0.88	3.30	3.26	3.26	3.24	3.22	3.23	3.21	3.18	3.17	3.15	3.13	3.12	3.10	3.08	3.05	3.04	3.01	3.00	2.98	2.95	2.93	2.89	2.88	2.85	2.81	2.79	2.75	2.73	2.70	2.66
No 4 Ashnak																																									
1 Difference between Water sales revenue and O&M cost	274.79	0.00	0.00	0.29	0.80	0.97	1.02	2.69	2.78	2.87	2.96	5.22	5.39	5.56	5.76	5.95	6.12	6.33	6.55	6.76	6.97	7.22	7.45	7.69	7.96	8.21	8.48	8.77	9.06	9.34	9.66	9.97	10.30	10.64	10.99	11.36	11.74	12.14	12.52	12.94	13.36
2 Difference between No.1 and Construction repayment	161.65											2.38	2.52	2.66	2.83	3.00	3.14	3.32	3.51	3.69	3.86	4.08	4.28	4.49	4.73	4.95	5.18	5.44	5.70	5.94	6.23	6.51	6.80	7.11	7.42	7.75	8.10	8.46	8.81	9.19	9.57
3 Difference between No.2 and Interest repayment	152.79	-0.02	-0.04	-0.12	-0.01	-0.01	0.03	1.70	1.79	1.88	1.97	1.39	1.56	1.73	1.93	2.13	2.30	2.51	2.73	2.94	3.14	3.39	3.62	3.86	4.13	4.39	4.65	4.94	5.24	5.51	5.83	6.15	6.47	6.82	7.16	7.53	7.91	8.31	8.70	9.11	9.53
4 Required subsidy amount	0.19	0.02	0.04	0.12	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 5 Avan+Khnusik																																									
1 Difference between Water sales revenue and O&M cost	164.72	0.00	0.00	0.10	0.41	0.47	0.49	1.56	1.60	1.65	1.71	3.14	3.24	3.35	3.46	3.57	3.69	3.81	3.94	4.07	4.20	4.33	4.50	4.63	4.79	4.94	5.10	5.28	5.45	5.62	5.81	6.00	6.20	6.40	6.62	6.84	7.07	7.30	7.53	7.80	8.05
2 Difference between No.1 and Construction repayment	-136.31											-5.29	-5.27	-5.24	-5.22	-5.20	-5.16	-5.13	-5.09	-5.05	-5.01	-4.98	-4.90	-4.86	-4.80	-4.74	-4.68	-4.60	-4.53	-4.46	-4.37	-4.28	-4.18	-4.09	-3.97	-3.86	-3.73	-3.61	-3.49	-3.33	-3.19
3 Difference between No.2 and Interest repayment	-197.39	-0.02	-0.04	-1.18	-2.15	-2.45	-2.44	-1.37	-1.33	-1.28	-1.22	-8.22	-8.12	-8.00	-7.90	-7.79	-7.66	-7.54	-7.41	-7.28	-7.15	-7.03	-6.86	-6.72	-6.57	-6.41	-6.25	-6.08	-5.91	-5.74	-5.55	-5.36	-5.15	-4.96	-4.73	-4.52	-4.28	-4.05	-3.82	-3.55	-3.30
4 Required subsidy amount	197.39	0.02	0.04	1.18	2.15	2.45	2.44	1.37	1.33	1.28	1.22	8.22	8.12	8.00	7.90	7.79	7.66	7.54	7.41	7.28	7.15	7.03	6.86	6.72	6.57	6.41	6.25	6.08	5.91	5.74	5.55	5.36	5.15	4.96	4.73	4.52	4.28	4.05	3.82	3.55	3.30
No 6 Avtona																																									
1 Difference between Water sales revenue and O&M cost	37.93	0.00	0.00	-0.11	0.02	0.05	0.05	0.32	0.33	0.35	0.35	0.73	0.76	0.78	0.80	0.84	0.86	0.90	0.91	0.95	0.98	1.01	1.05	1.08	1.12	1.16	1.18	1.23	1.27	1.32	1.36	1.40	1.45	1.49	1.55	1.59	1.64	1.71	1.75	1.82	1.87
2 Difference between No.1 and Construction repayment	-3.23											-0.41	-0.40	-0.39	-0.38	-0.35	-0.34	-0.31	-0.32	-0.29	-0.27	-0.25	-0.23	-0.21	-0.18	-0.15	-0.15	-0.11	-0.08	-0.05	-0.02	0.00	0.04	0.07	0.11	0.14	0.17	0.23	0.25	0.31	0.34
3 Difference between No.2 and Interest repayment	-11.31	-0.02	-0.04	-0.30	-0.32	-0.34	-0.35	-0.08	-0.07	-0.05	-0.05	-0.81	-0.79	-0.76	-0.74	-0.70	-0.68	-0.64	-0.64	-0.59	-0.56	-0.53	-0.50	-0.46	-0.42	-0.38	-0.36	-0.31	-0.27	-0.22	-0.18	-0.15	-0.09	-0.05	0.01	0.05	0.10	0.17	0.20	0.28	0.32
4 Required subsidy amount	12.44	0.02	0.04	0.30	0.32	0.34	0.35	0.08	0.07	0.05	0.05	0.81	0.79	0.76	0.74	0.70	0.68	0.64	0.64	0.59	0.56	0.53	0.50	0.46	0.42	0.38	0.36	0.31	0.27	0.22	0.18	0.15	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 7 Avshen																																									
1 Difference between Water sales revenue and O&M cost	25.10	0.00	0.00	-0.20	-0.16	-0.18	-0.17	0.11	0.11	0.12	0.13	0.50	0.52	0.55	0.56	0.58	0.60	0.61	0.64	0.67	0.68	0.70	0.73	0.75	0.79	0.80	0.82	0.86	0.87	0.90	0.94	0.96	1.00	1.03	1.06	1.11	1.14	1.19	1.22	1.26	1.30
2 Difference between No.1 and Construction repayment	-64.94											-2.10	-2.10	-2.10	-2.11	-2.12	-2.13	-2.15	-2.14	-2.14	-2.16	-2.17	-2.17	-2.17	-2.16	-2.18	-2.19	-2.18	-2.20	-2.20	-2.20	-2.21	-2.20	-2.20	-2.20	-2.19	-2.19	-2.17	-2.18	-2.17	-2.16
3 Difference between No.2 and Interest repayment	-86.39	-0.02	-0.04	-0.58	-0.90	-1.07	-1.07	-0.79	-0.79	-0.78	-0.77	-3.00	-2.98	-2.95	-2.93	-2.92	-2.90	-2.89	-2.86	-2.83	-2.82	-2.80	-2.77	-2.74	-2.70	-2.69	-2.68	-2.63	-2.62	-2.59	-2.56	-2.54	-2.50	-2.47	-2.44	-2.39	-2.36	-2.31	-2.28	-2.24	-2.19
4 Required subsidy amount	86.39	0.02	0.04	0.58	0.90	1.07	1.07	0.79	0.79	0.78	0.77	3.00	2.98	2.95	2.93	2.92	2.90	2.89	2.86	2.83	2.82	2.80	2.77	2.74	2.70	2.69	2.68	2.63	2.62	2.59	2.56	2.54	2.50	2.47	2.44	2.39	2.36	2.31	2.28	2.24	2.19
No 8 Aragats																																									
1 Difference between Water sales revenue and O&M cost	635.54	0.00	0.00	0.63	1.66	2.02	2.08	6.07	6.28	6.48	6.69	12.08	12.49	12.89	13.32	13.75	14.21	14.67	15.16	15.66	16.19	16.72	17.27	17.84	18.43	19.04	19.67	20.31	20.98	21.67	22.39	23.13	23.90	24.69	25.51	26.34	27.21	28.10	29.03	30.00	30.98
2 Difference between No.1 and Construction repayment	-204.43											-11.15	-10.97	-10.81	-10.61	-10.42	-10.21	-9.99	-9.75	-9.49	-9.22	-8.94	-8.65	-8.34	-8.01	-7.66	-7.30	-6.93	-6.53	-6.12	-5.67	-5.22	-4.73	-4.22	-3.69	-3.16	-2.58	-1.99	-1.36	-0.69	-0.02
3 Difference between No.2 and Interest repayment	-362.13	-0.02	-0.04	-2.62	-4.91	-6.05	-6.00	-2.01	-1.80	-1.60	-1.39	-19.23	-18.82	-18.42	-17.99	-17.56	-17.11	-16.64	-16.15	-15.65	-15.12	-14.59	-14.04	-13.47	-12.88	-12.27	-11.64	-11.00	-10.33	-9.64	-8.92	-8.19	-7.41	-6.62	-5.80	-4.97	-4.10	-3.21	-2.28	-1.31	-0.33
4 Required subsidy amount	362.13	0.02	0.04	2.62	4.91	6.05	6.00	2.01	1.80	1.60	1.39	19.23	18.82	18.42	17.99	17.56	17.11	16.64	16.15	15.65	15.12	14.59	14.04	13.47	12.88	12.27	11.64	11.00	10.33	9.64	8.92	8.19	7.41	6.62	5.80	4.97	4.10	3.21	2.28	1.31	0.33
No 9 Aragats																																									
1 Difference between Water sales revenue and O&M cost	765.74	0.00	0.00	6.92	14.73	16.53	16.15	15.76	15.35	14.94	14.51	14.06	14.52	15.00	15.48	16.01	-2.99	17.08	17.64	18.22	18.83	19.45	20.09	20.74	21.44	22.15	22.88	23.63	24.41	25.21	26.06	-4.88	27.79	28.71	29.66	30.64	31.65	32.68	33.77	34.89	36.04
2 Difference between No.1 and Construction repayment	52.87											-3.13	-2.84	-2.54	-2.23	-1.88	-21.06	-1.17	-0.79	-0.39	0.03	0.46	0.91	1.37	1.88	2.39	2.92	3.47	4.05	4.65	5.29	-25.86	6.60	7.31	8.05	8.81	9.60	10.41	11.28	12.18	13.10
3 Difference between No.2 and Interest repayment	26.89	-0.02	-0.04	4.33	9.50	10.56	10.17	9.78	9.37	8.96	8.53	-9.11	-8.65	-8.17	-7.69	-7.16	-26.16	-6.09	-5.53	-4.95	-4.34	-3.72	-3.08	-2.43	-1.73	-1.02	-0.29	0.46	1.24	2.04	2.89	-28.05	4.62	5.54	6.49	7.47	8.48	9.51	10.60	11.72	12.87
4 Required subsidy amount	128.23	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.11	8.65	8.17	7.69	7.16	26.16	6.09	5.53	4.95	4.34	3.72	3.08	2.43	1.73	1.02	0.29	0.00	0.00	0.00	0.00	28.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 10 Arayi																																									
1 Difference between Water sales revenue and O&M cost	102.39	0.00	0.00	-0.06	0.11	0.17	0.17	0.90	0.93	0.95	0.99	1.96	2.03	2.10	2.17	2.24	2.31	2.39	2.47	2.56	2.64	2.72	2.81	2.90	3.00	3.10	3.20	3.31	3.42	3.52	3.64	3.76	3.88	4.01	4.15	4.29	4.43	4.58	4.72	4.88	5.04
2 Difference between No.1 and Construction repayment	-58.78											-2.55	-2.53	-2.50	-2.48	-2.46	-2.43	-2.40	-2.37	-2.33	-2.30	-2.27	-2.23	-2.19	-2.14	-2.09	-2.04	-1.98	-1.93	-1.88	-1.81	-1.75	-1.68	-1.61	-1.52	-1.44	-1.36	-1.27	-1.18	-1.08	-0.98
3 Difference between No.2 and Interest repayment	-91.54	-0.02	-0.04	-0.71	-1.17	-1.39	-1.40	-0.67	-0.64	-0.62	-0.58	-4.12	-4.05	-3.98	-3.91	-3.85	-3.77	-3.69	-3.61	-3.53	-3.45	-3.37	-3.28	-3.19	-3.09	-2.99	-2.88	-2.77	-2.67	-2.56	-2.44	-2.33	-2.20	-2.08	-1.93	-1.79	-1.66	-1.51	-1.36	-1.20	-1.04
4 Required subsidy amount	91.54	0.02	0.04	0.71	1.17	1.39	1.40	0.67	0.64	0.62	0.58	4.12	4.05	3.98	3.91	3.85	3.77	3.69	3.61	3.53	3.45	3.37	3.28	3.19	3.09	2.99	2.88	2.77	2.67	2.56	2.44	2.33	2.20	2.08	1.93	1.79	1.66	1.51	1.36	1.20	1.04
No 11 Arteni																																									
1 Difference between Water sales revenue and O&M cost	346.77	0.00	0.00	3.37	7.24	8.06	7.80	7.53	7.24	6.96	6.67	6.36	6.57	6.78	7.00	7.25	-2.29	7.73	7.97	8.25	8.51	8.79	9.09	9.39	9.70	10.01	10.34	10.68	11.04	11.41	11.79	-3.73	12.57	12.98	13.41	13.86	14.32	14.78	15.27	15.78	16.29
2 Difference between No.1 and Construction repayment	-65.57											-3.92	-3.81	-3.70	-3.59	-3.44	-13.09	-3.18	-3.05	-2.88	-2.73	-2.56	-2.38	-2.19	-2.00	-1.80	-1.59	-1.37	-1.13	-0.88	-0.63	-16.27	-0.09	0.19	0.49	0.81	1.14	1.47	1.83	2.20	2.58
3 Difference between No.2 and Interest repayment	-94.95	-0.02	-0.04	1.82	4.12	4.50	4.22	3.95	3.66	3.38	3.09	-7.49	-7.28	-7.07	-6.85	-6.60	-16.14	-6.12	-5.88	-5.60	-5.34	-5.06	-4.77	-4.46	-4.16	-3.84	-3.51	-3.17	-2.81	-2.44	-2.07	-17.58	-1.28	-0.87	-0.44	0.01	0.47	0.93	1.42	1.93	2.44
4 Required subsidy amount	130.89	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.49	7.28	7.07	6.85	6.60	16.14	6.12	5.88	5.60	5.34	5.06	4.77	4.46	4.16	3.84	3.51	3.17	2.81	2.44	2.07	17.58	1.28	0.87	0.44	0.00	0.00	0.00	0.00	0.00	0.00
No 12 Apnagyugh																																									
1 Difference between Water sales revenue and O&M cost	125.58	0.00	0.00	0.05	0.34	0.44	0.46	1.22	1.27	1.31	1.35	2.39	2.46	2.55	2.63	2.73	2.80	2.90	3.00	3.09	3.19	3.29	3.42	3.52	3.64	3.75	3.88	4.01	4.14	4.28	4.42	4.56	4.71	4.87	5.03	5.20	5.37	5.56	5.73	5.91	6.11
2 Difference between No.1 and Construction repayment	74.09											1.09	1.15	1.23	1.30	1.38	1.44	1.52	1.61	1.69	1.77	1.86	1.97	2.06	2.17	2.26	2.38	2.49	2.61	2.73	2.86	2.98	3.11	3.26	3.40	3.56	3.71	3.88	4.04	4.20	4.38
3 Difference between No.2 and Interest repayment	69.89	-0.02	-0.04	-0.15	-0.03	0.00	0.01	0.77	0.82	0.86	0.90	0.64	0.71	0.81	0.89	0.98	1.06	1.15	1.25	1.35	1.44	1.54	1.67	1.77	1.90	2.00	2.14	2.26	2.40	2.53	2.68	2.81	2.96	3.13	3.28	3.46	3.63	3.81	3.99	4.17	4.36
4 Required subsidy amount	0.24	0.02	0.04	0.15	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 13 Baysz																																									
1 Difference between Water sales revenue and O&M cost	30.37	0.00	0.00	-0.16	-0.09	-0.08	-0.08	0.20	0.21	0.21	0.22	0.61	0.62	0.64	0.66	0.68	0.71	0.72	0.75	0.78	0.80	0.84	0.86	0.89	0.92	0.95	0.97	1.01	1.04	1.07	1.11	1.14	1.18	1.21	1.27	1.30	1.34	1.40	1.44	1.49	1.53
2 Difference between No.1 and Construction repayment	-74.98											-2.41	-2.43	-2.44	-2.45	-2.46	-2.46	-2.48	-2.48	-2.49	-2.50	-2.49	-2.50	-2.51	-2.51	-2.52	-2.53	-2.53	-2.53	-2.54	-2.53	-2.54	-2.54	-2.54	-2.52	-2.53	-2.53	-2.51	-2.50	-2.49	-2.49
3 Difference between No.2 and Interest repayment	-99.32	-0.02	-0.04	-0.63	-1.00	-1.12	-1.13	-0.85	-0.84	-0.84	-0.83	-3.46	-3.45	-3.43	-3.41	-3.39	-3.36	-3.34	-3.31	-3.29	-3.27	-3.22	-3.20	-3.18	-3.14	-3.12	-3.09	-3.06	-3.02	-3.00	-2.95	-2.92	-2.89	-2.85	-2.79	-2.77	-2.73	-2.67	-2.62	-2.57	-2.53
4 Required subsidy amount	99.32	0.02	0.04	0.63	1.00	1.12	1.13	0.85	0.84	0.84	0.83	3.46	3.45	3.43	3.41	3.39	3.36	3.34	3.31	3.29	3.27	3.22	3.20	3.18	3.14	3.12	3.09	3.06	3.02	3.00	2.95	2.92	2.89	2.85	2.79	2.77	2.73	2.67	2.62	2.57	2.53
No 14 Byurakan																																									
1 Difference between Water sales revenue and O&M cost	1081.80	0.00	0.00	1.66	4.18	4.76	4.91	11.05	11.40	11.77	12.17	20.43	21.09	21.78	22.50	23.24	24.02	24.81	25.63	26.48	27.34	28.24	29.18	30.14	31.13	32.16	33.22	34.33	35.45	36.63	37.82	39.08	40.37	41.71	43.08	44.50	45.97	47.48	49.06	50.68	52.35
2 Difference between No.1 and Construction repayment	150.66											-4.56	-4.15	-3.71	-3.25	-2.76	-2.24	-1.72	-1.16	-0.58	0.01	0.64	1.30	1.98	2.69	3.44	4.21	5.03	5.86	6.74	7.63	8.59	9.57	10.61	11.66	12.77	13.92	15.11	16.37	17.66	19.00
3 Difference between No.2 and Interest repayment	7.81	-0.02	-0.04	-2.10	-3.42	-3.92	-3.78	2.36	2.71	3.08	3.48	-13.25	-12.59	-11.90	-11.19	-10.44	-9.66	-8.88	-8.05	-7.20	-6.34	-5.44	-4.50	-3.54	-2.55	-1.52	-0.46	0.65	1.77	2.95	4.14	5.40	6.68	8.03	9.39	10.82	12.29	13.80	15.38	17.00	18.67
4 Required subsidy amount	130.79	0.02	0.04	2.10	3.42	3.92	3.78	0.00	0.00	0.00	0.00	13.25	12.59	11.90	11.19	10.44	9.66	8.88	8.05	7.20	6.34	5.44	4.50	3.54	2.55	1.52	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 15 Garnahovit																																									
1 Difference between Water sales revenue and O&M cost	81.15	0.00	0.00	-0.01	0.20	0.25	0.27	0.78	0.80	0.83	0.85	1.55	1.60	1.66	1.70	1.76	1.82	1.87	1.94	2.00	2.07	2.14	2.21	2.28	2.36	2.43	2.50	2.60	2.68	2.77	2.86	2.96	3.05	3.15	3.27	3.36	3.48	3.61	3.71	3.84	3.95
2 Difference between No.1 and Construction repayment	-25.84											-1.41	-1.39	-1.36	-1.35	-1.32	-1.29	-1.27	-1.24	-1.21	-1.17	-1.13	-1.09	-1.06	-1.01	-0.98	-0.94	-0.87	-0.83	-0.77	-0.72	-0.65	-0.60	-0.54	-0.45	-0.40	-0.32	-0.23	-0.17	-0.07	0.00
3 Difference between No.2 and Interest repayment	-46.19	-0.02	-0.04	-0.47	-0.70	-0.77	-0.76	-0.25	-0.23	-0.20	-0.18	-2.44	-2.39	-2.33	-2.29	-2.23	-2.17	-2.12	-2.06	-1.99	-1.92	-1.85	-1.78	-1.71	-1.63	-1.57	-1.49	-1.39	-1.31	-1.22	-1.13	-1.03	-0.94	-0.85	-0.72	-0.63	-0.51	-0.39	-0.29	-0.15	-0.04
4 Required subsidy amount	46.19	0.02	0.04	0.47	0.70	0.77	0.76	0.25	0.23	0.20	0.18	2.44	2.39	2.33	2.29	2.23	2.17	2.12	2.06	1.99	1.92	1.85	1.78	1.71	1.63	1.57	1.49	1.39	1.31	1.22	1.13	1.03	0.94	0.85	0.72	0.63	0.51	0.39	0.29	0.15	0.04
No 16 Geghadir																																									
1 Difference between Water sales revenue and O&M cost	134.31	0.00	0.00	0.02	0.24	0.32	0.34	1.24	1.27	1.31	1.36	2.57	2.66	2.74	2.83	2.93	3.02	3.12	3.22	3.33	3.43	3.55	3.67	3.79	3.91	4.05	4.18	4.32	4.46	4.60	4.75	4.91	5.08	5.24	5.41	5.59	5.77	5.97	6.17	6.37	6.57
2 Difference between No.1 and Construction repayment	-168.74											-5.97	-5.96	-5.97	-5.97	-5.95	-5.95	-5.94	-5.93	-5.91	-5.91	-5.88	-5.85	-5.83	-5.81	-5.76	-5.73	-5.69	-5.65	-5.61	-5.56	-5.51	-5.44	-5.39	-5.32	-5.25	-5.18	-5.09	-5.00	-4.91	-4.82
3 Difference between No.2 and Interest repayment	-232.36	-0.02	-0.04	-1.19	-2.17	-2.64	-2.63	-1.73	-1.70	-1.66	-1.61	-8.94	-8.84	-8.77	-8.68	-8.57	-8.48	-8.38	-8.28	-8.17	-8.08	-7.96	-7.83	-7.72	-7.60	-7.45	-7.33	-7.19	-7.05	-6.90	-6.75	-6.60	-6.43	-6.27	-6.09	-5.92	-5.74	-5.54	-5.34	-5.14	-4.93
4 Required subsidy amount	232.36	0.02	0.04	1.19	2.17	2.64	2.63	1.73	1.70	1.66	1.61	8.94	8.84	8.77	8.68	8.57	8.48	8.38	8.28	8.17	8.08	7.96	7.83	7.72	7.60	7.45	7.33	7.19	7.05	6.90	6.75	6.60	6.43	6.27	6.09	5.92	5.74	5.54	5.34	5.14	4.93

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (6/10)

PHASE 2 ARAGATSOTN MARZ

Unit: million AMD

Description	Total	Year																																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 17 Gegharot																																									
1 Difference between Water sales revenue and O&M cost	89.45	0.00	0.00	-0.06	0.09	0.14	0.16	0.79	0.81	0.85	0.86	1.72	1.78	1.83	1.90	1.95	2.02	2.09	2.16	2.22	2.30	2.37	2.47	2.53	2.63	2.70	2.80	2.89	2.98	3.08	3.18	3.28	3.39	3.51	3.62	3.75	3.87	4.00	4.13	4.26	4.40
2 Difference between No.1 and Construction repayment	-41.87											-1.95	-1.93	-1.91	-1.88	-1.87	-1.84	-1.81	-1.78	-1.76	-1.71	-1.68	-1.63	-1.61	-1.55	-1.52	-1.46	-1.41	-1.37	-1.31	-1.25	-1.20	-1.13	-1.06	-0.99	-0.91	-0.84	-0.75	-0.67	-0.59	-0.50
3 Difference between No.2 and Interest repayment	-68.27	-0.02	-0.04	-0.59	-0.95	-1.13	-1.12	-0.49	-0.47	-0.43	-0.42	-3.23	-3.17	-3.11	-3.05	-3.00	-2.93	-2.86	-2.79	-2.73	-2.64	-2.57	-2.48	-2.42	-2.32	-2.25	-2.15	-2.05	-1.97	-1.87	-1.76	-1.67	-1.55	-1.44	-1.32	-1.20	-1.08	-0.94	-0.82	-0.69	-0.55
4 Required subsidy amount	68.27	0.02	0.04	0.59	0.95	1.13	1.12	0.49	0.47	0.43	0.42	3.23	3.17	3.11	3.05	3.00	2.93	2.86	2.79	2.73	2.64	2.57	2.48	2.42	2.32	2.25	2.15	2.05	1.97	1.87	1.76	1.67	1.55	1.44	1.32	1.20	1.08	0.94	0.82	0.69	0.55
No 18 Getap																																									
1 Difference between Water sales revenue and O&M cost	8.51	0.00	0.00	-0.24	-0.26	-0.28	-0.29	-0.08	-0.08	-0.08	-0.08	0.20	0.21	0.22	0.22	0.23	0.23	0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.31	0.31	0.32	0.34	0.35	0.35	0.36	0.37	0.39	0.39	0.42	0.43	0.45	0.47	0.48	0.50	0.51
2 Difference between No.1 and Construction repayment	-139.97											-4.11	-4.14	-4.18	-4.22	-4.25	-4.30	-4.33	-4.37	-4.41	-4.45	-4.49	-4.53	-4.57	-4.59	-4.64	-4.68	-4.71	-4.75	-4.80	-4.85	-4.89	-4.92	-4.97	-5.00	-5.04	-5.08	-5.11	-5.16	-5.19	-5.24
3 Difference between No.2 and Interest repayment	-176.60	-0.02	-0.04	-0.86	-1.48	-1.77	-1.79	-1.58	-1.58	-1.58	-1.58	-5.61	-5.60	-5.59	-5.59	-5.57	-5.58	-5.56	-5.56	-5.55	-5.55	-5.54	-5.53	-5.52	-5.49	-5.49	-5.49	-5.47	-5.45	-5.45	-5.45	-5.44	-5.42	-5.41	-5.39	-5.38	-5.36	-5.34	-5.33	-5.30	-5.30
4 Required subsidy amount	176.60	0.02	0.04	0.86	1.48	1.77	1.79	1.58	1.58	1.58	1.58	5.61	5.60	5.59	5.59	5.57	5.58	5.56	5.56	5.55	5.55	5.54	5.53	5.52	5.49	5.49	5.49	5.47	5.45	5.45	5.45	5.44	5.42	5.41	5.39	5.38	5.36	5.34	5.33	5.30	5.30
No 19 Davtashen																																									
1 Difference between Water sales revenue and O&M cost	163.09	0.00	0.00	0.14	0.48	0.56	0.57	1.59	1.63	1.68	1.75	3.10	3.21	3.31	3.42	3.54	3.64	3.76	3.89	4.02	4.15	4.28	4.43	4.57	4.72	4.87	5.03	5.21	5.38	5.55	5.73	5.92	6.12	6.33	6.53	6.75	6.98	7.20	7.44	7.68	7.93
2 Difference between No.1 and Construction repayment	-61.70											-3.12	-3.07	-3.04	-2.99	-2.93	-2.90	-2.84	-2.78	-2.72	-2.65	-2.59	-2.51	-2.44	-2.36	-2.28	-2.19	-2.08	-1.99	-1.89	-1.79	-1.67	-1.55	-1.41	-1.29	-1.15	-1.00	-0.86	-0.70	-0.54	-0.37
3 Difference between No.2 and Interest repayment	-104.29	-0.02	-0.04	-0.81	-1.41	-1.59	-1.59	-0.57	-0.53	-0.48	-0.41	-5.28	-5.17	-5.08	-4.97	-4.84	-4.75	-4.62	-4.50	-4.37	-4.23	-4.10	-3.95	-3.81	-3.66	-3.51	-3.35	-3.17	-3.01	-2.83	-2.66	-2.46	-2.27	-2.05	-1.85	-1.64	-1.41	-1.19	-0.95	-0.71	-0.45
4 Required subsidy amount	104.29	0.02	0.04	0.81	1.41	1.59	1.59	0.57	0.53	0.48	0.41	5.28	5.17	5.08	4.97	4.84	4.75	4.62	4.50	4.37	4.23	4.10	3.95	3.81	3.66	3.51	3.35	3.17	3.01	2.83	2.66	2.46	2.27	2.05	1.85	1.64	1.41	1.19	0.95	0.71	0.45
No 20 Derek																																									
1 Difference between Water sales revenue and O&M cost	97.76	0.00	0.00	0.00	0.23	0.32	0.33	0.94	0.97	1.00	1.04	1.87	1.92	1.99	2.05	2.12	2.18	2.25	2.33	2.41	2.49	2.57	2.67	2.75	2.84	2.93	3.02	3.13	3.23	3.33	3.45	3.55	3.67	3.80	3.92	4.05	4.19	4.33	4.48	4.63	4.78
2 Difference between No.1 and Construction repayment	-20.18											-1.38	-1.36	-1.33	-1.30	-1.26	-1.24	-1.20	-1.16	-1.11	-1.07	-1.02	-0.96	-0.91	-0.86	-0.81	-0.75	-0.68	-0.62	-0.56	-0.48	-0.42	-0.34	-0.25	-0.17	-0.08	0.02	0.12	0.23	0.33	0.44
3 Difference between No.2 and Interest repayment	-41.94	-0.02	-0.04	-0.47	-0.69	-0.80	-0.80	-0.19	-0.16	-0.13	-0.09	-2.51	-2.46	-2.40	-2.33	-2.26	-2.21	-2.13	-2.06	-1.97	-1.90	-1.81	-1.71	-1.63	-1.54	-1.45	-1.36	-1.25	-1.15	-1.05	-0.93	-0.84	-0.72	-0.59	-0.46	-0.33	-0.19	-0.05	0.10	0.24	0.40
4 Required subsidy amount	42.68	0.02	0.04	0.47	0.69	0.80	0.80	0.19	0.16	0.13	0.09	2.51	2.46	2.40	2.33	2.26	2.21	2.13	2.06	1.97	1.90	1.81	1.71	1.63	1.54	1.45	1.36	1.25	1.15	1.05	0.93	0.84	0.72	0.59	0.46	0.33	0.19	0.05	0.00	0.00	0.00
No 21 Dian																																									
1 Difference between Water sales revenue and O&M cost	-0.10	0.00	0.00	-0.25	-0.28	-0.31	-0.30	-0.15	-0.16	-0.17	-0.17	0.04	0.04	0.04	0.05	0.04	0.03	0.04	0.04	0.05	0.04	0.05	0.06	0.05	0.06	0.05	0.05	0.07	0.06	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.08	0.09	0.08	0.09	0.08
2 Difference between No.1 and Construction repayment	-97.82											-2.82	-2.85	-2.88	-2.90	-2.94	-2.98	-3.00	-3.03	-3.05	-3.09	-3.11	-3.13	-3.17	-3.19	-3.24	-3.27	-3.28	-3.33	-3.37	-3.41	-3.43	-3.46	-3.50	-3.54	-3.56	-3.59	-3.61	-3.66	-3.69	-3.74
3 Difference between No.2 and Interest repayment	-123.13	-0.02	-0.04	-0.69	-1.15	-1.29	-1.30	-1.15	-1.16	-1.17	-1.17	-3.81	-3.82	-3.82	-3.81	-3.82	-3.83	-3.82	-3.82	-3.81	-3.82	-3.81	-3.79	-3.80	-3.79	-3.81	-3.80	-3.78	-3.80	-3.80	-3.81	-3.80	-3.79	-3.79	-3.80	-3.78	-3.78	-3.76	-3.77	-3.77	-3.78
4 Required subsidy amount	123.13	0.02	0.04	0.69	1.15	1.29	1.30	1.15	1.16	1.17	1.17	3.81	3.82	3.82	3.81	3.82	3.83	3.82	3.82	3.81	3.82	3.81	3.79	3.80	3.79	3.81	3.80	3.78	3.80	3.80	3.81	3.80	3.79	3.79	3.80	3.78	3.78	3.76	3.77	3.77	3.78
No 22 Yeghipartush																																									
1 Difference between Water sales revenue and O&M cost	123.01	0.00	0.00	-0.07	0.06	0.07	0.09	1.02	1.05	1.07	1.12	2.37	2.45	2.54	2.63	2.71	2.79	2.89	2.99	3.08	3.18	3.29	3.40	3.50	3.63	3.73	3.86	3.99	4.12	4.25	4.39	4.53	4.69	4.85	5.01	5.17	5.35	5.53	5.71	5.89	6.08
2 Difference between No.1 and Construction repayment	-75.20											-3.20	-3.18	-3.14	-3.11	-3.09	-3.07	-3.02	-2.98	-2.95	-2.91	-2.86	-2.82	-2.78	-2.71	-2.67	-2.61	-2.54	-2.48	-2.41	-2.34	-2.27	-2.18	-2.09	-1.99	-1.90	-1.80	-1.69	-1.58	-1.47	-1.36
3 Difference between No.2 and Interest repayment	-116.35	-0.02	-0.04	-0.86	-1.52	-1.86	-1.85	-0.92	-0.89	-0.87	-0.82	-5.14	-5.06	-4.97	-4.88	-4.80	-4.72	-4.62	-4.52	-4.43	-4.33	-4.22	-4.11	-4.01	-3.88	-3.78	-3.65	-3.52	-3.39	-3.26	-3.12	-2.98	-2.82	-2.66	-2.50	-2.34	-2.16	-1.98	-1.80	-1.62	-1.43
4 Required subsidy amount	116.35	0.02	0.04	0.86	1.52	1.86	1.85	0.92	0.89	0.87	0.82	5.14	5.06	4.97	4.88	4.80	4.72	4.62	4.52	4.43	4.33	4.22	4.11	4.01	3.88	3.78	3.65	3.52	3.39	3.26	3.12	2.98	2.82	2.66	2.50	2.34	2.16	1.98	1.80	1.62	1.43
No 23 Yeghnik																																									
1 Difference between Water sales revenue and O&M cost	101.47	0.00	0.00	0.06	0.35	0.42	0.44	1.02	1.06	1.09	1.12	1.92	1.99	2.04	2.12	2.20	2.25	2.33	2.41	2.49	2.57	2.65	2.75	2.84	2.93	3.03	3.12	3.24	3.33	3.44	3.56	3.67	3.79	3.92	4.05	4.18	4.32	4.47	4.61	4.76	4.92
2 Difference between No.1 and Construction repayment	30.06											0.03	0.08	0.11	0.17	0.23	0.26	0.32	0.38	0.44	0.50	0.56	0.64	0.71	0.78	0.85	0.92	1.02	1.09	1.18	1.27	1.36	1.46	1.56	1.67	1.78	1.89	2.02	2.13	2.26	2.39
3 Difference between No.2 and Interest repayment	20.05	-0.02	-0.04	-0.24	-0.22	-0.23	-0.22	0.36	0.40	0.43	0.46	-0.63	-0.56	-0.51	-0.43	-0.35	-0.30	-0.22	-0.14	-0.06	0.02	0.10	0.20	0.29	0.38	0.47	0.57	0.69	0.78	0.89	1.01	1.12	1.24	1.36	1.50	1.63	1.77	1.92	2.05	2.21	2.36
4 Required subsidy amount	4.16	0.02	0.04	0.24	0.22	0.23	0.22	0.00	0.00	0.00	0.00	0.63	0.56	0.51	0.43	0.35	0.30	0.22	0.14	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 24 Yernjatap																																									
1 Difference between Water sales revenue and O&M cost	100.89	0.00	0.00	-0.12	-0.04	-0.04	-0.03	0.78	0.81	0.83	0.86	1.97	2.02	2.09	2.16	2.23	2.31	2.38	2.46	2.54	2.62	2.71	2.81	2.89	2.99	3.09	3.18	3.30	3.40	3.51	3.62	3.74	3.86	4.00	4.13	4.27	4.41	4.56	4.71	4.87	5.01
2 Difference between No.1 and Construction repayment	-178.80											-5.98	-6.01	-6.02	-6.03	-6.05	-6.05	-6.06	-6.07	-6.07	-6.08	-6.08	-6.06	-6.07	-6.06	-6.05	-6.05	-6.03	-6.02	-6.00	-5.99	-5.96	-5.94	-5.90	-5.87	-5.83	-5.79	-5.74	-5.70	-5.64	-5.60
3 Difference between No.2 and Interest repayment	-240.76	-0.02	-0.04	-1.24	-2.29	-2.80	-2.80	-1.99	-1.96	-1.94	-1.91	-8.75	-8.70	-8.63	-8.56	-8.49	-8.41	-8.34	-8.26	-8.18	-8.10	-8.01	-7.91	-7.83	-7.73	-7.63	-7.54	-7.42	-7.32	-7.21	-7.10	-6.98	-6.86	-6.72	-6.59	-6.45	-6.31	-6.16	-6.02	-5.85	-5.71
4 Required subsidy amount	240.76	0.02	0.04	1.24	2.29	2.80	2.80	1.99	1.96	1.94	1.91	8.75	8.70	8.63	8.56	8.49	8.41	8.34	8.26	8.18	8.10	8.01	7.91	7.83	7.73	7.63	7.54	7.42	7.32	7.21	7.10	6.98	6.86	6.72	6.59	6.45	6.31	6.16	6.02	5.85	5.71
No 25 Nor Yedesia																																									
1 Difference between Water sales revenue and O&M cost	218.59	0.00	0.00	0.26	0.72	0.82	0.85	2.16	2.23	2.30	2.38	4.14	4.28	4.43	4.57	4.71	4.87	5.03	5.19	5.37	5.54	5.73	5.92	6.11	6.32	6.53	6.73	6.96	7.19	7.43	7.67	7.92	8.18	8.45	8.74	9.03	9.33	9.63	9.96	10.29	10.62
2 Difference between No.1 and Construction repayment	101.77											1.12	1.23	1.35	1.46	1.57	1.69	1.82	1.95	2.10	2.23	2.39	2.55	2.70	2.88	3.06	3.22	3.42	3.61	3.82	4.02	4.23	4.46	4.69	4.94	5.19	5.45	5.72	6.01	6.30	6.59
3 Difference between No.2 and Interest repayment	88.68	-0.02	-0.04	-0.21	-0.19	-0.22	-0.20	1.11	1.18	1.25	1.33	0.07	0.21	0.36	0.50	0.64	0.79	0.95	1.12	1.30	1.46	1.65	1.85	2.03	2.25	2.46	2.66	2.89	3.12	3.36	3.60	3.84	4.11	4.38	4.67	4.95	5.25	5.56	5.89	6.22	6.55
4 Required subsidy amount	0.88	0.02	0.04	0.21	0.19	0.22	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 26 Zovasar																																									
1 Difference between Water sales revenue and O&M cost	121.76	0.00	0.00	0.05	0.31	0.37	0.40	1.16	1.20	1.24	1.27	2.32	2.39	2.48	2.55	2.65	2.72	2.81	2.91	3.01	3.10	3.21	3.31	3.43	3.54	3.65	3.76	3.90	4.02	4.16	4.29	4.43	4.58	4.73	4.88	5.05	5.22	5.39	5.56	5.76	5.94
2 Difference between No.1 and Construction repayment	18.89											-0.46	-0.42	-0.36	-0.32	-0.25	-0.21	-0.15	-0.07	0.00	0.06	0.13	0.20	0.29	0.37	0.45	0.53	0.64	0.72	0.83	0.93	1.03	1.15	1.26	1.38	1.51	1.65	1.78	1.92	2.08	2.22
3 Difference between No.2 and Interest repayment	2.00	-0.02	-0.04	-0.38	-0.53	-0.59	-0.57	0.19	0.23	0.27	0.30	-1.43	-1.36	-1.27	-1.20	-1.11	-1.04	-0.95	-0.84	-0.74	-0.65	-0.55	-0.45	-0.33	-0.21	-0.10	0.01	0.15	0.26	0.41	0.54	0.67	0.83	0.97	1.13	1.29	1.47	1.63	1.81	2.01	2.18
4 Required subsidy amount	14.35	0.02	0.04	0.38	0.53	0.59	0.57	0.00	0.00	0.00	0.00	1.43	1.36	1.27	1.20	1.11	1.04	0.95	0.84	0.74	0.65	0.55	0.45	0.33	0.21	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 27 Ttujur																																									
1 Difference between Water sales revenue and O&M cost	41.36	0.00	0.00	-0.20	-0.20	-0.21	-0.21	0.22	0.22	0.23	0.24	0.83	0.85	0.88	0.92	0.95	0.97	1.01	1.03	1.08	1.11	1.14	1.19	1.22	1.26	1.31	1.34	1.39	1.44	1.48	1.52	1.58	1.62	1.68	1.74	1.81	1.86	1.92	1.98	2.05	2.11
2 Difference between No.1 and Construction repayment	-80.40											-2.67	-2.68	-2.69	-2.68	-2.69	-2.71	-2.70	-2.72	-2.71	-2.72	-2.72	-2.71	-2.72	-2.72	-2.71	-2.72	-2.71	-2.70	-2.70	-2.71	-2.69	-2.69	-2.67	-2.66	-2.63	-2.63	-2.61	-2.60	-2.57	-2.56
3 Difference between No.2 and Interest repayment	-108.92	-0.02	-0.04	-0.71	-1.19	-1.42	-1.43	-1.00	-1.00	-0.99	-0.98	-3.89	-3.86	-3.84	-3.79	-3.76	-3.75	-3.70	-3.68	-3.64	-3.61	-3.57	-3.52	-3.49	-3.45	-3.40	-3.37	-3.32	-3.27	-3.23	-3.20	-3.14	-3.09	-3.03	-2.98	-2.90	-2.86	-2.79	-2.74	-2.66	-2.61
4 Required subsidy amount	108.92	0.02	0.04	0.71	1.19	1.42	1.43	1.00	1.00	0.99	0.98	3.89	3.86	3.84	3.79	3.76	3.75	3.70	3.68	3.64	3.61	3.57	3.52	3.49	3.45	3.40	3.37	3.32	3.27	3.23	3.20	3.14	3.09	3.03	2.98	2.90	2.86	2.79	2.74	2.66	2.61
No 28 Tlik																																									
1 Difference between Water sales revenue and O&M cost	-78.92	0.00	0.00	-0.52	-0.61	-0.66	-0.72	-0.76	-0.80	-0.85	-0.91	-0.95	-0.97	-1.01	-1.05	-1.08	-10.87	-1.16	-1.19	-1.24	-1.27	-1.31	-1.36	-1.39	-1.46	-1.50	-1.54	-1.60	-1.65	-1.71	-1.75	-17.71	-1.88	-1.94	-2.00	-2.07	-2.14	-2.21	-2.29	-2.35	-2.44
2 Difference between No.1 and Construction repayment	-162.44											-3.52	-3.56	-3.63	-3.70	-3.75	-13.57	-3.89	-3.94	-4.02	-4.08	-4.15	-4.23	-4.29	-4.38	-4.45	-4.52	-4.61	-4.69	-4.78	-4.85	-20.85	-5.05	-5.14	-5.23	-5.33	-5.43	-5.54	-5.65	-5.74	-5.87
3 Difference between No.2 and Interest repayment	-189.36	-0.02	-0.04	-0.92	-1.39	-1.54	-1.61	-1.65	-1.69	-1.74	-1.80	-4.41	-4.43	-4.47	-4.52	-4.54	-14.33	-4.63	-4.65	-4.70	-4.73	-4.77	-4.83	-4.86	-4.92	-4.96	-5.00	-5.06	-5.11	-5.17	-5.21	-21.18	-5.35	-5.40	-5.46	-5.53	-5.60	-5.68	-5.75	-5.81	-5.90
4 Required subsidy amount	189.36	0.02	0.04	0.92	1.39	1.54	1.61	1.65	1.69	1.74	1.80	4.41	4.43	4.47	4.52	4.54	14.33	4.63	4.65	4.70	4.73	4.77	4.83	4.86	4.92	4.96	5.00	5.06	5.11	5.17	5.21	21.18	5.35	5.40	5.46	5.53	5.60	5.68	5.75	5.81	5.90
No 29 Irind																																									
1 Difference between Water sales revenue and O&M cost	153.16	0.00	0.00	0.04	0.28	0.31	0.32	1.38	1.42	1.46	1.52	2.93	3.03	3.13	3.23	3.34	3.44	3.56	3.68	3.80	3.92	4.06	4.20	4.33	4.48	4.62	4.77	4.94	5.09	5.26	5.42	5.60	5.79	5.99	6.18	6.39	6.60	6.82	7.04	7.28	7.51
2 Difference between No.1 and Construction repayment	-149.54											-5.58	-5.56	-5.55	-5.54	-5.51	-5.50	-5.47	-5.44	-5.41	-5.39	-5.34	-5.29	-5.26	-5.20	-5.16	-5.11	-5.04	-4.99	-4.92	-4.86	-4.78	-4.70	-4.60	-4.52	-4.41	-4.31	-4.20	-4.09	-3.96	-3.85
3 Difference between No.2 and Interest repayment	-212.57	-0.02	-0.04	-1.25	-2.30	-2.64	-2.64	-1.58	-1.54	-1.50	-1.44	-8.54	-8.43	-8.34	-8.24	-8.12	-8.03	-7.91	-7.79	-7.66	-7.55	-7.41	-7.27	-7.14	-6.98	-6.85	-6.70	-6.53	-6.38	-6.21	-6.05	-5.87	-5.68	-5.48	-5.29	-5.07	-4.87	-4.65	-4.43	-4.19	-3.96
4 Required subsidy amount	212.57	0.02	0.04	1.25	2.30	2.64	2.64	1.58	1.54	1.50	1.44	8.54	8.43	8.34	8.24	8.12	8.03	7.91	7.79	7.66	7.55	7.41	7.27	7.14	6.98	6.85	6.70	6.53	6.38	6.21	6.05	5.87	5.68	5.48	5.29	5.07	4.87	4.65	4.43	4.19	3.96
No 30 Lernapar																																									
1 Difference between Water sales revenue and O&M cost	110.61	0.00	0.00	0.01	0.25	0.33	0.36	1.05	1.09	1.13	1.16	2.11	2.17	2.25	2.32	2.40	2.48	2.55	2.65	2.73	2.82	2.92	3.01	3.11	3.22	3.32	3.43	3.55	3.66	3.78	3.90	4.03	4.16	4.30	4.44	4.59	4.74	4.90	5.06	5.23	5.40
2 Difference between No.1 and Construction repayment	-32.81											-1.86	-1.84	-1.80	-1.77	-1.73	-1.69	-1.66	-1.60	-1.57	-1.52	-1.46	-1.42	-1.36	-1.30	-1.24	-1.18	-1.10	-1.04	-0.97	-0.89	-0.81	-0.73	-0.64	-0.55	-0.45	-0.35	-0.24	-0.13	-0.01	0.10
3 Difference between No.2 and Interest repayment	-59.89	-0.02	-0.04	-0.56	-0.87	-1.04	-1.02	-0.33	-0.29	-0.25	-0.22	-3.24	-3.18	-3.10	-3.03	-2.95	-2.87	-2.80	-2.69	-2.62	-2.53	-2.43	-2.34	-2.24	-2.13	-2.03	-1.92	-1.80	-1.69	-1.57	-1.44	-1.32	-1.19	-1.05	-0.91	-0.76	-0.61	-0.45	-0.29	-0.12	0.05
4 Required subsidy amount	59.94	0.02	0.04	0.56	0.87	1.04	1.02	0.33	0.29	0.25	0.22	3.24	3.18	3.10	3.03	2.95	2.87	2.80	2.69	2.62	2.53	2.43	2.34	2.24	2.13	2.03	1.92	1.80	1.69	1.57	1.44	1.32	1.19	1.05	0.91	0.76	0.61	0.45	0.29	0.12	0.00
No 31 Lernarot																																									
1 Difference between Water sales revenue and O&M cost	8.36	0.00	0.00	-0.42	-0.65	-0.75	-0.78	-0.33	-0.34	-0.35	-0.37	0.25	0.26	0.26	0.28	0.29	0.28	0.30	0.31	0.32	0.33	0.35	0.35	0.37	0.38	0.40	0.39	0.42	0.43	0.45	0.45	0.47	0.48	0.51	0.52	0.53	0.56	0.57	0.59	0.62	0.63
2 Difference between No.1 and Construction repayment	-319.15											-9.28	-9.37	-9.46	-9.54	-9.63	-9.74	-9.82	-9.91	-10.00	-10.09	-10.18	-10.28	-10.37	-10.47	-10.55	-10.67	-10.75	-10.86	-10.95	-11.06	-11.16	-11.26	-11.35	-11.46	-11.57	-11.66	-11.77	-11.88	-11.97	-12.09
3 Difference between No.2 and Interest repayment	-401.30	-0.02	-0.04	-1.86	-3.55	-4.05	-4.10	-3.65	-3.66	-3.67	-3.69	-12.60	-12.59	-12.58	-12.57	-12.56	-12.57	-12.55	-12.54	-12.53	-12.51	-12.50	-12.49	-12.48	-12.47	-12.44	-12.45	-12.42	-12.42	-12.40	-12.39	-12.38	-12.36	-12.33	-12.32	-12.31	-12.28	-12.27	-12.26	-12.22	-12.22
4 Required subsidy amount	401.30	0.02	0.04	1.86	3.55	4.05	4.10	3.65	3.66	3.67	3.69	12.60	12.59	12.58	12.57	12.56	12.57	12.55	12.54	12.53	12.51	12.50	12.49	12.48	12.47	12.44	12.45	12.42	12.42	12.40	12.39	12.38	12.36	12.33	12.32	12.31	12.28	12.27	12.26	12.22	12.22
No 32 Lusagyugh																																									
1 Difference between Water sales revenue and O&M cost	174.57	0.00	0.00	0.16	0.54	0.69	0.73	1.74	1.81	1.86	1.92	3.31	3.41	3.53	3.64	3.77	3.89	4.01	4.15	4.29	4.42	4.58	4.73	4.88	5.05	5.21	5.37	5.56	5.74	5.93	6.12	6.33	6.53	6.75	6.97	7.20	7.44	7.69	7.94	8.21	8.47
2 Difference between No.1 and Construction repayment	76.43											0.76	0.83	0.93	1.01	1.12	1.21	1.30	1.42	1.53	1.63	1.76	1.89	2.01	2.15	2.28	2.41	2.57	2.72	2.88	3.04	3.22	3.39	3.58	3.76	3.96	4.17	4.39	4.60	4.84	5.07
3 Difference between No.2 and Interest repayment	64.98	-0.02	-0.04	-0.21	-0.18	-0.19	-0.16	0.85	0.92	0.97	1.03	-0.13	-0.03	0.09	0.20	0.34	0.45	0.57	0.72	0.85	0.98	1.14	1.30	1.45	1.62	1.77	1.93	2.12	2.30	2.49	2.68	2.89	3.10	3.32	3.53	3.76	4.00	4.26	4.50	4.77	5.04
4 Required subsidy amount	0.96	0.02	0.04	0.21	0.18	0.19	0.16	0.00	0.00	0.00	0.00	0.13	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (7/10)

PHASE 2 ARAGATSOTN MARZ

Unit: million AMD

Description	Total	Year																																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 33 Lusakn																																									
1 Difference between Water sales revenue and O&M cost	21.29	0.00	0.00	-0.18	-0.13	-0.13	-0.13	0.11	0.11	0.11	0.12	0.43	0.44	0.45	0.48	0.50	0.50	0.51	0.53	0.56	0.57	0.60	0.61	0.63	0.66	0.68	0.70	0.72	0.75	0.77	0.79	0.82	0.84	0.88	0.89	0.93	0.97	1.00	1.03	1.07	1.09
2 Difference between No.1 and Construction repayment	-35.71											-1.21	-1.22	-1.23	-1.21	-1.21	-1.23	-1.23	-1.23	-1.22	-1.23	-1.21	-1.22	-1.22	-1.21	-1.21	-1.21	-1.21	-1.19	-1.19	-1.19	-1.10	-1.10	-1.16	-1.17	-1.15	-1.14	-1.13	-1.12	-1.10	-1.10
3 Difference between No.2 and Interest repayment	-49.34	-0.02	-0.04	-0.44	-0.63	-0.69	-0.70	-0.46	-0.46	-0.46	-0.45	-1.78	-1.77	-1.77	-1.73	-1.71	-1.72	-1.70	-1.68	-1.66	-1.65	-1.61	-1.60	-1.58	-1.55	-1.54	-1.52	-1.50	-1.46	-1.44	-1.42	-1.39	-1.37	-1.33	-1.32	-1.28	-1.25	-1.22	-1.19	-1.14	-1.12
4 Required subsidy amount	49.34	0.02	0.04	0.44	0.63	0.69	0.70	0.46	0.46	0.46	0.45	1.78	1.77	1.77	1.73	1.71	1.72	1.70	1.68	1.66	1.65	1.61	1.60	1.58	1.55	1.54	1.52	1.50	1.46	1.44	1.42	1.39	1.37	1.33	1.32	1.28	1.25	1.22	1.19	1.14	1.12
No 34 Tsaghkahovit																																									
1 Difference between Water sales revenue and O&M cost	428.41	0.00	0.00	0.46	1.35	1.69	1.74	4.27	4.41	4.56	4.72	8.12	8.38	8.66	8.94	9.24	9.55	9.85	10.18	10.52	10.86	11.22	11.59	11.98	12.36	12.78	13.20	13.63	14.09	14.55	15.03	15.53	16.04	16.57	17.12	17.68	18.26	18.86	19.48	20.14	20.80
2 Difference between No.1 and Construction repayment	25.96											-2.78	-2.63	-2.46	-2.29	-2.11	-1.91	-1.72	-1.51	-1.29	-1.07	-0.82	-0.57	-0.31	-0.05	0.25	0.54	0.84	1.18	1.51	1.86	2.23	2.60	3.00	3.41	3.84	4.28	4.74	5.22	5.73	6.25
3 Difference between No.2 and Interest repayment	-39.82	-0.02	-0.04	-1.07	-1.73	-2.09	-2.05	0.48	0.62	0.77	0.93	-6.57	-6.31	-6.03	-5.75	-5.46	-5.15	-4.84	-4.52	-4.18	-3.84	-3.47	-3.10	-2.72	-2.34	-1.91	-1.50	-1.07	-0.60	-0.14	0.34	0.84	1.34	1.88	2.42	2.99	3.57	4.17	4.79	5.44	6.10
4 Required subsidy amount	76.50	0.02	0.04	1.07	1.73	2.09	2.05	0.00	0.00	0.00	0.00	6.57	6.31	6.03	5.75	5.46	5.15	4.84	4.52	4.18	3.84	3.47	3.10	2.72	2.34	1.91	1.50	1.07	0.60	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 35 Tsaghkashen																																									
1 Difference between Water sales revenue and O&M cost	148.75	0.00	0.00	0.10	0.43	0.55	0.58	1.47	1.52	1.56	1.62	2.82	2.91	3.01	3.12	3.21	3.31	3.43	3.54	3.66	3.78	3.90	4.04	4.16	4.31	4.45	4.59	4.74	4.90	5.06	5.23	5.39	5.58	5.76	5.95	6.15	6.35	6.57	6.77	7.00	7.23
2 Difference between No.1 and Construction repayment	36.48											-0.18	-0.12	-0.05	0.03	0.09	0.15	0.24	0.32	0.41	0.50	0.58	0.69	0.78	0.89	1.00	1.10	1.22	1.34	1.47	1.60	1.73	1.88	2.02	2.18	2.34	2.50	2.68	2.84	3.03	3.22
3 Difference between No.2 and Interest repayment	19.72	-0.02	-0.04	-0.34	-0.42	-0.40	-0.47	0.42	0.47	0.51	0.57	-1.22	-1.13	-1.03	-0.92	-0.83	-0.74	-0.62	-0.51	-0.39	-0.26	-0.15	-0.01	0.12	0.26	0.40	0.54	0.69	0.85	1.01	1.18	1.35	1.53	1.71	1.91	2.11	2.30	2.52	2.72	2.95	3.18
4 Required subsidy amount	9.58	0.02	0.04	0.34	0.42	0.48	0.47	0.00	0.00	0.00	0.00	1.22	1.13	1.03	0.92	0.83	0.74	0.62	0.51	0.39	0.26	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 36 Tsilqar																																									
1 Difference between Water sales revenue and O&M cost	110.25	0.00	0.00	0.06	0.35	0.46	0.49	1.12	1.16	1.19	1.24	2.09	2.15	2.22	2.31	2.38	2.45	2.53	2.62	2.71	2.79	2.89	2.98	3.08	3.18	3.28	3.39	3.51	3.63	3.74	3.86	3.99	4.12	4.26	4.39	4.54	4.70	4.86	5.01	5.18	5.34
2 Difference between No.1 and Construction repayment	35.94											0.13	0.17	0.22	0.29	0.34	0.39	0.45	0.52	0.59	0.64	0.72	0.79	0.87	0.95	1.02	1.11	1.21	1.31	1.39	1.49	1.60	1.70	1.82	1.92	2.05	2.18	2.32	2.44	2.59	2.72
3 Difference between No.2 and Interest repayment	25.96	-0.02	-0.04	-0.23	-0.21	-0.21	-0.19	0.44	0.48	0.51	0.56	-0.55	-0.49	-0.42	-0.33	-0.26	-0.19	-0.11	-0.02	0.07	0.14	0.24	0.33	0.44	0.54	0.63	0.74	0.87	0.99	1.09	1.22	1.35	1.47	1.62	1.74	1.90	2.05	2.22	2.36	2.54	2.69
4 Required subsidy amount	3.27	0.02	0.04	0.23	0.21	0.21	0.19	0.00	0.00	0.00	0.00	0.55	0.49	0.42	0.33	0.26	0.19	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 37 Katnaghbyur																																									
1 Difference between Water sales revenue and O&M cost	276.87	0.00	0.00	0.47	1.17	1.33	1.38	2.90	2.99	3.08	3.18	5.21	5.38	5.56	5.75	5.93	6.13	6.33	6.55	6.76	6.98	7.20	7.46	7.70	7.96	8.21	8.49	8.76	9.05	9.35	9.66	9.98	10.31	10.64	10.99	11.35	11.73	12.13	12.52	12.94	13.37
2 Difference between No.1 and Construction repayment	60.15											-0.55	-0.43	-0.31	-0.18	-0.06	0.08	0.22	0.38	0.53	0.68	0.84	1.04	1.21	1.41	1.59	1.81	2.01	2.23	2.46	2.71	2.96	3.22	3.48	3.75	4.04	4.35	4.67	4.99	5.33	5.69
3 Difference between No.2 and Interest repayment	29.44	-0.02	-0.04	-0.41	-0.58	-0.66	-0.62	0.90	0.99	1.08	1.18	-2.55	-2.37	-2.20	-2.01	-1.83	-1.63	-1.43	-1.21	-1.00	-0.78	-0.56	-0.30	-0.06	0.20	0.45	0.73	1.00	1.29	1.59	1.91	2.23	2.56	2.89	3.23	3.59	3.97	4.37	4.76	5.18	5.61
4 Required subsidy amount	20.27	0.02	0.04	0.41	0.58	0.66	0.62	0.00	0.00	0.00	0.00	2.55	2.37	2.20	2.01	1.83	1.63	1.43	1.21	1.00	0.78	0.56	0.30	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 38 Karmrashen																																									
1 Difference between Water sales revenue and O&M cost	117.80	0.00	0.00	0.04	0.30	0.35	0.38	1.12	1.15	1.20	1.23	2.24	2.32	2.39	2.47	2.56	2.63	2.72	2.81	2.92	3.00	3.11	3.21	3.31	3.43	3.54	3.64	3.77	3.90	4.02	4.16	4.29	4.43	4.58	4.73	4.89	5.05	5.21	5.38	5.57	5.75
2 Difference between No.1 and Construction repayment	-3.29											-1.07	-1.03	-0.99	-0.95	-0.89	-0.85	-0.80	-0.74	-0.67	-0.63	-0.55	-0.49	-0.43	-0.34	-0.27	-0.21	-0.12	-0.03	0.05	0.16	0.25	0.34	0.45	0.56	0.68	0.80	0.92	1.04	1.19	1.33
3 Difference between No.2 and Interest repayment	-24.69	-0.02	-0.04	-0.47	-0.70	-0.79	-0.77	-0.03	0.00	0.05	0.08	-2.22	-2.15	-2.08	-2.00	-1.91	-1.83	-1.75	-1.65	-1.55	-1.47	-1.36	-1.26	-1.16	-1.04	-0.93	-0.83	-0.70	-0.57	-0.45	-0.30	-0.17	-0.04	0.11	0.26	0.42	0.58	0.75	0.91	1.10	1.29
4 Required subsidy amount	30.24	0.02	0.04	0.47	0.70	0.79	0.77	0.03	0.00	0.00	0.00	2.22	2.15	2.08	2.00	1.91	1.83	1.75	1.65	1.55	1.47	1.36	1.26	1.16	1.04	0.93	0.83	0.70	0.57	0.45	0.30	0.17	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 39 Kaqavadzor																																									
1 Difference between Water sales revenue and O&M cost	214.70	0.00	0.00	0.28	0.75	0.87	0.90	2.16	2.23	2.30	2.37	4.06	4.20	4.33	4.47	4.63	4.78	4.94	5.09	5.27	5.44	5.62	5.81	6.00	6.20	6.39	6.60	6.83	7.06	7.28	7.52	7.77	8.02	8.28	8.57	8.85	9.15	9.45	9.75	10.07	10.41
2 Difference between No.1 and Construction repayment	-62.99											-3.58	-3.52	-3.47	-3.40	-3.32	-3.25	-3.17	-3.10	-3.01	-2.92	-2.82	-2.72	-2.61	-2.50	-2.39	-2.27	-2.13	-1.99	-1.86	-1.71	-1.56	-1.40	-1.23	-1.04	-0.85	-0.65	-0.43	-0.25	-0.03	0.21
3 Difference between No.2 and Interest repayment	-113.81	-0.02	-0.04	-0.88	-1.57	-1.78	-1.76	-0.50	-0.43	-0.36	-0.29	-6.24	-6.10	-5.97	-5.83	-5.67	-5.52	-5.36	-5.21	-5.04	-4.86	-4.68	-4.49	-4.30	-4.10	-3.91	-3.70	-3.47	-3.24	-3.02	-2.78	-2.54	-2.28	-2.02	-1.73	-1.45	-1.15	-0.85	-0.55	-0.23	0.11
4 Required subsidy amount	113.92	0.02	0.04	0.88	1.57	1.78	1.76	0.50	0.43	0.36	0.29	6.24	6.10	5.97	5.83	5.67	5.52	5.36	5.21	5.04	4.86	4.68	4.49	4.30	4.10	3.91	3.70	3.47	3.24	3.02	2.78	2.54	2.28	2.02	1.73	1.45	1.15	0.85	0.55	0.23	0.00
No 40 Hartavan																																									
1 Difference between Water sales revenue and O&M cost	182.60	0.00	0.00	0.11	0.41	0.52	0.54	1.72	1.78	1.83	1.89	3.48	3.60	3.72	3.84	3.96	4.09	4.22	4.37	4.51	4.66	4.82	4.98	5.13	5.31	5.48	5.65	5.86	6.05	6.24	6.44	6.66	6.87	7.10	7.34	7.58	7.83	8.10	8.35	8.63	8.93
2 Difference between No.1 and Construction repayment	-28.32											-2.33	-2.27	-2.21	-2.15	-2.09	-2.02	-1.95	-1.86	-1.78	-1.69	-1.60	-1.50	-1.42	-1.30	-1.20	-1.10	-0.95	-0.83	-0.71	-0.58	-0.43	-0.29	-0.13	0.04	0.20	0.38	0.57	0.75	0.95	1.18
3 Difference between No.2 and Interest repayment	-66.97	-0.02	-0.04	-0.72	-1.23	-1.49	-1.48	-0.30	-0.24	-0.19	-0.13	-4.35	-4.23	-4.11	-3.99	-3.88	-3.74	-3.61	-3.46	-3.32	-3.17	-3.01	-2.85	-2.70	-2.52	-2.35	-2.19	-1.97	-1.78	-1.59	-1.39	-1.17	-0.96	-0.73	-0.49	-0.25	0.00	0.26	0.52	0.80	1.10
4 Required subsidy amount	69.65	0.02	0.04	0.72	1.23	1.49	1.48	0.30	0.24	0.19	0.13	4.35	4.23	4.11	3.99	3.88	3.74	3.61	3.46	3.32	3.17	3.01	2.85	2.70	2.52	2.35	2.19	1.97	1.78	1.59	1.39	1.17	0.96	0.73	0.49	0.25	0.00	0.00	0.00	0.00	0.00
No 41 Dzoraglukh																																									
1 Difference between Water sales revenue and O&M cost	50.51	0.00	0.00	-0.13	-0.05	-0.04	-0.03	0.39	0.40	0.42	0.42	0.98	1.02	1.05	1.08	1.13	1.15	1.19	1.23	1.29	1.31	1.36	1.41	1.45	1.51	1.55	1.60	1.66	1.70	1.76	1.82	1.88	1.94	2.01	2.07	2.14	2.21	2.30	2.37	2.44	2.52
2 Difference between No.1 and Construction repayment	-40.36											-1.59	-1.58	-1.57	-1.57	-1.55	-1.55	-1.54	-1.53	-1.50	-1.50	-1.48	-1.46	-1.45	-1.42	-1.41	-1.39	-1.36	-1.35	-1.32	-1.29	-1.26	-1.23	-1.19	-1.16	-1.13	-1.09	-1.03	-0.99	-0.96	-0.91
3 Difference between No.2 and Interest repayment	-60.07	-0.02	-0.04	-0.51	-0.78	-0.92	-0.93	-0.51	-0.50	-0.48	-0.48	-2.48	-2.45	-2.41	-2.39	-2.34	-2.31	-2.28	-2.24	-2.18	-2.15	-2.11	-2.06	-2.02	-1.96	-1.92	-1.87	-1.81	-1.77	-1.71	-1.65	-1.59	-1.53	-1.46	-1.39	-1.33	-1.26	-1.17	-1.09	-1.03	-0.94
4 Required subsidy amount	60.07	0.02	0.04	0.51	0.78	0.92	0.93	0.51	0.50	0.48	0.48	2.48	2.45	2.41	2.39	2.34	2.31	2.28	2.24	2.18	2.15	2.11	2.06	2.02	1.96	1.92	1.87	1.81	1.77	1.71	1.65	1.59	1.53	1.46	1.39	1.33	1.26	1.17	1.09	1.03	0.94
No 42 Dzoragyugh																																									
1 Difference between Water sales revenue and O&M cost	632.11	0.00	0.00	1.31	3.06	3.52	3.63	6.84	7.07	7.30	7.54	11.85	12.24	12.65	13.06	13.49	13.93	14.39	14.86	15.35	15.86	16.39	16.93	17.49	18.07	18.67	19.29	19.91	20.58	21.25	21.96	22.69	23.42	24.20	25.00	25.82	26.68	27.56	28.46	29.41	30.38
2 Difference between No.1 and Construction repayment	467.07											8.26	8.62	8.99	9.36	9.76	10.16	10.58	11.01	11.47	11.94	12.43	12.93	13.45	13.99	14.55	15.13	15.70	16.33	16.96	17.63	18.31	19.00	19.73	20.49	21.27	22.08	22.91	23.77	24.67	25.59
3 Difference between No.2 and Interest repayment	477.90	-0.02	-0.04	0.76	1.98	2.28	2.38	5.59	5.82	6.05	6.29	7.01	7.41	7.81	8.22	8.66	9.10	9.55	10.02	10.52	11.03	11.56	12.10	12.66	13.24	13.84	14.46	15.07	15.74	16.42	17.13	17.85	18.59	19.36	20.16	20.99	21.85	22.72	23.63	24.57	25.54
4 Required subsidy amount	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 43 Meliqgyugh																																									
1 Difference between Water sales revenue and O&M cost	261.57	0.00	0.00	0.37	0.98	1.21	1.25	2.70	2.80	2.88	2.98	4.93	5.10	5.26	5.44	5.62	5.79	5.99	6.19	6.39	6.60	6.82	7.06	7.28	7.53	7.77	8.02	8.30	8.56	8.85	9.14	9.45	9.75	10.08	10.41	10.74	11.11	11.48	11.86	12.24	12.64
2 Difference between No.1 and Construction repayment	63.56											-0.33	-0.21	-0.10	0.02	0.15	0.27	0.41	0.55	0.70	0.85	1.01	1.20	1.36	1.55	1.73	1.92	2.14	2.33	2.56	2.79	3.04	3.27	3.54	3.80	4.07	4.37	4.67	4.98	5.29	5.63
3 Difference between No.2 and Interest repayment	35.75	-0.02	-0.04	-0.38	-0.51	-0.64	-0.58	0.87	0.97	1.05	1.15	-2.16	-1.99	-1.82	-1.65	-1.47	-1.29	-1.10	-0.90	-0.69	-0.49	-0.27	-0.02	0.20	0.45	0.69	0.94	1.22	1.47	1.76	2.06	2.37	2.66	3.00	3.32	3.66	4.03	4.39	4.77	5.15	5.56
4 Required subsidy amount	15.99	0.02	0.04	0.38	0.51	0.61	0.58	0.00	0.00	0.00	0.00	2.16	1.99	1.82	1.65	1.47	1.29	1.10	0.90	0.69	0.49	0.27	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 44 Miraq																																									
1 Difference between Water sales revenue and O&M cost	9.39	0.00	0.00	-0.20	-0.19	-0.19	-0.19	-0.02	-0.02	-0.02	-0.02	0.21	0.22	0.21	0.23	0.24	0.24	0.24	0.26	0.28	0.28	0.28	0.29	0.30	0.32	0.32	0.33	0.34	0.35	0.37	0.38	0.40	0.40	0.41	0.43	0.45	0.46	0.48	0.49	0.52	0.52
2 Difference between No.1 and Construction repayment	-67.65											-2.03	-2.04	-2.07	-2.08	-2.09	-2.11	-2.14	-2.14	-2.15	-2.17	-2.19	-2.21	-2.22	-2.23	-2.25	-2.27	-2.29	-2.30	-2.31	-2.33	-2.33	-2.36	-2.38	-2.39	-2.39	-2.41	-2.42	-2.44	-2.44	-2.47
3 Difference between No.2 and Interest repayment	-86.85	-0.02	-0.04	-0.53	-0.82	-0.96	-0.97	-0.80	-0.80	-0.80	-0.80	-2.81	-2.80	-2.80	-2.79	-2.78	-2.77	-2.78	-2.76	-2.74	-2.74	-2.73	-2.73	-2.72	-2.70	-2.69	-2.69	-2.68	-2.67	-2.65	-2.64	-2.62	-2.62	-2.61	-2.59	-2.56	-2.56	-2.54	-2.53	-2.50	-2.50
4 Required subsidy amount	86.85	0.02	0.04	0.53	0.82	0.96	0.97	0.80	0.80	0.80	0.80	2.81	2.80	2.80	2.79	2.78	2.77	2.78	2.76	2.74	2.74	2.73	2.73	2.72	2.70	2.69	2.69	2.68	2.67	2.65	2.64	2.62	2.62	2.61	2.59	2.56	2.56	2.54	2.53	2.50	2.50
No 45 Mulqi																																									
1 Difference between Water sales revenue and O&M cost	11.26	0.00	0.00	0.22	0.84	1.08	0.99	0.93	0.85	0.78	0.70	0.61	0.64	0.65	0.68	0.69	-9.04	0.74	0.77	0.79	0.82	0.85	0.88	0.90	0.93	0.97	0.99	1.02	1.06	1.09	1.14	-14.72	1.21	1.25	1.29	1.32	1.38	1.42	1.47	1.51	1.56
2 Difference between No.1 and Construction repayment	-107.44											-2.62	-2.62	-2.64	-2.65	-2.67	-12.43	-2.69	-2.69	-2.71	-2.71	-2.72	-2.72	-2.74	-2.74	-2.74	-2.76	-2.77	-2.76	-2.77	-2.76	-18.66	-2.77	-2.77	-2.77	-2.78	-2.76	-2.76	-2.75	-2.76	-2.75
3 Difference between No.2 and Interest repayment	-127.44	-0.02	-0.04	-0.25	-0.07	-0.03	-0.13	-0.19	-0.27	-0.34	-0.42	-3.74	-3.71	-3.70	-3.68	-3.66	-13.39	-3.61	-3.58	-3.57	-3.53	-3.51	-3.47	-3.45	-3.42	-3.38	-3.36	-3.34	-3.29	-3.26	-3.21	-19.07	-3.14	-3.10	-3.06	-3.03	-2.97	-2.93	-2.88	-2.85	-2.79
4 Required subsidy amount	127.44	0.02	0.04	0.25	0.07	0.03	0.13	0.19	0.27	0.34	0.42	3.74	3.71	3.70	3.68	3.66	13.39	3.61	3.58	3.57	3.53	3.51	3.47	3.45	3.42	3.38	3.36	3.34	3.29	3.26	3.21	19.07	3.14	3.10	3.06	3.03	2.97	2.93	2.88	2.85	2.79
No 46 Nigavan																																									
1 Difference between Water sales revenue and O&M cost	116.86	0.00	0.00	0.01	0.24	0.31	0.33	1.09	1.13	1.17	1.20	2.24	2.30	2.38	2.46	2.55	2.62	2.71	2.80	2.89	2.98	3.08	3.20	3.29	3.40	3.50	3.63	3.75	3.87	4.00	4.13	4.27	4.41	4.55	4.70	4.86	5.02	5.19	5.36	5.53	5.71
2 Difference between No.1 and Construction repayment	77.13											1.26	1.31	1.38	1.45	1.53	1.58	1.66	1.74	1.82	1.90	1.99	2.10	2.18	2.28	2.37	2.49	2.60	2.70	2.82	2.94	3.07	3.20	3.32	3.46	3.61	3.76	3.91	4.07	4.23	4.40
3 Difference between No.2 and Interest repayment	74.53	-0.02	-0.04	-0.15	-0.04	-0.02	-0.01	0.75	0.79	0.83	0.86	0.92	0.98	1.06	1.14	1.23	1.29	1.38	1.47	1.56	1.65	1.75	1.87	1.96	2.07	2.17	2.31	2.43	2.54	2.67	2.80	2.94	3.09	3.22	3.37	3.53	3.70	3.86	4.03	4.20	4.39
4 Required subsidy amount	0.28	0.02	0.04	0.15	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 47 Norashen																																									
1 Difference between Water sales revenue and O&M cost	0.27	0.00	0.00	-0.28	-0.32	-0.37	-0.38	-0.19	-0.20	-0.21	-0.21	0.05	0.05	0.05	0.06	0.07	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.07	0.08	0.09	0.08	0.08	0.10	0.10	0.09	0.10	0.11	0.11	0.11	0.11	0.12	0.12	0.12
2 Difference between No.1 and Construction repayment	-132.30											-3.02	-3.86	-3.90	-3.93	-3.96	-4.02	-4.06	-4.09	-4.13	-4.18	-4.21	-4.25	-4.30	-4.33	-4.30	-4.42	-4.45	-4.51	-4.55	-4.58	-4.63	-4.60	-4.72	-4.76	-4.81	-4.86	-4.91	-4.95	-5.00	-5.05
3 Difference between No.2 and Interest repayment	-166.15	-0.02	-0.04	-0.84	-1.42	-1.71	-1.73	-1.54	-1.55	-1.56	-1.56	-5.17	-5.17	-5.17	-5.16	-5.15	-5.17	-5.17	-5.16	-5.16	-5.16	-5.15	-5.15	-5.16	-5.14	-5.15	-5.14	-5.13	-5.14	-5.14	-5.12	-5.12	-5.13	-5.12	-5.11	-5.11	-5.11	-5.11	-5.10	-5.10	-5.10
4 Required subsidy amount	166.15	0.02	0.04	0.84	1.42	1.71	1.73	1.54	1.55	1.56	1.56	5.17	5.17	5.17	5.16	5.15	5.17	5.17	5.16	5.16	5.16	5.15	5.15	5.16	5.14	5.15	5.14	5.13	5.14	5.14	5.12	5.12	5.13	5.12	5.11	5.11	5.11	5.11	5.10	5.10	5.10
No 48 Norashen																																									
1 Difference between Water sales revenue and O&M cost	201.64	0.00	0.00	0.14	0.48	0.60	0.63	1.92	1.97	2.04	2.11	3.84	3.97	4.10	4.23	4.38	4.51	4.66	4.82	4.99	5.13	5.31	5.50	5.66	5.86	6.05	6.25	6.46	6.66	6.89	7.10	7.34	7.58	7.84	8.10	8.37	8.64	8.93	9.21	9.53	9.83
2 Difference between No.1 and Construction repayment	41.68											-0.47	-0.39	-0.30	-0.21	-0.11	-0.02	0.08	0.19	0.32	0.41	0.54	0.69	0.80	0.95	1.09	1.24	1.40	1.55	1.73	1.89	2.08	2.26	2.47	2.68	2.89	3.11	3.34	3.57	3.83	4.07
3 Difference between No.2 and Interest repayment	16.31	-0.02	-0.04	-0.48	-0.74	-0.89	-0.87	0.42	0.47	0.54	0.61	-1.97	-1.85	-1.71	-1.58	-1.44	-1.30	-1.16	-1.00	-0.82	-0.69	-0.51	-0.31	-0.15	0.05	0.23	0.43	0.64	0.84	1.08	1.29	1.53	1.76	2.03	2.29	2.55	2.83	3.11	3.40	3.72	4.01
4 Required subsidy amount	17.52	0.02	0.04	0.48	0.74	0.89	0.87	0.00	0.00	0.00	0.00	1.97	1.85	1.71	1.58	1.44	1.30	1.16	1.00	0.82	0.69	0.51	0.31	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (8/10)

PHASE 2 ARAGATSOTN MARZ

Unit: million AMD

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 49 Shenavan																																									
1 Difference between Water sales revenue and O&M cost	324.13	0.00	0.00	0.42	1.06	1.29	1.35	3.25	3.35	3.46	3.57	6.14	6.33	6.55	6.76	6.99	7.21	7.45	7.71	7.95	8.22	8.49	8.77	9.06	9.36	9.65	9.98	10.31	10.65	11.00	11.37	11.73	12.12	12.53	12.94	13.36	13.81	14.27	14.74	15.22	15.71
2 Difference between No.1 and Construction repayment	-66.48											-4.58	-4.50	-4.38	-4.26	-4.16	-4.06	-3.93	-3.70	-3.66	-3.50	-3.35	-3.19	-3.02	-2.84	-2.67	-2.46	-2.26	-2.05	-1.82	-1.58	-1.35	-1.09	-0.81	-0.54	-0.25	0.06	0.39	0.72	1.06	1.40
3 Difference between No.2 and Interest repayment	-136.26	-0.02	-0.04	-1.09	-1.97	-2.43	-2.38	-0.48	-0.38	-0.27	-0.16	-8.31	-8.12	-7.89	-7.68	-7.45	-7.24	-7.00	-6.74	-6.50	-6.22	-5.96	-5.68	-5.39	-5.09	-4.80	-4.46	-4.14	-3.80	-3.45	-3.08	-2.72	-2.33	-1.92	-1.51	-1.09	-0.64	-0.17	0.30	0.78	1.26
4 Required subsidy amount	138.60	0.02	0.04	1.09	1.97	2.43	2.38	0.48	0.38	0.27	0.16	8.31	8.12	7.89	7.68	7.45	7.24	7.00	6.74	6.50	6.22	5.96	5.68	5.39	5.09	4.80	4.46	4.14	3.80	3.45	3.08	2.72	2.33	1.92	1.51	1.09	0.64	0.17	0.00	0.00	0.00
No 50 Shgharshik																																									
1 Difference between Water sales revenue and O&M cost	113.04	0.00	0.00	0.08	0.37	0.44	0.47	1.13	1.17	1.20	1.24	2.15	2.21	2.29	2.36	2.44	2.51	2.60	2.68	2.78	2.86	2.97	3.06	3.16	3.27	3.38	3.48	3.60	3.72	3.84	3.96	4.09	4.23	4.37	4.52	4.66	4.82	4.99	5.14	5.32	5.48
2 Difference between No.1 and Construction repayment	-13.56											-1.31	-1.29	-1.24	-1.21	-1.17	-1.13	-1.08	-1.03	-0.97	-0.93	-0.86	-0.81	-0.74	-0.67	-0.60	-0.54	-0.46	-0.38	-0.30	-0.23	-0.14	-0.04	0.06	0.16	0.26	0.38	0.50	0.61	0.74	0.86
3 Difference between No.2 and Interest repayment	-35.94	-0.02	-0.04	-0.45	-0.68	-0.75	-0.74	-0.08	-0.04	-0.01	0.03	-2.52	-2.46	-2.38	-2.31	-2.23	-2.16	-2.07	-1.99	-1.89	-1.81	-1.70	-1.61	-1.51	-1.40	-1.29	-1.19	-1.07	-0.95	-0.83	-0.71	-0.58	-0.44	-0.30	-0.15	-0.01	0.15	0.32	0.47	0.65	0.81
4 Required subsidy amount	38.37	0.02	0.04	0.45	0.68	0.75	0.74	0.08	0.04	0.01	0.00	2.52	2.46	2.38	2.31	2.23	2.16	2.07	1.99	1.89	1.81	1.70	1.61	1.51	1.40	1.29	1.19	1.07	0.95	0.83	0.71	0.58	0.44	0.30	0.15	0.01	0.00	0.00	0.00	0.00	0.00
No 51 Vosketas																																									
1 Difference between Water sales revenue and O&M cost	93.87	0.00	0.00	-0.04	0.12	0.14	0.14	0.82	0.84	0.88	0.91	1.80	1.86	1.92	1.99	2.06	2.12	2.20	2.26	2.35	2.42	2.49	2.58	2.66	2.76	2.84	2.93	3.04	3.13	3.23	3.33	3.45	3.56	3.67	3.80	3.93	4.06	4.19	4.33	4.48	4.62
2 Difference between No.1 and Construction repayment	-85.25											-3.24	-3.23	-3.22	-3.20	-3.18	-3.16	-3.15	-3.14	-3.11	-3.09	-3.08	-3.04	-3.02	-2.98	-2.95	-2.92	-2.87	-2.84	-2.80	-2.76	-2.70	-2.65	-2.60	-2.54	-2.47	-2.40	-2.34	-2.26	-2.18	-2.11
3 Difference between No.2 and Interest repayment	-122.75	-0.02	-0.04	-0.81	-1.41	-1.60	-1.61	-0.93	-0.91	-0.87	-0.84	-4.99	-4.93	-4.87	-4.80	-4.73	-4.68	-4.59	-4.53	-4.45	-4.37	-4.31	-4.21	-4.13	-4.04	-3.95	-3.86	-3.75	-3.66	-3.56	-3.46	-3.34	-3.23	-3.12	-3.00	-2.86	-2.73	-2.61	-2.46	-2.31	-2.18
4 Required subsidy amount	122.75	0.02	0.04	0.81	1.41	1.60	1.61	0.93	0.91	0.87	0.84	4.99	4.93	4.87	4.80	4.73	4.68	4.59	4.53	4.45	4.37	4.31	4.21	4.13	4.04	3.95	3.86	3.75	3.66	3.56	3.46	3.34	3.23	3.12	3.00	2.86	2.73	2.61	2.46	2.31	2.18
No 52 Chqnagh																																									
1 Difference between Water sales revenue and O&M cost	35.81	0.00	0.00	-0.15	-0.08	-0.05	-0.05	0.26	0.27	0.27	0.28	0.70	0.73	0.76	0.77	0.80	0.82	0.85	0.88	0.91	0.94	0.97	1.01	1.04	1.07	1.11	1.14	1.19	1.22	1.25	1.29	1.34	1.38	1.43	1.48	1.52	1.59	1.64	1.69	1.74	1.80
2 Difference between No.1 and Construction repayment	-5.42											-0.46	-0.45	-0.43	-0.43	-0.41	-0.40	-0.39	-0.37	-0.35	-0.33	-0.32	-0.29	-0.27	-0.25	-0.23	-0.21	-0.17	-0.16	-0.14	-0.12	-0.08	-0.05	-0.02	0.02	0.04	0.10	0.13	0.17	0.20	0.25
3 Difference between No.2 and Interest repayment	-14.26	-0.02	-0.04	-0.33	-0.41	-0.44	-0.46	-0.15	-0.14	-0.14	-0.13	-0.86	-0.84	-0.81	-0.80	-0.77	-0.75	-0.72	-0.69	-0.66	-0.63	-0.60	-0.56	-0.53	-0.49	-0.46	-0.43	-0.37	-0.35	-0.32	-0.28	-0.23	-0.18	-0.14	-0.09	-0.05	0.02	0.07	0.12	0.17	0.23
4 Required subsidy amount	14.87	0.02	0.04	0.33	0.41	0.44	0.46	0.15	0.14	0.14	0.13	0.86	0.84	0.81	0.80	0.77	0.75	0.72	0.69	0.66	0.63	0.60	0.56	0.53	0.49	0.46	0.43	0.37	0.35	0.32	0.28	0.23	0.18	0.14	0.09	0.05	0.00	0.00	0.00	0.00	0.00
No 53 Jamshlu																																									
1 Difference between Water sales revenue and O&M cost	4.05	0.00	0.00	-0.24	-0.26	-0.29	-0.29	-0.11	-0.11	-0.11	-0.12	0.11	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.17	0.17	0.18	0.17	0.17	0.20	0.20	0.20	0.20	0.21	0.22	0.23	0.23	0.24	0.25	0.27	0.26	0.28	0.29
2 Difference between No.1 and Construction repayment	-93.98											-2.75	-2.77	-2.80	-2.83	-2.85	-2.88	-2.90	-2.93	-2.96	-2.98	-3.01	-3.02	-3.06	-3.08	-3.12	-3.15	-3.16	-3.19	-3.22	-3.26	-3.28	-3.31	-3.33	-3.37	-3.39	-3.42	-3.44	-3.49	-3.50	-3.53
3 Difference between No.2 and Interest repayment	-118.98	-0.02	-0.04	-0.66	-1.07	-1.27	-1.29	-1.11	-1.11	-1.11	-1.12	-3.75	-3.74	-3.74	-3.74	-3.73	-3.73	-3.72	-3.72	-3.72	-3.71	-3.71	-3.68	-3.69	-3.68	-3.69	-3.68	-3.66	-3.66	-3.65	-3.66	-3.65	-3.64	-3.63	-3.63	-3.61	-3.61	-3.59	-3.60	-3.56	-3.57
4 Required subsidy amount	118.98	0.02	0.04	0.66	1.07	1.27	1.29	1.11	1.11	1.11	1.12	3.75	3.74	3.74	3.74	3.73	3.73	3.72	3.72	3.72	3.71	3.71	3.68	3.69	3.68	3.69	3.68	3.66	3.66	3.65	3.66	3.65	3.64	3.63	3.63	3.61	3.61	3.59	3.60	3.58	3.57
No 54 Saralanj																																									
1 Difference between Water sales revenue and O&M cost	36.06	0.00	0.00	-0.13	-0.02	0.01	0.01	0.30	0.30	0.31	0.33	0.70	0.72	0.75	0.77	0.81	0.82	0.85	0.87	0.91	0.93	0.97	1.00	1.03	1.07	1.11	1.13	1.18	1.22	1.25	1.29	1.34	1.38	1.42	1.47	1.53	1.58	1.64	1.68	1.74	1.79
2 Difference between No.1 and Construction repayment	-39.72											-1.45	-1.45	-1.44	-1.44	-1.42	-1.44	-1.43	-1.43	-1.41	-1.42	-1.40	-1.39	-1.39	-1.37	-1.36	-1.36	-1.34	-1.32	-1.32	-1.30	-1.28	-1.27	-1.25	-1.23	-1.20	-1.17	-1.14	-1.13	-1.10	-1.07
3 Difference between No.2 and Interest repayment	-56.23	-0.02	-0.04	-0.45	-0.63	-0.73	-0.74	-0.45	-0.45	-0.44	-0.42	-2.20	-2.18	-2.14	-2.12	-2.08	-2.08	-2.04	-2.02	-1.98	-1.97	-1.92	-1.89	-1.86	-1.82	-1.79	-1.76	-1.72	-1.67	-1.65	-1.60	-1.55	-1.52	-1.47	-1.42	-1.37	-1.31	-1.25	-1.22	-1.16	-1.10
4 Required subsidy amount	56.23	0.02	0.04	0.45	0.63	0.73	0.74	0.45	0.45	0.44	0.42	2.20	2.18	2.14	2.12	2.08	2.08	2.04	2.02	1.98	1.97	1.92	1.89	1.86	1.82	1.79	1.76	1.72	1.67	1.65	1.60	1.55	1.52	1.47	1.42	1.37	1.31	1.25	1.22	1.16	1.10
No 55 Sipan																																									
1 Difference between Water sales revenue and O&M cost	49.40	0.00	0.00	-0.11	0.00	0.04	0.05	0.42	0.43	0.46	0.46	0.95	0.99	1.03	1.05	1.09	1.12	1.16	1.20	1.24	1.28	1.31	1.36	1.41	1.45	1.50	1.55	1.60	1.66	1.72	1.77	1.82	1.88	1.95	2.00	2.08	2.14	2.23	2.29	2.38	2.44
2 Difference between No.1 and Construction repayment	-35.05											-1.43	-1.41	-1.40	-1.40	-1.38	-1.38	-1.36	-1.35	-1.33	-1.32	-1.32	-1.29	-1.27	-1.26	-1.23	-1.21	-1.19	-1.16	-1.12	-1.10	-1.08	-1.05	-1.01	-0.99	-0.94	-0.91	-0.85	-0.82	-0.76	-0.73
3 Difference between No.2 and Interest repayment	-52.79	-0.02	-0.04	-0.46	-0.67	-0.78	-0.78	-0.41	-0.40	-0.37	-0.37	-2.26	-2.21	-2.18	-2.15	-2.11	-2.09	-2.04	-2.01	-1.96	-1.92	-1.90	-1.84	-1.80	-1.76	-1.70	-1.65	-1.61	-1.55	-1.48	-1.43	-1.38	-1.32	-1.26	-1.21	-1.13	-1.07	-0.98	-0.91	-0.82	-0.76
4 Required subsidy amount	52.79	0.02	0.04	0.46	0.67	0.78	0.78	0.41	0.40	0.37	0.37	2.26	2.21	2.18	2.15	2.11	2.09	2.04	2.01	1.96	1.92	1.90	1.84	1.80	1.76	1.70	1.65	1.61	1.55	1.48	1.43	1.38	1.32	1.26	1.21	1.13	1.07	0.98	0.91	0.82	0.76
No 56 Vardenis																																									
1 Difference between Water sales revenue and O&M cost	153.92	0.00	0.00	0.14	0.50	0.65	0.68	1.56	1.61	1.66	1.72	2.92	3.01	3.10	3.21	3.32	3.42	3.54	3.65	3.78	3.90	4.02	4.17	4.30	4.44	4.58	4.73	4.89	5.05	5.22	5.40	5.57	5.75	5.93	6.14	6.34	6.56	6.78	7.00	7.22	7.46
2 Difference between No.1 and Construction repayment	10.51											-0.96	-0.91	-0.86	-0.79	-0.72	-0.66	-0.58	-0.51	-0.42	-0.34	-0.26	-0.16	-0.07	0.03	0.12	0.23	0.34	0.46	0.58	0.72	0.84	0.97	1.10	1.27	1.42	1.59	1.76	1.93	2.10	2.29
3 Difference between No.2 and Interest repayment	-12.67	-0.02	-0.04	-0.42	-0.60	-0.69	-0.67	-0.21	-0.26	-0.31	-0.37	-2.31	-2.22	-2.13	-2.02	-1.91	-1.81	-1.69	-1.58	-1.45	-1.33	-1.20	-1.06	-0.93	-0.78	-0.65	-0.49	-0.34	-0.17	-0.01	0.18	0.34	0.52	0.70	0.92	1.12	1.34	1.56	1.78	2.00	2.24
4 Required subsidy amount	26.52	0.02	0.04	0.42	0.60	0.69	0.67	0.00	0.00	0.00	0.00	2.31	2.22	2.13	2.02	1.91	1.81	1.69	1.58	1.45	1.33	1.20	1.06	0.93	0.78	0.65	0.49	0.34	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 57 Vardenut																																									
1 Difference between Water sales revenue and O&M cost	191.38	0.00	0.00	0.20	0.60	0.76	0.80	1.93	1.98	2.04	2.11	3.62	3.74	3.87	4.00	4.13	4.25	4.40	4.55	4.70	4.85	5.01	5.18	5.34	5.53	5.70	5.89	6.09	6.29	6.50	6.71	6.93	7.17	7.39	7.64	7.90	8.16	8.42	8.71	8.99	9.29
2 Difference between No.1 and Construction repayment	3.70											-1.40	-1.41	-1.33	-1.25	-1.17	-1.11	-1.01	-0.91	-0.82	-0.72	-0.62	-0.50	-0.40	-0.27	-0.16	-0.03	0.12	0.26	0.41	0.55	0.71	0.89	1.05	1.23	1.43	1.63	1.82	2.04	2.26	2.49
3 Difference between No.2 and Interest repayment	-27.51	-0.02	-0.04	-0.53	-0.84	-1.00	-0.97	0.16	0.21	0.27	0.34	-3.25	-3.13	-3.00	-2.87	-2.74	-2.62	-2.47	-2.31	-2.17	-2.02	-1.86	-1.68	-1.53	-1.34	-1.17	-0.98	-0.77	-0.57	-0.36	-0.16	0.06	0.30	0.52	0.77	1.03	1.30	1.55	1.84	2.12	2.42
4 Required subsidy amount	40.40	0.02	0.04	0.53	0.84	1.00	0.97	0.00	0.00	0.00	0.00	3.25	3.13	3.00	2.87	2.74	2.62	2.47	2.31	2.17	2.02	1.86	1.68	1.53	1.34	1.17	0.98	0.77	0.57	0.36	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 58 Verin Sasunik																																									
1 Difference between Water sales revenue and O&M cost	31.03	0.00	0.00	-0.12	-0.03	0.00	0.01	0.25	0.26	0.27	0.27	0.61	0.62	0.64	0.67	0.70	0.71	0.73	0.76	0.79	0.80	0.84	0.87	0.88	0.92	0.96	0.97	1.01	1.05	1.08	1.11	1.15	1.19	1.23	1.26	1.32	1.35	1.41	1.44	1.50	1.54
2 Difference between No.1 and Construction repayment	4.86											-0.12	-0.11	-0.10	-0.08	-0.06	-0.05	-0.04	-0.02	0.00	0.01	0.04	0.06	0.06	0.09	0.13	0.13	0.16	0.19	0.21	0.23	0.26	0.30	0.33	0.35	0.40	0.42	0.47	0.49	0.54	0.57
3 Difference between No.2 and Interest repayment	-0.22	-0.02	-0.04	-0.24	-0.25	-0.24	-0.24	0.00	0.01	0.02	0.02	-0.37	-0.36	-0.34	-0.31	-0.28	-0.27	-0.25	-0.22	-0.19	-0.17	-0.14	-0.11	-0.10	-0.06	-0.01	-0.01	0.03	0.07	0.10	0.13	0.17	0.22	0.26	0.28	0.34	0.37	0.43	0.46	0.52	0.56
4 Required subsidy amount	4.21	0.02	0.04	0.24	0.25	0.24	0.24	0.00	0.00	0.00	0.00	0.37	0.36	0.34	0.31	0.28	0.27	0.25	0.22	0.19	0.17	0.14	0.11	0.10	0.06	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 59 Tegher																																									
1 Difference between Water sales revenue and O&M cost	25.19	0.00	0.00	-0.20	-0.19	-0.21	-0.20	0.09	0.10	0.10	0.10	0.51	0.53	0.55	0.56	0.58	0.60	0.62	0.65	0.67	0.69	0.71	0.74	0.76	0.79	0.81	0.82	0.86	0.90	0.91	0.95	0.98	1.00	1.05	1.09	1.12	1.16	1.19	1.23	1.27	1.31
2 Difference between No.1 and Construction repayment	-91.90											-2.87	-2.88	-2.90	-2.92	-2.94	-2.95	-2.97	-2.97	-2.99	-3.00	-3.02	-3.03	-3.05	-3.05	-3.07	-3.10	-3.10	-3.10	-3.13	-3.13	-3.14	-3.16	-3.16	-3.16	-3.17	-3.17	-3.19	-3.19	-3.19	-3.20
3 Difference between No.2 and Interest repayment	-120.07	-0.02	-0.04	-0.72	-1.21	-1.37	-1.38	-1.09	-1.08	-1.08	-1.08	-4.05	-4.02	-4.01	-3.99	-3.98	-3.95	-3.94	-3.90	-3.89	-3.86	-3.84	-3.81	-3.80	-3.76	-3.74	-3.73	-3.69	-3.65	-3.64	-3.60	-3.57	-3.55	-3.51	-3.47	-3.43	-3.39	-3.37	-3.32	-3.28	-3.25
4 Required subsidy amount	120.07	0.02	0.04	0.72	1.21	1.37	1.38	1.09	1.08	1.08	1.08	4.05	4.02	4.01	3.99	3.98	3.95	3.94	3.90	3.89	3.86	3.84	3.81	3.80	3.76	3.74	3.73	3.69	3.65	3.64	3.60	3.57	3.55	3.51	3.47	3.43	3.39	3.37	3.32	3.28	3.25
No 60 Orgov																																									
1 Difference between Water sales revenue and O&M cost	96.52	0.00	0.00	-0.04	0.12	0.14	0.15	0.85	0.87	0.90	0.92	1.85	1.92	1.98	2.05	2.11	2.18	2.25	2.33	2.41	2.48	2.56	2.65	2.74	2.83	2.92	3.02	3.12	3.21	3.33	3.43	3.54	3.66	3.78	3.91	4.04	4.18	4.31	4.46	4.61	4.75
2 Difference between No.1 and Construction repayment	-108.58											-3.93	-3.92	-3.92	-3.91	-3.91	-3.90	-3.89	-3.87	-3.85	-3.85	-3.83	-3.80	-3.78	-3.75	-3.73	-3.69	-3.66	-3.64	-3.59	-3.56	-3.52	-3.47	-3.42	-3.36	-3.30	-3.24	-3.18	-3.11	-3.03	-2.97
3 Difference between No.2 and Interest repayment	-152.11	-0.02	-0.04	-0.92	-1.64	-1.86	-1.86	-1.16	-1.14	-1.11	-1.09	-5.94	-5.87	-5.82	-5.76	-5.69	-5.62	-5.55	-5.46	-5.38	-5.32	-5.24	-5.14	-5.06	-4.96	-4.88	-4.77	-4.67	-4.59	-4.47	-4.37	-4.26	-4.14	-4.02	-3.88	-3.75	-3.62	-3.48	-3.34	-3.18	-3.05
4 Required subsidy amount	152.11	0.02	0.04	0.92	1.64	1.86	1.86	1.16	1.14	1.11	1.09	5.94	5.87	5.82	5.75	5.69	5.62	5.55	5.46	5.38	5.32	5.24	5.14	5.06	4.96	4.88	4.77	4.67	4.59	4.47	4.37	4.26	4.14	4.02	3.88	3.75	3.62	3.48	3.34	3.18	3.05
No 61 Ortachya																																									
1 Difference between Water sales revenue and O&M cost	28.85	0.00	0.00	-0.17	-0.10	-0.08	-0.07	0.19	0.19	0.21	0.21	0.57	0.60	0.62	0.63	0.65	0.67	0.69	0.72	0.74	0.76	0.79	0.82	0.83	0.87	0.90	0.92	0.96	0.99	1.02	1.05	1.08	1.12	1.17	1.20	1.24	1.28	1.33	1.37	1.42	1.46
2 Difference between No.1 and Construction repayment	-68.14											-2.21	-2.20	-2.21	-2.23	-2.24	-2.25	-2.26	-2.26	-2.27	-2.28	-2.28	-2.28	-2.30	-2.29	-2.29	-2.30	-2.30	-2.30	-2.30	-2.30	-2.31	-2.30	-2.29	-2.29	-2.29	-2.28	-2.27	-2.26	-2.25	-2.25
3 Difference between No.2 and Interest repayment	-90.52	-0.02	-0.04	-0.67	-0.89	-1.04	-1.04	-0.78	-0.78	-0.76	-0.76	-3.18	-3.14	-3.12	-3.11	-3.09	-3.07	-3.06	-3.03	-3.01	-2.99	-2.96	-2.92	-2.91	-2.87	-2.84	-2.82	-2.79	-2.75	-2.72	-2.69	-2.66	-2.62	-2.58	-2.54	-2.51	-2.46	-2.42	-2.37	-2.32	-2.29
4 Required subsidy amount	90.52	0.02	0.04	0.57	0.89	1.04	1.04	0.78	0.78	0.76	0.76	3.18	3.14	3.12	3.11	3.09	3.07	3.06	3.03	3.01	2.99	2.96	2.92	2.91	2.87	2.84	2.82	2.79	2.75	2.72	2.69	2.66	2.62	2.58	2.54	2.51	2.46	2.42	2.37	2.32	2.29

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (9/10)

PHASE 2 SHIRAK MARZ

Unit: million AMD

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 1 Alvar																																									
1 Difference between Water sales revenue and O&M cost	7.99	0.00	0.00	-0.24	-0.21	-0.22	-0.22	-0.04	-0.04	-0.05	-0.05	0.19	0.18	0.19	0.20	0.21	0.21	0.22	0.23	0.25	0.24	0.25	0.27	0.27	0.28	0.29	0.29	0.31	0.31	0.32	0.34	0.33	0.35	0.36	0.38	0.40	0.40	0.43	0.44	0.46	0.46
2 Difference between No.1 and Construction repayment	-77.02											-2.29	-2.32	-2.33	-2.35	-2.37	-2.39	-2.41	-2.42	-2.43	-2.47	-2.48	-2.49	-2.52	-2.54	-2.55	-2.58	-2.59	-2.62	-2.64	-2.65	-2.69	-2.70	-2.72	-2.73	-2.74	-2.77	-2.78	-2.80	-2.81	-2.84
3 Difference between No.2 and Interest repayment	-98.19	-0.02	-0.04	-0.30	-1.05	-1.07	-1.08	-0.90	-0.90	-0.91	-0.91	-3.15	-3.16	-3.14	-3.14	-3.13	-3.12	-3.12	-3.10	-3.09	-3.10	-3.08	-3.06	-3.07	-3.06	-3.04	-3.04	-3.02	-3.02	-3.02	-3.00	-3.01	-2.99	-2.98	-2.95	-2.93	-2.93	-2.91	-2.90	-2.88	-2.87
4 Required subsidy amount	98.19	0.02	0.04	0.30	1.05	1.07	1.08	0.90	0.90	0.91	0.91	3.15	3.16	3.14	3.14	3.13	3.12	3.12	3.10	3.09	3.10	3.08	3.06	3.07	3.06	3.04	3.04	3.02	3.02	3.02	3.00	3.01	2.99	2.98	2.95	2.93	2.93	2.91	2.90	2.88	2.87
No 2 Aghvorik																																									
1 Difference between Water sales revenue and O&M cost	-8.64	0.00	0.00	-0.24	-0.34	-0.36	-0.35	-0.24	-0.25	-0.26	-0.27	-0.12	-0.13	-0.13	-0.14	-0.14	-0.16	-0.16	-0.16	-0.16	-0.17	-0.17	-0.18	-0.18	-0.19	-0.20	-0.22	-0.21	-0.22	-0.22	-0.23	-0.24	-0.26	-0.27	-0.27	-0.28	-0.28	-0.28	-0.32	-0.32	-0.32
2 Difference between No.1 and Construction repayment	-88.65											-2.49	-2.52	-2.54	-2.58	-2.60	-2.65	-2.67	-2.70	-2.72	-2.76	-2.78	-2.82	-2.85	-2.88	-2.92	-2.97	-2.98	-3.02	-3.05	-3.09	-3.13	-3.18	-3.22	-3.24	-3.28	-3.31	-3.35	-3.42	-3.45	-3.48
3 Difference between No.2 and Interest repayment	-110.14	-0.02	-0.04	-0.30	-1.15	-1.17	-1.17	-1.06	-1.07	-1.08	-1.09	-3.31	-3.32	-3.32	-3.33	-3.33	-3.35	-3.35	-3.35	-3.35	-3.36	-3.36	-3.37	-3.37	-3.38	-3.39	-3.41	-3.39	-3.41	-3.41	-3.42	-3.43	-3.45	-3.46	-3.45	-3.46	-3.46	-3.47	-3.51	-3.51	-3.51
4 Required subsidy amount	110.14	0.02	0.04	0.30	1.15	1.17	1.17	1.06	1.07	1.08	1.09	3.31	3.32	3.32	3.33	3.33	3.35	3.35	3.35	3.35	3.36	3.36	3.37	3.37	3.38	3.39	3.41	3.39	3.41	3.41	3.42	3.43	3.45	3.46	3.45	3.46	3.46	3.47	3.51	3.51	3.51
No 3 Ardenis																																									
1 Difference between Water sales revenue and O&M cost	46.68	0.00	0.00	-0.24	0.10	0.08	0.09	0.42	0.43	0.44	0.46	0.91	0.93	0.96	1.00	1.03	1.06	1.08	1.13	1.17	1.20	1.24	1.29	1.33	1.38	1.42	1.46	1.52	1.56	1.61	1.66	1.71	1.77	1.83	1.89	1.95	2.03	2.10	2.15	2.23	2.30
2 Difference between No.1 and Construction repayment	-2.91											-0.46	-0.46	-0.44	-0.42	-0.40	-0.39	-0.38	-0.34	-0.32	-0.30	-0.28	-0.24	-0.22	-0.18	-0.16	-0.14	-0.09	-0.07	-0.03	0.00	0.03	0.08	0.12	0.16	0.20	0.27	0.32	0.35	0.41	0.47
3 Difference between No.2 and Interest repayment	-12.33	-0.02	-0.04	-0.30	-0.36	-0.39	-0.39	-0.06	-0.05	-0.04	-0.02	-0.94	-0.92	-0.89	-0.86	-0.82	-0.80	-0.77	-0.72	-0.68	-0.65	-0.61	-0.56	-0.52	-0.47	-0.43	-0.40	-0.33	-0.29	-0.24	-0.19	-0.15	-0.08	-0.02	0.04	0.09	0.18	0.25	0.30	0.37	0.45
4 Required subsidy amount	14.01	0.02	0.04	0.30	0.36	0.39	0.39	0.06	0.05	0.04	0.02	0.94	0.92	0.89	0.86	0.82	0.80	0.77	0.72	0.68	0.65	0.61	0.56	0.52	0.47	0.43	0.40	0.33	0.29	0.24	0.19	0.15	0.08	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 4 Arpeni																																									
1 Difference between Water sales revenue and O&M cost	68.64	0.00	0.00	0.15	0.13	0.10	0.11	0.60	0.63	0.64	0.66	1.32	1.37	1.40	1.45	1.50	1.54	1.60	1.64	1.71	1.76	1.81	1.89	1.93	2.01	2.07	2.13	2.22	2.28	2.36	2.43	2.51	2.59	2.68	2.77	2.86	2.95	3.07	3.15	3.26	3.36
2 Difference between No.1 and Construction repayment	-49.78											-2.00	-1.98	-1.98	-1.97	-1.95	-1.93	-1.92	-1.92	-1.88	-1.87	-1.85	-1.81	-1.81	-1.77	-1.74	-1.72	-1.67	-1.65	-1.61	-1.58	-1.54	-1.50	-1.45	-1.40	-1.35	-1.30	-1.23	-1.19	-1.12	-1.07
3 Difference between No.2 and Interest repayment	-74.72	-0.02	-0.04	-0.96	-1.01	-1.04	-1.05	-0.56	-0.53	-0.52	-0.50	-3.15	-3.10	-3.07	-3.02	-2.97	-2.93	-2.87	-2.83	-2.76	-2.71	-2.66	-2.58	-2.54	-2.47	-2.40	-2.34	-2.25	-2.19	-2.11	-2.04	-1.96	-1.88	-1.79	-1.70	-1.61	-1.52	-1.40	-1.32	-1.21	-1.11
4 Required subsidy amount	74.72	0.02	0.04	0.96	1.01	1.04	1.05	0.56	0.53	0.52	0.50	3.15	3.10	3.07	3.02	2.97	2.93	2.87	2.83	2.76	2.71	2.66	2.58	2.54	2.47	2.40	2.34	2.25	2.19	2.11	2.04	1.96	1.88	1.79	1.70	1.61	1.52	1.40	1.32	1.21	1.11
No 5 Bandivan																																									
1 Difference between Water sales revenue and O&M cost	97.52	0.00	0.00	-0.24	0.37	0.35	0.38	0.96	1.00	1.03	1.06	1.85	1.92	1.98	2.04	2.12	2.17	2.26	2.33	2.41	2.47	2.57	2.65	2.74	2.83	2.92	3.02	3.13	3.22	3.32	3.44	3.55	3.66	3.79	3.90	4.03	4.17	4.31	4.46	4.60	4.75
2 Difference between No.1 and Construction repayment	32.19											0.11	0.17	0.21	0.25	0.31	0.35	0.42	0.47	0.53	0.57	0.65	0.71	0.78	0.85	0.92	1.00	1.09	1.16	1.24	1.34	1.43	1.52	1.63	1.72	1.83	1.94	2.06	2.19	2.31	2.43
3 Difference between No.2 and Interest repayment	23.02	-0.02	-0.04	-0.30	-0.22	-0.24	-0.22	0.36	0.40	0.43	0.46	-0.49	-0.42	-0.36	-0.30	-0.22	-0.17	-0.08	-0.01	0.07	0.13	0.23	0.31	0.40	0.49	0.58	0.68	0.79	0.88	0.98	1.10	1.21	1.32	1.45	1.56	1.69	1.83	1.97	2.12	2.26	2.41
4 Required subsidy amount	3.09	0.02	0.04	0.30	0.22	0.24	0.22	0.00	0.00	0.00	0.00	0.49	0.42	0.36	0.30	0.22	0.17	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 6 Bashgyugh																																									
1 Difference between Water sales revenue and O&M cost	-13.40	0.00	0.00	-0.31	-0.33	-0.34	-0.34	-0.27	-0.28	-0.30	-0.31	-0.22	-0.23	-0.24	-0.24	-0.24	-0.26	-0.27	-0.28	-0.28	-0.30	-0.29	-0.31	-0.32	-0.33	-0.34	-0.36	-0.36	-0.38	-0.40	-0.41	-0.42	-0.44	-0.44	-0.46	-0.47	-0.50	-0.50	-0.53	-0.54	-0.56
2 Difference between No.1 and Construction repayment	-86.98											-2.41	-2.44	-2.47	-2.49	-2.52	-2.56	-2.59	-2.62	-2.65	-2.69	-2.71	-2.75	-2.78	-2.82	-2.85	-2.90	-2.92	-2.97	-3.02	-3.05	-3.09	-3.13	-3.16	-3.21	-3.25	-3.30	-3.33	-3.39	-3.43	-3.48
3 Difference between No.2 and Interest repayment	-107.89	-0.02	-0.04	-1.03	-1.07	-1.09	-1.10	-1.03	-1.04	-1.06	-1.07	-3.17	-3.18	-3.19	-3.18	-3.19	-3.21	-3.22	-3.22	-3.23	-3.25	-3.24	-3.26	-3.26	-3.28	-3.28	-3.31	-3.30	-3.33	-3.35	-3.36	-3.37	-3.38	-3.39	-3.41	-3.42	-3.44	-3.44	-3.48	-3.49	-3.51
4 Required subsidy amount	107.89	0.02	0.04	1.03	1.07	1.09	1.10	1.03	1.04	1.06	1.07	3.17	3.18	3.19	3.18	3.19	3.21	3.22	3.22	3.23	3.25	3.24	3.26	3.26	3.28	3.28	3.31	3.30	3.33	3.35	3.36	3.37	3.38	3.39	3.41	3.42	3.44	3.44	3.48	3.49	3.51
No 7 Garnaritch + Yeghnajur																																									
1 Difference between Water sales revenue and O&M cost	10.05	0.00	0.00	-0.24	-0.40	-0.43	-0.43	-0.13	-0.14	-0.14	-0.16	0.24	0.25	0.27	0.27	0.28	0.28	0.30	0.31	0.31	0.32	0.34	0.36	0.36	0.37	0.39	0.39	0.40	0.43	0.44	0.45	0.46	0.47	0.49	0.51	0.52	0.55	0.56	0.58	0.60	0.62
2 Difference between No.1 and Construction repayment	-202.09											-5.92	-5.97	-6.01	-6.07	-6.13	-6.19	-6.24	-6.29	-6.36	-6.41	-6.46	-6.51	-6.58	-6.64	-6.69	-6.76	-6.82	-6.86	-6.93	-6.99	-7.05	-7.12	-7.17	-7.23	-7.30	-7.35	-7.42	-7.48	-7.54	-7.60
3 Difference between No.2 and Interest repayment	-254.02	-0.02	-0.04	-0.30	-2.52	-2.56	-2.57	-2.27	-2.28	-2.28	-2.30	-8.06	-8.05	-8.03	-8.03	-8.02	-8.02	-8.00	-7.99	-7.99	-7.98	-7.96	-7.94	-7.94	-7.93	-7.91	-7.91	-7.90	-7.87	-7.86	-7.85	-7.84	-7.83	-7.81	-7.79	-7.78	-7.75	-7.74	-7.72	-7.70	-7.68
4 Required subsidy amount	254.02	0.02	0.04	0.30	2.52	2.56	2.57	2.27	2.28	2.28	2.30	8.06	8.05	8.03	8.03	8.02	8.02	8.00	7.99	7.99	7.98	7.96	7.94	7.94	7.93	7.91	7.91	7.90	7.87	7.86	7.85	7.84	7.83	7.81	7.79	7.78	7.75	7.74	7.72	7.70	7.68
No 8 Kamkhut																																									
1 Difference between Water sales revenue and O&M cost	58.57	0.00	0.00	-0.24	0.21	0.19	0.21	0.57	0.59	0.61	0.63	1.12	1.16	1.20	1.24	1.28	1.30	1.35	1.40	1.45	1.49	1.55	1.60	1.65	1.71	1.76	1.81	1.89	1.94	2.01	2.06	2.14	2.20	2.27	2.35	2.43	2.52	2.60	2.68	2.77	2.87
2 Difference between No.1 and Construction repayment	6.55											-0.30	-0.27	-0.24	-0.22	-0.19	-0.19	-0.15	-0.12	-0.08	-0.06	-0.01	0.02	0.05	0.10	0.13	0.17	0.23	0.26	0.32	0.35	0.41	0.45	0.51	0.57	0.63	0.70	0.77	0.83	0.90	0.98
3 Difference between No.2 and Interest repayment	-2.21	-0.02	-0.04	-0.30	-0.27	-0.29	-0.28	0.08	0.10	0.12	0.14	-0.79	-0.75	-0.70	-0.67	-0.63	-0.61	-0.56	-0.51	-0.46	-0.42	-0.35	-0.31	-0.26	-0.20	-0.15	-0.09	-0.02	0.03	0.11	0.15	0.23	0.29	0.36	0.44	0.52	0.61	0.70	0.77	0.86	0.96
4 Required subsidy amount	8.68	0.02	0.04	0.30	0.27	0.29	0.28	0.00	0.00	0.00	0.00	0.79	0.75	0.70	0.67	0.63	0.61	0.56	0.51	0.46	0.42	0.35	0.31	0.26	0.20	0.15	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 9 Zari Shat																																									
1 Difference between Water sales revenue and O&M cost	4.44	0.00	0.00	-0.24	-0.15	-0.16	-0.16	-0.04	-0.04	-0.04	-0.04	0.12	0.11	0.12	0.12	0.13	0.11	0.12	0.13	0.15	0.14	0.15	0.16	0.16	0.16	0.17	0.16	0.18	0.19	0.19	0.20	0.21	0.20	0.21	0.22	0.23	0.24	0.26	0.24	0.26	0.27
2 Difference between No.1 and Construction repayment	-38.15											-1.13	-1.16	-1.16	-1.17	-1.17	-1.20	-1.21	-1.21	-1.20	-1.23	-1.23	-1.23	-1.25	-1.26	-1.27	-1.29	-1.29	-1.29	-1.30	-1.31	-1.31	-1.34	-1.35	-1.35	-1.36	-1.36	-1.36	-1.39	-1.39	-1.40
3 Difference between No.2 and Interest repayment	-49.22	-0.02	-0.04	-0.30	-0.57	-0.58	-0.60	-0.48	-0.48	-0.48	-0.48	-1.56	-1.57	-1.56	-1.57	-1.55	-1.57	-1.57	-1.55	-1.53	-1.55	-1.53	-1.52	-1.53	-1.52	-1.52	-1.52	-1.51	-1.49	-1.49	-1.48	-1.47	-1.48	-1.48	-1.46	-1.46	-1.44	-1.43	-1.44	-1.42	-1.42
4 Required subsidy amount	49.22	0.02	0.04	0.30	0.57	0.58	0.60	0.48	0.48	0.48	0.48	1.56	1.57	1.56	1.57	1.55	1.57	1.57	1.55	1.53	1.55	1.53	1.52	1.53	1.52	1.52	1.52	1.51	1.49	1.49	1.48	1.47	1.48	1.48	1.46	1.46	1.44	1.43	1.44	1.42	1.42
No 10 Zorakert+Darik																																									
1 Difference between Water sales revenue and O&M cost	-7.71	0.00	0.00	-0.24	-0.42	-0.45	-0.45	-0.28	-0.30	-0.30	-0.32	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.14	-0.14	-0.13	-0.15	-0.14	-0.15	-0.17	-0.17	-0.17	-0.18	-0.19	-0.20	-0.20	-0.20	-0.21	-0.21	-0.23	-0.23	-0.23	-0.24	-0.26
2 Difference between No.1 and Construction repayment	-85.54											-2.42	-2.44	-2.47	-2.50	-2.52	-2.56	-2.58	-2.60	-2.63	-2.67	-2.70	-2.72	-2.76	-2.78	-2.81	-2.86	-2.89	-2.91	-2.95	-2.99	-3.03	-3.06	-3.08	-3.12	-3.15	-3.20	-3.23	-3.26	-3.30	-3.35
3 Difference between No.2 and Interest repayment	-107.15	-0.02	-0.04	-0.30	-1.21	-1.25	-1.26	-1.09	-1.11	-1.11	-1.13	-3.23	-3.22	-3.23	-3.24	-3.23	-3.25	-3.24	-3.24	-3.24	-3.26	-3.26	-3.26	-3.27	-3.27	-3.27	-3.29	-3.30	-3.29	-3.30	-3.31	-3.33	-3.33	-3.32	-3.33	-3.33	-3.35	-3.35	-3.35	-3.36	-3.38
4 Required subsidy amount	107.15	0.02	0.04	0.30	1.21	1.25	1.26	1.09	1.11	1.11	1.13	3.23	3.22	3.23	3.24	3.23	3.25	3.24	3.24	3.24	3.26	3.26	3.26	3.27	3.27	3.27	3.29	3.30	3.29	3.30	3.31	3.33	3.33	3.32	3.33	3.33	3.35	3.35	3.35	3.36	3.38
No 11 Lernakert																																									
1 Difference between Water sales revenue and O&M cost	314.87	0.00	0.00	0.58	1.39	1.59	1.65	3.33	3.44	3.55	3.67	5.92	6.12	6.31	6.52	6.74	6.96	7.20	7.42	7.68	7.93	8.18	8.47	8.73	9.03	9.32	9.63	9.95	10.29	10.62	10.96	11.32	11.70	12.09	12.49	12.90	13.33	13.77	14.22	14.70	15.17
2 Difference between No.1 and Construction repayment	105.41											0.45	0.60	0.73	0.88	1.05	1.21	1.39	1.56	1.76	1.95	2.14	2.37	2.57	2.80	3.03	3.28	3.54	3.81	4.08	4.35	4.65	4.96	5.28	5.61	5.95	6.32	6.69	7.06	7.47	7.87
3 Difference between No.2 and Interest repayment	79.75	-0.02	-0.04	-0.25	-0.27	-0.30	-0.25	1.43	1.54	1.65	1.77	-1.45	-1.25	-1.06	-0.86	-0.63	-0.41	-0.18	0.05	0.31	0.56	0.81	1.10	1.36	1.65	1.94	2.26	2.58	2.92	3.25	3.59	3.95	4.33	4.72	5.11	5.52	5.96	6.40	6.84	7.32	7.80
4 Required subsidy amount	6.97	0.02	0.04	0.25	0.27	0.30	0.25	0.00	0.00	0.00	0.00	1.45	1.25	1.06	0.86	0.63	0.41	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 12 Lernut																																									
1 Difference between Water sales revenue and O&M cost	30.86	0.00	0.00	0.04	0.02	0.01	0.02	0.25	0.26	0.27	0.28	0.59	0.62	0.63	0.66	0.68	0.70	0.73	0.74	0.77	0.79	0.83	0.86	0.87	0.91	0.94	0.97	1.00	1.03	1.07	1.10	1.13	1.17	1.21	1.25	1.30	1.34	1.39	1.43	1.48	1.52
2 Difference between No.1 and Construction repayment	-12.83											-0.63	-0.62	-0.62	-0.60	-0.59	-0.59	-0.57	-0.57	-0.55	-0.55	-0.52	-0.50	-0.51	-0.48	-0.47	-0.45	-0.43	-0.42	-0.39	-0.38	-0.36	-0.34	-0.31	-0.29	-0.25	-0.23	-0.19	-0.17	-0.14	-0.11
3 Difference between No.2 and Interest repayment	-22.01	-0.02	-0.04	-0.34	-0.39	-0.40	-0.41	-0.18	-0.17	-0.16	-0.15	-1.06	-1.03	-1.02	-0.99	-0.97	-0.95	-0.92	-0.91	-0.87	-0.86	-0.82	-0.78	-0.78	-0.74	-0.71	-0.68	-0.64	-0.62	-0.58	-0.55	-0.52	-0.48	-0.44	-0.40	-0.35	-0.31	-0.25	-0.22	-0.17	-0.13
4 Required subsidy amount	22.01	0.02	0.04	0.34	0.39	0.40	0.41	0.18	0.17	0.16	0.15	1.06	1.03	1.02	0.99	0.97	0.95	0.92	0.91	0.87	0.86	0.82	0.78	0.78	0.74	0.71	0.68	0.64	0.62	0.58	0.55	0.52	0.48	0.44	0.40	0.35	0.31	0.25	0.22	0.17	0.13
No 13 Tsaghkut																																									
1 Difference between Water sales revenue and O&M cost	25.66	0.00	0.00	-0.24	-0.19	-0.21	-0.22	0.10	0.09	0.09	0.10	0.53	0.54	0.57	0.58	0.60	0.62	0.64	0.65	0.68	0.70	0.73	0.75	0.77	0.81	0.82	0.84	0.89	0.90	0.94	0.97	0.99	1.03	1.06	1.10	1.14	1.18	1.22	1.25	1.30	1.34
2 Difference between No.1 and Construction repayment	-74.12											-2.35	-2.37	-2.37	-2.39	-2.40	-2.41	-2.42	-2.44	-2.44	-2.45	-2.45	-2.47	-2.48	-2.47	-2.49	-2.51	-2.49	-2.51	-2.51	-2.51	-2.53	-2.52	-2.53	-2.52	-2.52	-2.52	-2.51	-2.52	-2.51	-2.51
3 Difference between No.2 and Interest repayment	-98.00	-0.02	-0.04	-0.30	-1.18	-1.20	-1.22	-0.90	-0.91	-0.91	-0.90	-3.35	-3.34	-3.32	-3.31	-3.29	-3.27	-3.25	-3.23	-3.20	-3.18	-3.15	-3.14	-3.12	-3.07	-3.06	-3.05	-3.00	-2.98	-2.95	-2.91	-2.90	-2.85	-2.83	-2.78	-2.75	-2.71	-2.66	-2.63	-2.59	-2.55
4 Required subsidy amount	98.00	0.02	0.04	0.30	1.18	1.20	1.22	0.90	0.91	0.91	0.90	3.35	3.34	3.32	3.31	3.29	3.27	3.25	3.23	3.20	3.18	3.15	3.14	3.12	3.07	3.06	3.05	3.00	2.98	2.95	2.91	2.90	2.85	2.83	2.78	2.75	2.71	2.66	2.63	2.59	2.55
No 14 Kamo																																									
1 Difference between Water sales revenue and O&M cost	337.29	0.00	0.00	1.73	1.71	1.68	1.74	3.54	3.65	3.77	3.90	6.32	6.53	6.75	6.96	7.20	7.42	7.68	7.93	8.19	8.46	8.74	9.04	9.33	9.64	9.96	10.27	10.62	10.97	11.34	11.70	12.10	12.48	12.89	13.32	13.77	14.22	14.69	15.17	15.68	16.20
2 Difference between No.1 and Construction repayment	167.91											2.08	2.24	2.42	2.59	2.78	2.96	3.17	3.38	3.59	3.82	4.05	4.30	4.55	4.81	5.08	5.34	5.64	5.94	6.26	6.57	6.92	7.25	7.61	7.98	8.38	8.78	9.19	9.62	10.07	10.54
3 Difference between No.2 and Interest repayment	153.84	-0.02	-0.04	0.29	0.25	0.21	0.26	2.06	2.17	2.29	2.42	0.60	0.81	1.03	1.24	1.48	1.70	1.95	2.21	2.47	2.74	3.02	3.31	3.61	3.92	4.24	4.55	4.90	5.25	5.62	5.98	6.38	6.76	7.17	7.60	8.05	8.50	8.97	9.45	9.96	10.48
4 Required subsidy amount	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 15 Karmraqar																																									
1 Difference between Water sales revenue and O&M cost	-4.59	0.00	0.00	-0.17	-0.18	-0.19	-0.19	-0.13	-0.13	-0.14	-0.15	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.10	-0.09	-0.10	-0.10	-0.10	-0.11	-0.10	-0.12	-0.12	-0.12	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.16	-0.15	-0.17
2 Difference between No.1 and Construction repayment	-26.38											-0.73	-0.74	-0.75	-0.75	-0.77	-0.78	-0.78	-0.79	-0.80	-0.82	-0.83	-0.83	-0.85	-0.85	-0.86	-0.88	-0.88	-0.91	-0.91	-0.92	-0.94	-0.96	-0.97	-0.97	-0.99	-1.00	-1.01	-1.03	-1.03	-1.05
3 Difference between No.2 and Interest repayment	-33.23	-0.02	-0.04	-0.36	-0.39	-0.41	-0.42	-0.36	-0.36	-0.37	-0.38	-0.96	-0.96	-0.97	-0.96	-0.97	-0.98	-0.97	-0.97	-0.98	-0.99	-0.99	-0.98	-1.00	-0.99	-0.99	-1.00	-1.00	-1.02	-1.01	-1.01	-1.02	-1.04	-1.04	-1.03	-1.04	-1.04	-1.04	-1.06	-1.05	-1.06
4 Required subsidy amount	33.23	0.02	0.04	0.36	0.39	0.41	0.42	0.36	0.36	0.37	0.38	0.96	0.96	0.97	0.96	0.97	0.98	0.97	0.97	0.98	0.99	0.99	0.98	1.00	0.99	0.99	1.00	1.00	1.02	1.01	1.01	1.02	1.04	1.04	1.03	1.04	1.04	1.04	1.06	1.05	1.06
No 17 Krashen																																									
1 Difference between Water sales revenue and O&M cost	43.91	0.00	0.00	0.05	0.04	0.02	0.04	0.36	0.38	0.39	0.40	0.85	0.87	0.91	0.94	0.97	1.00	1.02	1.06	1.10	1.14	1.17	1.21	1.25	1.29	1.33	1.37	1.42	1.46	1.51	1.56	1.61	1.67	1.72	1.79	1.84	1.91	1.97	2.03	2.10	2.16
2 Difference between No.1 and Construction repayment	-17.34											-0.86	-0.86	-0.84	-0.82	-0.81	-0.80	-0.80	-0.78	-0.75	-0.73	-0.72	-0.70	-0.68	-0.66	-0.64	-0.62	-0.59	-0.57	-0.54	-0.51	-0.48	-0.44	-0.41	-0.36	-0.33	-0.29	-0.25	-0.21	-0.16	-0.13
3 Difference between No.2 and Interest repayment	-30.14	-0.02	-0.04	-0.50	-0.54	-0.57	-0.56	-0.24	-0.22	-0.21	-0.20	-1.46	-1.44	-1.40	-1.36	-1.34	-1.31	-1.29	-1.25	-1.20	-1.17	-1.14	-1.10	-1.06	-1.02	-0.98	-0.94	-0.89	-0.85	-0.80	-0.75	-0.70	-0.64	-0.59	-0.52	-0.46	-0.40	-0.34	-0.28	-0.21	-0.15
4 Required subsidy amount	30.14	0.02	0.04	0.50	0.54	0.57	0.56	0.24	0.22	0.21	0.20	1.46	1.44	1.40	1.36	1.34	1.31	1.29	1.25	1.20	1.17	1.14	1.10	1.06	1.02	0.98	0.94	0.89	0.85	0.80	0.75	0.70	0.64	0.59	0.52	0.46	0.40	0.34	0.28	0.21	0.15

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.3 Cost Recovery Analysis Results (10/10)

PHASE 2 SHIRAK MARZ | **Unit: million AMD**

Description	Total	Year																																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No 18 Krasar																																									
1 Difference between Water sales revenue and O&M cost	86.75	0.00	0.00	-0.24	0.22	0.20	0.21	0.79	0.82	0.85	0.87	1.67	1.72	1.77	1.84	1.90	1.95	2.02	2.08	2.16	2.22	2.31	2.38	2.45	2.54	2.62	2.70	2.79	2.89	2.98	3.08	3.18	3.28	3.39	3.50	3.62	3.74	3.87	3.99	4.13	4.26
2 Difference between No.1 and Construction repayment	7.20											-0.51	-0.48	-0.45	-0.41	-0.37	-0.34	-0.29	-0.26	-0.20	-0.16	-0.10	-0.05	-0.01	0.06	0.11	0.17	0.23	0.31	0.37	0.45	0.52	0.59	0.68	0.76	0.85	0.94	1.05	1.14	1.25	1.35
3 Difference between No.2 and Interest repayment	-6.80	-0.02	-0.04	-0.30	-0.52	-0.55	-0.55	0.03	0.06	0.09	0.11	-1.27	-1.22	-1.16	-1.10	-1.04	-0.99	-0.91	-0.86	-0.78	-0.71	-0.63	-0.56	-0.49	-0.40	-0.32	-0.24	-0.15	-0.05	0.04	0.15	0.24	0.34	0.46	0.56	0.68	0.80	0.94	1.05	1.19	1.32
4 Required subsidy amount	14.86	0.02	0.04	0.30	0.52	0.55	0.55	0.00	0.00	0.00	0.00	1.27	1.22	1.16	1.10	1.04	0.99	0.91	0.86	0.78	0.71	0.63	0.56	0.49	0.40	0.32	0.24	0.15	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 19 Mayisyan Kayaran																																									
1 Difference between Water sales revenue and O&M cost	-5.39	0.00	0.00	-0.17	-0.18	-0.19	-0.19	-0.14	-0.14	-0.15	-0.15	-0.08	-0.08	-0.08	-0.08	-0.08	-0.10	-0.10	-0.10	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.14	-0.13	-0.14	-0.14	-0.15	-0.15	-0.17	-0.17	-0.17	-0.19	-0.19	-0.19	-0.20	-0.20	-0.21
2 Difference between No.1 and Construction repayment	-26.70											-0.73	-0.74	-0.74	-0.75	-0.76	-0.78	-0.79	-0.80	-0.81	-0.83	-0.84	-0.85	-0.85	-0.86	-0.88	-0.89	-0.89	-0.91	-0.92	-0.94	-0.94	-0.97	-0.98	-0.99	-1.02	-1.02	-1.03	-1.05	-1.06	-1.08
3 Difference between No.2 and Interest repayment	-33.52	-0.02	-0.04	-0.35	-0.39	-0.41	-0.42	-0.37	-0.37	-0.38	-0.38	-0.96	-0.96	-0.95	-0.96	-0.96	-0.97	-0.98	-0.98	-0.98	-1.00	-1.00	-1.00	-0.99	-1.00	-1.01	-1.01	-1.00	-1.02	-1.02	-1.03	-1.02	-1.05	-1.05	-1.05	-1.07	-1.06	-1.06	-1.08	-1.08	-1.09
4 Required subsidy amount	33.52	0.02	0.04	0.35	0.39	0.41	0.42	0.37	0.37	0.38	0.38	0.96	0.96	0.95	0.96	0.96	0.97	0.98	0.98	0.98	1.00	1.00	1.00	0.99	1.00	1.01	1.01	1.00	1.02	1.02	1.03	1.02	1.05	1.05	1.05	1.07	1.06	1.06	1.08	1.08	1.09
No 20 Hovit																																									
1 Difference between Water sales revenue and O&M cost	111.21	0.00	0.00	0.49	0.47	0.45	0.48	1.12	1.15	1.20	1.22	2.10	2.17	2.23	2.32	2.38	2.46	2.54	2.63	2.71	2.81	2.89	3.00	3.09	3.20	3.30	3.41	3.52	3.63	3.76	3.88	4.00	4.13	4.28	4.42	4.57	4.72	4.88	5.03	5.20	5.37
2 Difference between No.1 and Construction repayment	29.55											-0.06	-0.01	0.03	0.10	0.13	0.19	0.25	0.32	0.37	0.45	0.51	0.59	0.66	0.74	0.82	0.90	0.99	1.07	1.18	1.27	1.37	1.47	1.59	1.71	1.83	1.95	2.08	2.21	2.35	2.49
3 Difference between No.2 and Interest repayment	17.92	-0.02	-0.04	-0.22	-0.26	-0.29	-0.27	0.37	0.40	0.45	0.47	-0.81	-0.74	-0.68	-0.59	-0.53	-0.45	-0.37	-0.28	-0.20	-0.10	-0.02	0.09	0.18	0.29	0.39	0.50	0.61	0.72	0.85	0.97	1.09	1.22	1.37	1.51	1.66	1.81	1.97	2.12	2.29	2.46
4 Required subsidy amount	5.87	0.02	0.04	0.22	0.26	0.29	0.27	0.00	0.00	0.00	0.00	0.81	0.74	0.68	0.59	0.53	0.45	0.37	0.28	0.20	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 22 Akhuryan Kayaran																																									
1 Difference between Water sales revenue and O&M cost	-16.97	0.00	0.00	-0.26	-0.27	-0.28	-0.29	-0.28	-0.29	-0.29	-0.30	-0.28	-0.30	-0.31	-0.32	-0.33	-0.36	-0.36	-0.37	-0.38	-0.40	-0.41	-0.42	-0.44	-0.45	-0.46	-0.49	-0.49	-0.51	-0.53	-0.55	-0.56	-0.59	-0.60	-0.63	-0.64	-0.66	-0.68	-0.71	-0.72	-0.76
2 Difference between No.1 and Construction repayment	-35.92											-0.89	-0.92	-0.93	-0.95	-0.96	-1.00	-1.01	-1.02	-1.04	-1.07	-1.08	-1.10	-1.13	-1.14	-1.16	-1.20	-1.21	-1.23	-1.26	-1.29	-1.30	-1.34	-1.36	-1.40	-1.41	-1.44	-1.47	-1.51	-1.53	-1.57
3 Difference between No.2 and Interest repayment	-43.30	-0.02	-0.04	-0.43	-0.46	-0.48	-0.50	-0.49	-0.50	-0.50	-0.51	-1.10	-1.13	-1.13	-1.14	-1.15	-1.18	-1.18	-1.19	-1.20	-1.23	-1.23	-1.24	-1.26	-1.27	-1.28	-1.31	-1.32	-1.33	-1.35	-1.38	-1.38	-1.41	-1.42	-1.46	-1.46	-1.48	-1.50	-1.53	-1.55	-1.58
4 Required subsidy amount	43.30	0.02	0.04	0.43	0.46	0.48	0.50	0.49	0.50	0.50	0.51	1.10	1.13	1.13	1.14	1.15	1.18	1.18	1.19	1.20	1.23	1.23	1.24	1.26	1.27	1.28	1.31	1.32	1.33	1.35	1.38	1.38	1.41	1.42	1.46	1.46	1.48	1.50	1.53	1.55	1.58
No 23 Mets Sariar																																									
1 Difference between Water sales revenue and O&M cost	53.77	0.00	0.00	-0.11	-0.14	-0.17	-0.16	0.34	0.35	0.36	0.38	1.06	1.10	1.13	1.17	1.21	1.24	1.29	1.33	1.37	1.42	1.46	1.52	1.57	1.62	1.68	1.72	1.79	1.84	1.89	1.96	2.02	2.10	2.16	2.23	2.31	2.38	2.47	2.54	2.63	2.71
2 Difference between No.1 and Construction repayment	-58.24											-2.14	-2.13	-2.13	-2.12	-2.12	-2.12	-2.10	-2.10	-2.09	-2.07	-2.07	-2.04	-2.03	-2.02	-1.99	-1.99	-1.96	-1.94	-1.93	-1.90	-1.88	-1.84	-1.82	-1.79	-1.75	-1.72	-1.67	-1.64	-1.59	-1.55
3 Difference between No.2 and Interest repayment	-84.31	-0.02	-0.04	-1.18	-1.23	-1.27	-1.27	-0.77	-0.76	-0.75	-0.73	-3.25	-3.21	-3.18	-3.13	-3.10	-3.07	-3.01	-2.98	-2.94	-2.88	-2.85	-2.78	-2.74	-2.69	-2.62	-2.59	-2.52	-2.46	-2.41	-2.35	-2.29	-2.21	-2.15	-2.08	-2.00	-1.93	-1.84	-1.77	-1.67	-1.59
4 Required subsidy amount	84.31	0.02	0.04	1.18	1.23	1.27	1.27	0.77	0.76	0.75	0.73	3.25	3.21	3.18	3.13	3.10	3.07	3.01	2.98	2.94	2.88	2.85	2.78	2.74	2.69	2.62	2.59	2.52	2.46	2.41	2.35	2.29	2.21	2.15	2.08	2.00	1.93	1.84	1.77	1.67	1.59
No 24 Musaelyan																																									
1 Difference between Water sales revenue and O&M cost	402.95	0.00	0.00	2.09	2.06	2.02	2.10	4.23	4.37	4.51	4.67	7.55	7.79	8.06	8.33	8.59	8.87	9.16	9.48	9.79	10.10	10.44	10.79	11.14	11.51	11.88	12.28	12.69	13.11	13.53	13.98	14.45	14.91	15.41	15.92	16.44	16.98	17.54	18.12	18.72	19.34
2 Difference between No.1 and Construction repayment	146.38											0.92	1.10	1.30	1.50	1.69	1.91	2.13	2.38	2.61	2.85	3.12	3.40	3.67	3.97	4.26	4.59	4.92	5.26	5.60	5.97	6.36	6.74	7.16	7.59	8.03	8.48	8.96	9.45	9.96	10.50
3 Difference between No.2 and Interest repayment	116.52	-0.02	-0.04	-0.17	-0.23	-0.27	-0.21	1.92	2.06	2.20	2.36	-1.39	-1.14	-0.87	-0.60	-0.35	-0.06	0.23	0.55	0.85	1.17	1.51	1.86	2.21	2.58	2.95	3.35	3.76	4.18	4.59	5.04	5.51	5.97	6.48	6.99	7.51	8.05	8.61	9.19	9.78	10.41
4 Required subsidy amount	5.35	0.02	0.04	0.17	0.23	0.27	0.21	0.00	0.00	0.00	0.00	1.39	1.14	0.87	0.60	0.35	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 25 Shaghik																																									
1 Difference between Water sales revenue and O&M cost	17.04	0.00	0.00	-0.24	-0.17	-0.18	-0.18	0.04	0.04	0.04	0.05	0.36	0.36	0.38	0.39	0.41	0.41	0.43	0.44	0.46	0.47	0.49	0.51	0.52	0.53	0.55	0.58	0.60	0.61	0.63	0.66	0.68	0.69	0.71	0.75	0.77	0.80	0.83	0.85	0.87	0.90
2 Difference between No.1 and Construction repayment	-63.84											-1.98	-2.01	-2.01	-2.02	-2.03	-2.05	-2.06	-2.07	-2.08	-2.09	-2.10	-2.10	-2.12	-2.14	-2.14	-2.14	-2.15	-2.16	-2.17	-2.17	-2.18	-2.20	-2.21	-2.19	-2.20	-2.20	-2.20	-2.21	-2.23	-2.23
3 Difference between No.2 and Interest repayment	-83.48	-0.02	-0.04	-0.30	-0.97	-0.98	-1.00	-0.78	-0.78	-0.78	-0.77	-2.79	-2.80	-2.78	-2.76	-2.75	-2.75	-2.73	-2.72	-2.70	-2.69	-2.67	-2.64	-2.64	-2.63	-2.60	-2.58	-2.56	-2.54	-2.53	-2.50	-2.48	-2.47	-2.45	-2.40	-2.38	-2.35	-2.32	-2.30	-2.29	-2.26
4 Required subsidy amount	83.48	0.02	0.04	0.30	0.97	0.98	1.00	0.78	0.78	0.78	0.77	2.79	2.80	2.78	2.76	2.75	2.75	2.73	2.72	2.70	2.69	2.67	2.64	2.64	2.63	2.60	2.58	2.56	2.54	2.53	2.50	2.48	2.47	2.45	2.40	2.38	2.35	2.32	2.30	2.29	2.26
No 26 Shirak																																									
1 Difference between Water sales revenue and O&M cost	250.16	0.00	0.00	1.38	1.36	1.35	1.40	2.68	2.77	2.86	2.95	4.68	4.83	4.99	5.15	5.32	5.49	5.68	5.87	6.06	6.26	6.47	6.69	6.89	7.13	7.36	7.60	7.86	8.11	8.38	8.66	8.94	9.23	9.54	9.86	10.18	10.52	10.87	11.22	11.60	11.97
2 Difference between No.1 and Construction repayment	165.85											2.74	2.87	3.01	3.15	3.30	3.45	3.62	3.79	3.96	4.14	4.32	4.52	4.70	4.92	5.13	5.34	5.58	5.81	6.06	6.31	6.57	6.84	7.12	7.42	7.71	8.03	8.35	8.68	9.03	9.38
3 Difference between No.2 and Interest repayment	166.19	-0.02	-0.04	0.75	0.70	0.69	0.72	2.00	2.09	2.18	2.27	2.06	2.21	2.37	2.53	2.70	2.87	3.06	3.25	3.45	3.65	3.85	4.07	4.27	4.51	4.74	4.98	5.24	5.49	5.77	6.04	6.32	6.62	6.92	7.24	7.56	7.90	8.25	8.60	8.98	9.35
4 Required subsidy amount	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 27 Pemzashen																																									
1 Difference between Water sales revenue and O&M cost	953.59	0.00	0.00	1.93	4.53	5.18	5.36	10.25	10.59	10.94	11.31	17.89	18.48	19.08	19.71	20.37	21.04	21.74	22.45	23.19	23.96	24.74	25.57	26.41	27.27	28.18	29.11	30.06	31.06	32.09	33.15	34.23	35.36	36.53	37.75	38.99	40.28	41.60	42.98	44.38	45.86
2 Difference between No.1 and Construction repayment	484.30											6.13	6.60	7.08	7.59	8.13	8.68	9.25	9.84	10.45	11.09	11.74	12.44	13.15	13.88	14.66	15.45	16.27	17.13	18.02	18.94	19.88	20.86	21.89	22.96	24.05	25.19	26.36	27.59	28.84	30.16
3 Difference between No.2 and Interest repayment	447.97	-0.02	-0.04	0.15	0.95	1.10	1.27	6.16	6.50	6.85	7.22	2.04	2.63	3.22	3.85	4.52	5.19	5.88	6.60	7.33	8.10	8.88	9.71	10.55	11.41	12.33	13.25	14.21	15.21	16.24	17.30	18.38	19.50	20.68	21.89	23.13	24.42	25.74	27.12	28.53	30.00
4 Required subsidy amount	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 28 Jajur																																									
1 Difference between Water sales revenue and O&M cost	279.60	0.00	0.00	1.05	1.01	0.96	0.99	2.70	2.80	2.88	2.98	5.29	5.47	5.65	5.83	6.03	6.22	6.42	6.64	6.86	7.09	7.32	7.55	7.81	8.07	8.33	8.61	8.89	9.19	9.49	9.81	10.12	10.46	10.81	11.17	11.52	11.90	12.30	12.70	13.13	13.55
2 Difference between No.1 and Construction repayment	-102.08											-5.24	-5.17	-5.09	-5.02	-4.93	-4.85	-4.76	-4.65	-4.54	-4.43	-4.31	-4.20	-4.06	-3.91	-3.77	-3.62	-3.46	-3.28	-3.11	-2.91	-2.73	-2.52	-2.30	-2.07	-1.85	-1.60	-1.34	-1.08	-0.78	-0.50
3 Difference between No.2 and Interest repayment	-175.50	-0.02	-0.04	-2.57	-2.64	-2.69	-2.67	-0.96	-0.86	-0.78	-0.68	-8.90	-8.73	-8.54	-8.36	-8.17	-7.98	-7.78	-7.55	-7.33	-7.11	-6.87	-6.64	-6.39	-6.12	-5.86	-5.59	-5.31	-5.00	-4.71	-4.38	-4.07	-3.74	-3.39	-3.02	-2.67	-2.29	-1.89	-1.50	-1.06	-0.64
4 Required subsidy amount	175.50	0.02	0.04	2.57	2.64	2.69	2.67	0.96	0.86	0.78	0.68	8.90	8.73	8.54	8.36	8.17	7.98	7.78	7.55	7.33	7.11	6.87	6.64	6.39	6.12	5.86	5.59	5.31	5.00	4.71	4.38	4.07	3.74	3.39	3.02	2.67	2.29	1.89	1.50	1.06	0.64
No 29 Jajur Kayaran																																									
1 Difference between Water sales revenue and O&M cost	46.70	0.00	0.00	0.11	0.10	0.09	0.10	0.42	0.43	0.45	0.45	0.89	0.93	0.96	0.98	1.02	1.05	1.09	1.11	1.16	1.20	1.24	1.28	1.32	1.37	1.40	1.44	1.50	1.54	1.60	1.66	1.70	1.76	1.82	1.88	1.94	2.00	2.08	2.13	2.22	2.28
2 Difference between No.1 and Construction repayment	-24.34											-1.09	-1.07	-1.06	-1.06	-1.04	-1.03	-1.01	-1.01	-0.98	-0.97	-0.95	-0.93	-0.91	-0.88	-0.88	-0.86	-0.82	-0.81	-0.77	-0.73	-0.72	-0.68	-0.65	-0.61	-0.57	-0.54	-0.49	-0.46	-0.40	-0.36
3 Difference between No.2 and Interest repayment	-38.89	-0.02	-0.04	-0.54	-0.57	-0.59	-0.59	-0.27	-0.26	-0.24	-0.24	-1.78	-1.74	-1.71	-1.69	-1.65	-1.62	-1.58	-1.56	-1.50	-1.47	-1.43	-1.39	-1.35	-1.30	-1.27	-1.23	-1.17	-1.13	-1.07	-1.01	-0.97	-0.91	-0.85	-0.79	-0.72	-0.67	-0.59	-0.54	-0.45	-0.39
4 Required subsidy amount	38.89	0.02	0.04	0.54	0.57	0.59	0.59	0.27	0.26	0.24	0.24	1.78	1.74	1.71	1.69	1.65	1.62	1.58	1.56	1.50	1.47	1.43	1.39	1.35	1.30	1.27	1.23	1.17	1.13	1.07	1.01	0.97	0.91	0.85	0.79	0.72	0.67	0.59	0.54	0.45	0.39
No 30 Jrarat																																									
1 Difference between Water sales revenue and O&M cost	222.43	0.00	0.00	0.98	0.95	0.91	0.96	2.24	2.30	2.39	2.46	4.19	4.32	4.48	4.63	4.78	4.92	5.08	5.26	5.44	5.60	5.80	5.99	6.19	6.40	6.59	6.81	7.04	7.28	7.51	7.76	8.01	8.28	8.55	8.84	9.12	9.42	9.75	10.06	10.40	10.74
2 Difference between No.1 and Construction repayment	23.04											-1.16	-1.09	-0.98	-0.89	-0.79	-0.71	-0.60	-0.48	-0.36	-0.25	-0.11	0.02	0.16	0.31	0.44	0.59	0.76	0.94	1.11	1.29	1.48	1.68	1.89	2.11	2.32	2.55	2.82	3.06	3.33	3.60
3 Difference between No.2 and Interest repayment	-8.87	-0.02	-0.04	-0.84	-0.89	-0.94	-0.90	0.38	0.44	0.53	0.60	-3.02	-2.90	-2.73	-2.59	-2.43	-2.30	-2.13	-1.96	-1.78	-1.61	-1.41	-1.22	-1.02	-0.81	-0.62	-0.41	-0.18	0.06	0.30	0.54	0.80	1.06	1.34	1.62	1.90	2.20	2.54	2.85	3.19	3.53
4 Required subsidy amount	32.75	0.02	0.04	0.84	0.89	0.94	0.90	0.00	0.00	0.00	0.00	3.02	2.90	2.73	2.59	2.43	2.30	2.13	1.96	1.78	1.61	1.41	1.22	1.02	0.81	0.62	0.41	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 31 Sarnaghbyur																																									
1 Difference between Water sales revenue and O&M cost	738.96	0.00	0.00	1.52	3.48	3.99	4.11	7.93	8.20	8.47	8.73	13.86	14.33	14.79	15.28	15.78	16.31	16.84	17.40	17.97	18.57	19.18	19.81	20.47	21.14	21.84	22.56	23.31	24.07	24.87	25.70	26.54	27.41	28.32	29.26	30.21	31.21	32.24	33.31	34.41	35.54
2 Difference between No.1 and Construction repayment	382.68											4.95	5.33	5.70	6.10	6.51	6.95	7.39	7.85	8.33	8.83	9.34	9.87	10.43	11.00	11.60	12.22	12.87	13.52	14.22	14.94	15.67	16.43	17.23	18.06	18.90	19.79	20.70	21.66	22.64	23.65
3 Difference between No.2 and Interest repayment	356.06	-0.02	-0.04	0.17	0.78	0.90	1.01	4.83	5.10	5.37	5.63	1.85	2.32	2.78	3.27	3.77	4.31	4.84	5.39	5.97	6.57	7.17	7.80	8.46	9.13	9.83	10.56	11.31	12.06	12.87	13.70	14.53	15.40	16.31	17.25	18.20	19.21	20.23	21.31	22.40	23.53
4 Required subsidy amount	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No 32 Sarapat																																									
1 Difference between Water sales revenue and O&M cost	2.39	0.00	0.00	-0.20	-0.21	-0.23	-0.23	-0.09	-0.11	-0.11	-0.11	0.08	0.08	0.08	0.09	0.09	0.08	0.09	0.09	0.10	0.09	0.10	0.11	0.11	0.12	0.12	0.11	0.12	0.13	0.13	0.14	0.14	0.14	0.14	0.15	0.16	0.17	0.17	0.17	0.19	0.19
2 Difference between No.1 and Construction repayment	-43.72											-1.28	-1.30	-1.31	-1.31	-1.33	-1.35	-1.36	-1.37	-1.38	-1.40	-1.40	-1.41	-1.43	-1.43	-1.45	-1.47	-1.48	-1.48	-1.50	-1.51	-1.52	-1.54	-1.56	-1.56	-1.57	-1.58	-1.59	-1.61	-1.61	-1.63
3 Difference between No.2 and Interest repayment	-56.47	-0.02	-0.04	-0.63	-0.67	-0.69	-0.70	-0.56	-0.58	-0.58	-0.58	-1.75	-1.76	-1.76	-1.74	-1.75	-1.75	-1.75	-1.75	-1.74	-1.75	-1.73	-1.73	-1.73	-1.72	-1.72	-1.72	-1.72	-1.70	-1.71	-1.70	-1.69	-1.70	-1.70	-1.68	-1.68	-1.67	-1.66	-1.66	-1.65	-1.65
4 Required subsidy amount	56.47	0.02	0.04	0.63	0.67	0.69	0.70	0.56	0.58	0.58	0.58	1.75	1.76	1.76	1.74	1.75	1.75	1.75	1.75	1.74	1.75	1.73	1.73	1.73	1.72	1.72	1.72	1.72	1.70	1.71	1.70	1.69	1.70	1.70	1.68	1.68	1.67	1.66	1.66	1.65	1.65
No 33 Sizavet																																									
1 Difference between Water sales revenue and O&M cost	16.78	0.00	0.00	-0.24	-0.50	-0.54	-0.55	-0.15	-0.15	-0.16	-0.17	0.38	0.40	0.40	0.43	0.44	0.46	0.47	0.49	0.51	0.51	0.53	0.56	0.57	0.60	0.61	0.63	0.65	0.67	0.69	0.71	0.74	0.76	0.78	0.80	0.84	0.86	0.90	0.92	0.95	0.98
2 Difference between No.1 and Construction repayment	-287.54											-8.44	-8.51	-8.60	-8.66	-8.74	-8.81	-8.89	-8.96	-9.04	-9.13	-9.21	-9.28	-9.37	-9.44	-9.53	-9.61	-9.69	-9.77	-9.86	-9.94	-10.02	-10.11	-10.20	-10.29	-10.36	-10.45	-10.52	-10.62	-10.70	-10.79
3 Difference between No.2 and Interest repayment	-361.42	-0.02	-0.04	-0.30	-3.55	-3.60	-3.62	-3.22	-3.22	-3.23	-3.24	-11.51	-11.49	-11.49	-11.46	-11.45	-11.43	-11.41	-11.39	-11.38	-11.37	-11.35	-11.33	-11.32	-11.29	-11.28	-11.26	-11.24	-11.21	-11.20	-11.17	-11.15	-11.13	-11.11	-11.09	-11.05	-11.03	-10.98	-10.97	-10.93	-10.91
4 Required subsidy amount	361.42	0.02	0.04	0.30	3.55	3.60	3.62	3.22	3.22	3.23	3.24	11.51	11.49	11.49	11.46	11.45	11.43	11.41	11.39	11.38	11.37	11.35	11.33	11.32	11.29	11.28	11.26	11.24	11.21	11.20	11.17	11.15	11.13	11.11	11.09	11.05	11.03	10.98	10.97	10.93	10.91
No 34 Tzoghamarg																																									
1 Difference between Water sales revenue and O&M cost	98.10	0.00	0.00	-0.24	0.32	0.30	0.32	0.94	0.97	1.00	1.03	1.86	1.94	2.01	2.07	2.14	2.19	2.27	2.34	2.43	2.50	2.59	2.67	2.76	2.85	2.95	3.04	3.15	3.25	3.35	3.47	3.58	3.70	3.82	3.95	4.08	4.22	4.36	4.49	4.64	4.79
2 Difference between No.1 and Construction repayment	-21.25											-1.44	-1.39	-1.35	-1.33	-1.29	-1.28	-1.23	-1.20	-1.14	-1.11	-1.05	-1.01	-0.96	-0.90	-0.84	-0.79	-0.72	-0.66	-0.59	-0.51	-0.44	-0.36	-0.28	-0.20	-0.11	-0.01	0.09	0.18	0.28	0.39
3 Difference between No.2 and Interest repayment	-43.38	-0.02	-0.04	-0.30	-0.81	-0.84	-0.83	-0.21	-0.18	-0.15	-0.12	-2.59	-2.50	-2.43	-2.38	-2.30	-2.26	-2.17	-2.11	-2.01	-1.95	-1.85	-1.78	-1.69	-1.59	-1.49	-1.41	-1.30	-1.20	-1.09	-0.97	-0.86	-0.74	-0.62	-0.50	-0.37	-0.23	-0.08	0.05	0.19	0.35
4 Required subsidy amount	43.97	0.02	0.04	0.30	0.81	0.84	0.83	0.21	0.18	0.15	0.12	2.59	2.50	2.43	2.38	2.30	2.26	2.17	2.11	2.01	1.95	1.85	1.78	1.69	1.59	1.49	1.41	1.30	1.20	1.09	0.97	0.86	0.74	0.62	0.50	0.37	0.23	0.08	0.00	0.00	0.00

Note: Hatch shows deficit amount.
Source JICA Study Team, 2008

Table 13.2.6 Phase 1 Projected Income and Cash Flow Statements

PROJECTED INCOME STATEMENT — **Unit: million AMD**

Description	Unit	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A Water Sales Revenue																																											
Water consumption volume	1000m3/yr		5,006.0																																								
Sub-total		28143.10	0.00	0.00	88.36	168.59	203.69	209.27	330.06	339.77	349.89	360.19	522.31	539.54	557.35	575.77	594.75	614.34	634.69	655.61	677.19	699.63	722.65	746.52	771.19	796.59	822.86	850.01	878.10	907.07	937.03	967.92	999.89	1032.87	1066.94	1102.19	1138.53	1176.14	1214.89	1255.03	1296.46	1339.22
B Operating Costs																																											
1. Staff salary																																										
Inspectors	person				94																																					
Pump operators	person				5																																					
Base Salary	AMD/m/p				20,000	20,660	21,342	22,046	22,774	23,525	24,301	25,103	25,932	26,788	27,672	28,585	29,528	30,502	31,509	32,549	33,623	34,732	35,879	37,063	38,286	39,549	40,854	42,202	43,595	45,034	46,520	48,055	49,641	51,279	52,971	54,719	56,525	58,390	60,317	62,308	64,364	66,488
Sub-total		1752.07			23.76	24.63	25.45	26.04	26.98	27.84	28.76	29.71	30.70	31.73	32.79	33.91	34.95	36.34	37.50	38.61	39.85	41.33	42.57	43.86	45.54	46.83	48.51	50.24	51.73	53.46	55.32	57.17	59.10	61.08	63.06	65.09	67.20	69.30	71.57	74.13	76.35	79.08
2. Chlorine																																											
Dosing volume	kg/yr				236																																					
Unit rate	AMD/kg				600	620	640	661	683	706	729	753	778	804	830	858	886	915	945	976	1009	1042	1076	1112	1149	1186	1226	1266	1308	1351	1396	1442	1489	1538	1589	1642	1696	1752	1810	1869	1931	1995
Sub-total		1317.37			7.76	15.41	19.23	19.90	20.55	21.26	21.91	22.67	23.40	24.15	24.95	25.80	26.63	27.54	28.39	29.35	30.35	31.36	32.35	33.44	34.52	35.68	36.88	38.05	39.34	40.61	41.95	43.34	44.80	46.24	47.81	49.36	51.00	52.72	54.44	56.18	58.05	60.00
3. Electricity (for pump)		693.39			4.34	8.18	10.13	10.46	10.81	11.17	11.53	11.91	12.30	12.72	13.14	13.56	14.02	14.48	14.95	15.44	15.96	16.48	17.04	17.60	18.18	18.77	19.39	20.03	20.69	21.37	22.08	22.82	23.56	24.33	25.14	25.96	26.83	27.71	28.63	29.58	30.55	31.55
4. Maintenance cost		2679.68			15.28	31.21	39.18	40.50	41.80	43.19	44.60	46.06	47.60	49.16	50.79	52.50	54.19	56.00	57.84	59.74	61.74	63.75	65.85	68.00	70.22	72.59	75.00	77.48	79.99	82.70	85.38	88.24	91.14	94.13	97.24	100.45	103.74	107.15	110.71	114.34	118.15	122.05
Pump repair					0.78	1.31	1.60	1.65	1.70	1.75	1.80	1.90	1.95	2.00	2.10	2.15	2.20	2.30	2.35	2.45	2.50	2.60	2.70	2.80	2.85	2.95	3.05	3.15	3.25	3.40	3.50	3.60	3.70	3.85	3.95	4.10	4.25	4.40	4.50	4.65	4.85	5.00
Pipe repair					14.5	29.88	37.58	38.85	40.07	41.43	42.80	44.17	45.65	47.16	48.71	50.35	51.98	53.70	55.48	57.31	59.23	61.15	63.16	65.24	67.36	69.64	71.93	74.33	76.74	79.30	81.90	84.64	87.41	90.29	93.26	96.35	99.49	102.78	106.18	109.66	113.33	117.07
5. PMU head quarter operation cost		3205.13						50.00	51.65	53.35	55.12	56.93	58.81	60.75	62.76	64.83	66.97	69.18	71.46	73.82	76.26	78.77	81.37	84.06	86.83	89.70	92.66	95.71	98.87	102.14	105.51	108.99	112.58	116.30	120.14	124.10	128.20	132.43	136.80	141.31	145.98	150.79
6. Pump replacement		230.88																87.86															143.02										
Sub-total		9878.52	0.00	0.00	51.13	79.43	93.99	146.90	151.79	156.81	161.92	167.28	172.81	178.51	184.43	190.60	196.76	291.40	210.14	216.96	224.16	231.69	239.18	246.96	255.29	263.57	272.44	281.51	290.62	300.28	310.24	320.56	474.20	342.08	353.39	364.96	376.97	389.31	402.15	415.54	429.08	443.47
C Gross Income (A-B)		18264.58	0.00	0.00	37.23	89.16	109.70	62.37	178.27	182.96	187.97	192.91	349.50	361.03	372.92	385.17	397.99	322.94	424.55	438.65	453.03	467.94	483.47	499.56	515.90	533.02	550.42	568.50	587.48	606.79	626.79	647.36	525.69	690.79	713.55	737.23	761.56	786.83	812.74	839.49	867.38	895.75
D Depreciation cost		12279.75						350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85
E Interest paid		3822.95	2.24	3.92	65.79	132.23	162.27	162.49	162.49	162.49	162.49	162.49	162.75	158.05	153.35	148.53	143.82	138.87	133.98	129.00	124.00	118.94	113.81	108.66	103.43	98.15	92.78	87.48	82.05	76.52	70.99	65.34	59.78	54.04	48.27	42.45	36.52	30.62	24.61	18.54	12.47	6.25
F Net Income		2161.88	-2.24	-3.92	-28.56	-43.07	-52.57	-450.97	-335.07	-330.38	-325.37	-320.43	-164.10	-147.87	-131.28	-114.21	-96.68	-166.78	-60.28	-41.20	-21.82	-1.85	18.81	40.05	61.62	84.02	106.79	130.17	154.58	179.42	204.95	231.17	115.06	285.90	314.43	343.93	374.19	405.36	437.28	470.10	504.06	538.65
G Tax and duties		1118.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.70	13.95	18.26	22.74	27.30	31.97	36.86	41.82	46.93	52.17	28.95	63.12	68.83	74.73	80.78	87.01	93.40	99.96	106.75	113.67
H Net Income after tax		1042.98	-2.24	-3.92	-28.56	-43.07	-52.57	-450.97	-335.07	-330.38	-325.37	-320.43	-164.10	-147.87	-131.28	-114.21	-96.68	-166.78	-60.28	-41.20	-21.82	-1.85	9.11	26.10	43.36	61.28	79.49	98.20	117.72	137.60	158.02	179.00	86.11	222.78	245.60	269.20	293.41	318.35	343.88	370.14	397.31	424.98
OM Cost Recovery Ratio (A/B)		285%	0%	0%	173%	212%	217%	142%	217%	217%	216%	215%	302%	302%	302%	302%	302%	211%	302%	302%	302%	302%	302%	302%	302%	302%	302%	302%	302%	302%	302%	302%	211%	302%	302%	302%	302%	302%	302%	302%	302%	302%

PROJECTED CASH FLOW STATEMENT — **Unit: million AMD**

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
SOURCES OF FUNDS																																									
A Internal Cash Generation																																									
1. Net Income after tax	1042.98	-2.24	-3.92	-28.56	-43.07	-52.57	-450.97	-335.07	-330.38	-325.37	-320.43	-164.10	-147.87	-131.28	-114.21	-96.68	-166.78	-60.28	-41.20	-21.82	-1.85	9.11	26.10	43.36	61.28	79.49	98.20	117.72	137.60	158.02	179.00	86.11	222.78	245.60	269.20	293.41	318.35	343.88	370.14	397.31	424.98
2. Depreciation cost	12279.75	0.00	0.00	0.00	0.00	0.00	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85	350.85
3. Interest Paid	3822.95	2.24	3.92	65.79	132.23	162.27	162.49	162.49	162.49	162.49	162.49	162.75	158.05	153.35	148.53	143.82	138.87	133.98	129.00	124.00	118.94	113.81	108.66	103.43	98.15	92.78	87.48	82.05	76.52	70.99	65.34	59.78	54.04	48.27	42.45	36.52	30.62	24.61	18.54	12.47	6.25
Sub-total	17145.68	0.00	0.00	37.23	89.16	109.70	62.37	178.27	182.96	187.97	192.91	349.50	361.03	372.92	385.17	397.99	322.94	424.55	438.65	453.03	467.94	473.77	485.61	497.64	510.28	523.12	536.53	550.62	564.97	579.86	595.19	496.74	627.67	644.72	662.50	680.78	699.82	719.34	739.53	760.63	782.08
B Finances																																									
1. Project Loan	16275.36	218.96	156.24	6210.81	6643.84	2987.83	32.48	25.20																																	
2. Local fund	5569.06	72.24	50.96	2104.03	2281.19	1040.36	11.92	8.36																																	
Sub-total	21844.42	291.20	207.20	8314.84	8925.03	4028.19	44.40	33.56																																	
C Subsidy from Government																																									
1. Subsidy for community's O&M cost	207.58	0.00	0.00	5.77	2.11	2.13	2.14	0.18	0.19	0.20	0.22	0.00	0.00	0.00	0.00	0.00	74.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	120.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Subsidy for debt services	3689.27	2.24	3.92	28.56	43.07	52.57	100.12	0.00	0.00	0.00	0.00	281.15	269.61	257.74	245.43	232.73	307.71	206.08	191.99	177.65	162.71	156.91	145.03	133.05	120.40	107.50	94.19	80.07	65.72	50.78	35.40	133.94	2.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total	3896.85	2.24	3.92	34.34	45.18	54.70	102.26	0.18	0.19	0.20	0.22	281.15	269.61	257.74	245.43	232.73	381.79	206.08	191.99	177.65	162.71	156.91	145.03	133.05	120.40	107.50	94.19	80.07	65.72	50.78	35.40	254.50	2.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Cash Inflow	42886.95	293.44	211.12	8386.40	9059.37	4192.59	209.03	212.01	183.15	188.17	193.13	630.65	630.64	630.66	630.60	630.72	704.73	630.63	630.64	630.68	630.65	630.68	630.64	630.69	630.68	630.62	630.72	630.69	630.69	630.64	630.59	751.24	630.66	644.72	662.50	680.78	699.82	719.34	739.53	760.63	782.08
APPLICATION OF FUNDS																																									
D Project disbursement	21844.42	291.20	207.20	8314.84	8925.03	4028.19	44.40	33.56																																	
E Total debt services																																									
1. Loan repayment	16275.66											467.90	472.59	477.31	482.07	486.90	491.78	496.65	501.64	506.68	511.71	516.87	521.98	527.26	532.53	537.84	543.24	548.64	554.17	559.65	565.25	570.90	576.62	582.38	588.20	594.11	600.04	606.01	612.13	618.24	624.37
2. Interest paid	3822.95	2.24	3.92	65.79	132.23	162.27	162.49	162.49	162.49	162.49	162.49	162.75	158.05	153.35	148.53	143.82	138.87	133.98	129.00	124.00	118.94	113.81	108.66	103.43	98.15	92.78	87.48	82.05	76.52	70.99	65.34	59.78	54.04	48.27	42.45	36.52	30.62	24.61	18.54	12.47	6.25
Sub-total	20098.61	2.24	3.92	65.79	132.23	162.27	162.49	162.49	162.49	162.49	162.49	630.65	630.64	630.66	630.60	630.72	630.65	630.63	630.64	630.68	630.65	630.68	630.64	630.69	630.68	630.62	630.72	630.69	630.69	630.64	630.59	630.68	630.66	630.65	630.65	630.63	630.66	630.62	630.67	630.71	630.62
Total Cash Outflow	41943.03	293.44	211.12	8380.63	9057.26	4190.46	206.89	196.05	162.49	162.49	162.49	630.65	630.64	630.66	630.60	630.72	630.65	630.63	630.64	630.68	630.65	630.68	630.64	630.69	630.68	630.62	630.72	630.69	630.69	630.64	630.59	630.68	630.66	630.65	630.65	630.63	630.66	630.62	630.67	630.71	630.62
F Net surplus cash (A+C2)-E	736.34	0.00	0.00	0.00	0.00	0.00	0.00	15.78	20.47	25.48	30.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.07	31.85	50.15	69.16	88.72	108.86	129.92	151.46	
Investment Cost Recovery Ratio (%)																																									
By water fee (A/E)	85%	0%	0%	57%	67%	68%	38%	110%	113%	116%	119%	55%	57%	59%	61%	63%	51%	67%	70%	72%	74%	75%	77%	79%	81%	83%	85%	87%	90%	92%	94%	79%	100%	102%	105%	108%	111%	114%	117%	121%	124%
By water fee + subsidy ((A+C2)/E)	104%	100%	100%	100%	100%	100%	100%	110%	113%	116%	119%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	102%	105%	108%	111%	114%	117%	121%	124%

Note: Hatch shows that water fees covers the investment costs partially.
Source: JICA Study Team, 2008

Table 13.2.7 Phase 2 Projected Income and Cash Flow Statements

PROJECTED INCOME STATEMENT — **Unit: million AMD**

Description	Unit	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A Water Sales Revenue																																											
Water consumption volume	1000m3/yr		3,659.2																																								
Sub-total		20708.15	0.00	0.00	76.75	143.94	163.66	167.46	250.48	257.19	264.09	271.22	382.62	395.23	408.25	421.77	435.71	450.03	464.89	480.20	496.10	512.48	529.30	546.85	564.91	583.52	602.74	622.60	643.22	664.46	686.38	709.06	732.40	756.53	781.57	807.33	833.96	861.49	889.95	919.28	949.59	980.94
B Operating Costs																																										
1. Staff salary																																										
Inspectors	person				107																																					
Pump operators	person				4																																					
Base Salary	AMD/m/p				20,000	20,660	21,342	22,046	22,774	23,525	24,301	25,103	25,932	26,788	27,672	28,585	29,528	30,502	31,509	32,549	33,623	34,732	35,879	37,063	38,286	39,549	40,854	42,202	43,595	45,034	46,520	48,055	49,641	51,279	52,971	54,719	56,525	58,390	60,317	62,308	64,364	66,488
Sub-total		1964.64			26.64	27.71	28.73	28.99	30.09	31.12	32.21	33.31	34.42	35.54	36.67	37.86	38.98	40.94	42.14	43.29	44.52	46.50	47.73	48.97	51.06	52.30	54.39	56.49	57.84	59.94	62.12	64.26	66.47	68.69	70.91	73.14	75.44	77.70	80.05	83.21	85.51	88.76
2. Chlorine																																										
Dosing volume	kg/yr				236																																					
Unit rate	AMD/kg				600	620	640	661	683	706	729	753	778	804	830	858	886	915	945	976	1009	1042	1076	1112	1149	1186	1226	1266	1308	1351	1396	1442	1489	1538	1589	1642	1696	1752	1810	1869	1931	1995
Sub-total		965.31			6.29	11.99	14.09	14.54	15.01	15.54	16.03	16.57	17.09	17.68	18.27	18.93	19.51	20.12	20.79	21.52	22.25	22.94	23.65	24.45	25.28	26.12	26.96	27.87	28.75	29.72	30.69	31.72	32.76	33.89	34.96	36.08	37.31	38.60	39.84	41.11	42.47	43.92
3. Electricity (for pump)		958.35			5.74	11.86	13.99	14.46	14.93	15.43	15.94	16.46	17.00	17.56	18.15	18.75	19.36	20.00	20.66	21.35	22.04	22.78	23.53	24.30	25.11	25.93	26.79	27.68	28.58	29.54	30.52	31.50	32.55	33.63	34.74	35.89	37.07	38.30	39.56	40.86	42.21	43.60
4. Maintenance cost		2650.85			15.83	32.85	38.70	40.05	41.25	42.68	44.11	45.56	47.01	48.56	50.18	51.81	53.55	55.33	57.15	59.06	60.98	62.99	65.10	67.25	69.45	71.76	74.08	76.57	79.07	81.75	84.40	87.15	90.04	93.01	96.08	99.23	102.53	105.93	109.37	113.03	116.76	120.64
Pump repair					0.51	1.06	1.28	1.32	1.36	1.40	1.44	1.52	1.56	1.60	1.68	1.72	1.76	1.84	1.88	1.96	2.00	2.08	2.16	2.24	2.28	2.36	2.44	2.52	2.60	2.72	2.80	2.88	2.96	3.08	3.16	3.28	3.40	3.52	3.60	3.72	3.88	4.00
Pipe repair					15.32	31.77	37.42	38.71	39.89	41.26	42.65	44.06	45.45	46.96	48.52	50.10	51.78	53.50	55.26	57.10	58.95	60.91	62.95	65.02	67.16	69.38	71.63	74.05	76.45	79.04	81.60	84.27	87.07	89.94	92.91	95.95	99.14	102.44	105.73	109.28	112.90	116.65
5. PMU head quarter operation cost		3205.13						50.00	51.65	53.35	55.12	56.93	58.81	60.75	62.76	64.83	66.97	69.18	71.46	73.82	76.26	78.77	81.37	84.06	86.83	89.70	92.66	95.71	98.87	102.14	105.51	108.99	112.58	116.30	120.14	124.10	128.20	132.43	136.80	141.31	145.98	150.79
6. Pump replacement		128.26																48.81															79.45										
Sub-total		9872.55	0.00	0.00	54.50	84.41	95.51	148.04	152.93	158.12	163.41	168.83	174.33	180.09	186.03	192.18	198.37	254.38	212.20	219.04	226.05	233.98	241.38	249.03	257.73	265.81	274.88	284.32	293.11	303.09	313.24	323.62	413.85	345.52	356.83	368.44	380.55	392.96	405.62	419.52	432.93	447.71
C Gross Income (A-B)		10835.60	0.00	0.00	22.25	59.53	68.15	19.42	97.55	99.07	100.68	102.39	208.29	215.14	222.22	229.59	237.34	195.65	252.69	261.16	270.05	278.50	287.92	297.82	307.18	317.71	327.86	338.28	350.11	361.37	373.14	385.44	318.55	411.01	424.74	438.89	453.41	468.53	484.33	499.76	516.66	533.23
D Depreciation cost		11113.55						317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53
E Interest paid		3485.28	1.86	3.72	66.78	128.96	146.65	147.74	147.74	147.74	147.74	147.74	147.65	143.40	139.14	134.82	130.42	126.03	121.57	117.06	112.51	107.92	103.28	98.53	93.81	89.05	84.21	79.28	74.41	69.38	64.39	59.24	54.24	49.02	43.79	38.48	33.15	27.74	22.26	16.85	11.29	5.69
F Net Income		-3763.23	-1.86	-3.72	-44.53	-69.43	-78.50	-445.85	-367.72	-366.20	-364.59	-362.88	-256.89	-245.79	-234.45	-222.76	-210.61	-247.91	-186.41	-173.43	-159.99	-146.95	-132.89	-118.24	-104.16	-88.87	-73.88	-58.53	-41.83	-25.54	-8.78	8.67	-53.22	44.46	63.42	82.88	102.73	123.26	144.54	165.38	187.84	210.01
G Tax and duties		293.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.39	0.00	15.55	19.34	23.24	27.21	31.31	35.57	39.74	44.23	48.66
H Net Income after tax		-4056.47	-1.86	-3.72	-44.53	-69.43	-78.50	-445.85	-367.72	-366.20	-364.59	-362.88	-256.89	-245.79	-234.45	-222.76	-210.61	-247.91	-186.41	-173.43	-159.99	-146.95	-132.89	-118.24	-104.16	-88.87	-73.88	-58.53	-41.83	-25.54	-8.78	0.28	-53.22	28.91	44.08	59.64	75.52	91.95	108.97	125.64	143.61	161.35
OM Cost Recovery Ratio (A/B)		210%	0%	0%	141%	171%	171%	113%	164%	163%	162%	161%	219%	219%	219%	219%	220%	177%	219%	219%	219%	219%	219%	220%	219%	220%	219%	219%	219%	219%	219%	219%	177%	219%	219%	219%	219%	219%	219%	219%	219%	219%

PROJECTED CASH FLOW STATEMENT — **Unit: million AMD**

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
SOURCES OF FUNDS																																									
A Internal Cash Generation																																									
1. Net Income after tax	-4056.47	-1.86	-3.72	-44.53	-69.43	-78.50	-445.85	-367.72	-366.20	-364.59	-362.88	-256.89	-245.79	-234.45	-222.76	-210.61	-247.91	-186.41	-173.43	-159.99	-146.95	-132.89	-118.24	-104.16	-88.87	-73.88	-58.53	-41.83	-25.54	-8.78	0.28	-53.22	28.91	44.08	59.64	75.52	91.95	108.97	125.64	143.61	161.35
2. Depreciation cost	11113.55	0.00	0.00	0.00	0.00	0.00	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53	317.53
3. Interest Paid	3485.28	1.86	3.72	66.78	128.96	146.65	147.74	147.74	147.74	147.74	147.74	147.65	143.40	139.14	134.82	130.42	126.03	121.57	117.06	112.51	107.92	103.28	98.53	93.81	89.05	84.21	79.28	74.41	69.38	64.39	59.24	54.24	49.02	43.79	38.48	33.15	27.74	22.26	16.85	11.29	5.69
Sub-total	10542.36	0.00	0.00	22.25	59.53	68.15	19.42	97.55	99.07	100.68	102.39	208.29	215.14	222.22	229.59	237.34	195.65	252.69	261.16	270.05	278.50	287.92	297.82	307.18	317.71	327.86	338.28	350.11	361.37	373.14	377.05	318.55	395.46	405.40	415.65	426.20	437.22	448.76	460.02	472.43	484.57
B Finances																																									
1. Project Loan	14766.46	219.48	155.31	6338.92	6192.09	1801.14	33.48	26.04																																	
2. Local fund	5050.61	73.47	52.08	2146.48	2120.47	635.22	13.08	9.81																																	
Sub-total	19817.07	292.95	207.39	8485.40	8312.56	2436.36	46.56	35.85																																	
C Subsidy from Government																																									
1. Subsidy for community's O&M cost	202.20	0.00	0.00	8.94	7.52	7.99	8.05	3.43	3.58	3.73	3.91	1.82	1.88	1.95	2.01	2.06	26.27	2.25	2.30	2.37	2.49	2.54	2.61	2.70	2.79	2.88	3.03	3.06	3.19	3.30	3.40	42.74	3.68	3.76	3.88	4.01	4.15	4.24	4.44	4.52	4.72
2. Subsidy for debt services	7709.56	1.86	3.72	44.53	69.43	78.50	128.32	50.19	48.67	47.06	45.35	363.88	357.03	349.92	342.62	334.84	376.58	319.52	310.99	302.13	293.72	284.27	274.33	265.05	254.45	244.28	233.84	222.08	210.77	198.99	195.06	253.68	176.74	166.79	156.52	145.96	134.92	123.39	112.18	99.77	87.62
Sub-total	7911.76	1.86	3.72	53.48	76.96	86.49	136.37	53.62	52.25	50.79	49.26	365.70	358.91	351.87	344.63	336.90	402.85	321.77	313.29	304.50	296.21	286.81	276.94	267.75	257.24	247.16	236.87	225.14	213.96	202.29	198.46	296.42	180.42	170.55	160.40	149.97	139.07	127.63	116.62	104.29	92.34
Total Cash Inflow	38271.19	294.81	211.11	8561.12	8449.04	2591.00	202.35	187.02	151.32	151.47	151.65	573.99	574.05	574.09	574.22	574.24	598.50	574.46	574.45	574.55	574.71	574.73	574.76	574.93	574.95	575.02	575.15	575.25	575.33	575.43	575.51	614.97	575.88	575.95	576.05	576.17	576.29	576.39	576.64	576.72	576.91
APPLICATION OF FUNDS																																								
D Project disbursement	19817.07	292.95	207.39	8485.40	8312.56	2436.36	46.56	35.85																																	
E Total debt services																																									
1. Loan repayment	14766.64											424.52	428.77	433.00	437.39	441.76	446.20	450.64	455.09	459.67	464.30	468.91	473.62	478.42	483.11	487.93	492.84	497.78	502.76	507.74	512.87	517.99	523.18	528.40	533.69	539.01	544.40	549.89	555.35	560.91	566.50
2. Interest paid	3485.28	1.86	3.72	66.78	128.96	146.65	147.74	147.74	147.74	147.74	147.74	147.65	143.40	139.14	134.82	130.42	126.03	121.57	117.06	112.51	107.92	103.28	98.53	93.81	89.05	84.21	79.28	74.41	69.38	64.39	59.24	54.24	49.02	43.79	38.48	33.15	27.74	22.26	16.85	11.29	5.69
Sub-total	18251.92	1.86	3.72	66.78	128.96	146.65	147.74	147.74	147.74	147.74	147.74	572.17	572.17	572.14	572.21	572.18	572.23	572.21	572.15	572.18	572.22	572.19	572.15	572.23	572.16	572.14	572.12	572.19	572.14	572.13	572.11	572.23	572.20	572.19	572.17	572.16	572.14	572.15	572.20	572.20	572.19
Total Cash Outflow	38068.99	294.81	211.11	8552.18	8441.52	2583.01	194.30	183.59	147.74	147.74	147.74	572.17	572.17	572.14	572.21	572.18	572.23	572.21	572.15	572.18	572.22	572.19	572.15	572.23	572.16	572.14	572.12	572.19	572.14	572.13	572.11	572.23	572.20	572.19	572.17	572.16	572.14	572.15	572.20	572.20	572.19
F Net surplus cash (A+C2)-E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment Cost Recovery Ratio (%)																																								
By water fee (A/E)	58%	0%	0%	33%	46%	46%	13%	66%	67%	68%	69%	36%	38%	39%	40%	41%	34%	44%	46%	47%	49%	50%	52%	54%	56%	57%	59%	61%	63%	65%	66%	56%	69%	71%	73%	74%	76%	78%	80%	83%	85%
By water fee + subsidy ((A+C2)/E)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Hatch shows that water fees covers the investment costs partially.
Source: JICA Study Team, 2008

Table 13.2.9 **Phase 1** FIRR Calculation Results

A. FIRR CALCULATION **Unit: million AMD**

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A COST																																									
1. Investment Cost	14,535.47	213.92	152.88	5669.97	5879.37	2566.13	29.68	23.52																																	
2. Operation and Maintenance Cost																																									
Salary	902.88			23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76
Chlorine	694.54			7.76	15.38	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65	18.65
Electricity	349.68			4.34	3.70	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49	9.49
Mantenance cost	1,367.06			15.28	30.22	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71	36.71
Pump replacement	108.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total	3,422.15			51.13	73.06	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	142.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	142.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61
Total Outflow	17,957.62	213.92	152.88	5721.10	5952.43	2654.74	118.29	112.13	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	142.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	142.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61	88.61
B BENEFIT																																									
1. Water Tariff	17,719.12	0.00	0.00	88.36	168.59	203.69	209.27	330.06	339.77	349.89	360.19	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31	522.31
2. Subsidy	3,149.43	0.00	0.00	5.77	2.11	2.13	2.14	0.18	0.19	0.20	0.22	106.78	113.58	114.80	118.52	117.31	203.59	113.71	111.81	110.38	108.77	107.05	105.20	103.55	101.53	99.58	97.55	95.07	92.93	90.77	88.58	229.48	84.40	82.49	80.88	79.20	77.66	76.39	75.69	74.90	74.34
Total Inflow	20,868.55	0.00	0.00	94.13	170.70	205.82	211.41	330.24	339.96	350.09	360.41	629.09	635.89	637.11	640.83	639.62	725.90	636.02	634.12	632.69	631.08	629.36	627.51	625.86	623.84	621.89	619.86	617.38	615.24	613.08	610.89	751.79	606.71	604.80	603.19	601.51	599.97	598.70	598.00	597.21	596.65
NET BENEFIT	2,910.93	-213.92	-152.88	-5627.0	-5781.7	-2448.9	93.12	218.11	251.35	261.48	271.80	540.48	547.28	548.50	552.22	551.01	583.29	547.41	545.51	544.08	542.47	540.75	538.90	537.25	535.23	533.28	531.25	528.77	526.63	524.47	522.28	609.18	518.10	516.19	514.58	512.90	511.36	510.09	509.39	508.60	508.04
FIRR =	**0.93%**																																								

B. SENSITIVITY ANALYSIS

No.	Description	PV 1.75%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	1 Capital cost 10% up	-3,292.83	-235.3	-168.2	-6194.0	-6369.7	-2705.5	90.2	215.8	251.4	261.5	271.8	540.5	547.3	548.5	552.2	551.0	583.3	547.4	545.5	544.1	542.5	540.8	538.9	537.3	535.2	533.3	531.3	528.8	526.6	524.5	522.3	609.2	518.1	516.2	514.6	512.9	511.4	510.1	509.4	508.6	508.0
	2 Capital cost 20% up	-4,655.43	-256.7	-183.5	-6761.0	-6957.6	-2962.1	87.2	213.4	251.4	261.5	271.8	540.5	547.3	548.5	552.2	551.0	583.3	547.4	545.5	544.1	542.5	540.8	538.9	537.3	535.2	533.3	531.3	528.8	526.6	524.5	522.3	609.2	518.1	516.2	514.6	512.9	511.4	510.1	509.4	508.6	508.0
2	1 OM cost 10% up	-2,168.57	-213.9	-152.9	-5632.1	-5789.0	-2457.8	84.3	209.2	242.5	252.6	262.9	531.6	538.4	539.6	543.4	542.1	569.0	538.5	536.6	535.2	533.6	531.9	530.0	528.4	526.4	524.4	522.4	519.9	517.8	515.6	513.4	594.9	509.2	507.3	505.7	504.0	502.5	501.2	500.5	499.7	499.2
	2 OM cost 20% up	-2,406.91	-213.9	-152.9	-5637.2	-5796.3	-2466.6	75.4	200.4	233.6	243.8	254.1	522.8	529.6	530.8	534.5	533.3	554.8	529.7	527.8	526.4	524.7	523.0	521.2	519.5	517.5	515.6	513.5	511.0	508.9	506.7	504.6	580.7	500.4	498.5	496.9	495.2	493.6	492.4	491.7	490.9	490.3
3	1 Revenue 10% down	-3,338.15	-213.9	-152.9	-5636.4	-5798.8	-2469.5	72.0	185.1	217.4	226.5	235.8	477.6	483.7	484.8	488.1	487.0	510.7	483.8	482.1	480.8	479.4	477.8	476.1	474.7	472.8	471.1	469.3	467.0	465.1	463.2	461.2	534.0	457.4	455.7	454.3	452.7	451.4	450.2	449.6	448.9	448.4
	2 Revenue 20% down	-4,746.07	-213.9	-152.9	-5645.8	-5815.9	-2490.1	50.8	152.1	183.4	191.5	199.7	414.7	420.1	421.1	424.1	423.1	438.1	420.2	418.7	417.5	416.3	414.9	413.4	412.1	410.5	408.9	407.3	405.3	403.6	401.9	400.1	458.8	396.8	395.2	393.9	392.6	391.4	390.4	389.8	389.2	388.7

No.	Description	FIRR	Sensitivity indicator	Swiching value
1	1 Capital cost 10% up	0.44%	11.22	8.92%
	2 Capital cost 20% up	0.00%	8518.55	0.01%
2	1 OM cost 10% up	0.83%	1.27	78.46%
	2 OM cost 20% up	0.72%	2.94	34.01%
3	1 Revenue 10% down	0.28%	23.79	4.20%
	2 Revenue 20% down	-0.44%	-30.97	-3.23%

Source: JICA Study Team, 2008

Table 13.2.10 Phase 2 FIRR Calculation Results

A. FIRR CALCULATION — **Unit: million AMD**

Description	Total	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A COST																																									
1. Investment Cost	13,236.80	213.90	152.52	5786.73	5479.89	1548.89	30.69	24.18																																	
2. Operation and Maintenance Cost																																									
Salary	1,012.32			26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64	26.64
Chlorine	508.65			6.29	12.04	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62	13.62
Electricity	483.09			5.74	5.03	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12	13.12
Mantenance cost	1,353.70			15.83	31.79	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28	36.28
Pump replacement	60.00				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total	3,417.77			54.50	75.50	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	119.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	119.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66
Total Outflow	16,654.57	213.90	152.52	5841.23	5555.39	1638.55	120.35	113.84	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	119.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	119.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66	89.66
B BENEFIT																																									
1. Water Tariff	13,073.39	0.00	0.00	76.75	143.94	163.66	167.46	250.48	257.19	264.09	271.22	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62	382.62
2. Subsidy	4,921.03	0.00	0.00	8.94	7.52	7.99	8.05	3.43	3.58	3.73	3.91	169.56	181.23	180.35	178.64	180.19	208.20	176.90	175.55	172.75	170.46	168.50	166.46	164.96	162.75	161.22	159.78	157.54	155.94	154.17	152.22	217.18	148.13	145.97	143.83	141.77	139.67	137.68	136.12	133.82	132.33
Total Inflow	17,994.42	0.00	0.00	85.69	151.46	171.65	175.51	253.91	260.77	267.82	275.13	552.18	563.85	562.97	561.26	562.81	590.82	559.52	558.17	555.37	553.08	551.12	549.08	547.58	545.37	543.84	542.40	540.16	538.56	536.79	534.84	599.80	530.75	528.59	526.45	524.39	522.29	520.30	518.74	516.44	514.95
NET BENEFIT	1,339.85	-213.90	-152.52	-5755.5	-5403.9	-1466.9	55.16	140.07	171.11	178.16	185.47	462.52	474.19	473.31	471.60	473.15	471.16	469.86	468.51	465.71	463.42	461.46	459.42	457.92	455.71	454.18	452.74	450.50	448.90	447.13	445.18	480.14	441.09	438.93	436.79	434.73	432.63	430.64	429.08	426.78	425.29
FIRR =	**0.48%**																																								

B. SENSITIVITY ANALYSIS

No.	Description	PV 1.75%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	1 Capital cost 10% up	-3,940.59	-235.3	-167.8	-6334.2	-5951.9	-1621.8	52.1	137.7	171.1	178.2	185.5	462.5	474.2	473.3	471.6	473.1	471.2	469.9	468.5	465.7	463.4	461.5	459.4	457.9	455.7	454.2	452.7	450.5	448.9	447.1	445.2	480.1	441.1	438.9	436.8	434.7	432.6	430.6	429.1	426.8	425.3
	2 Capital cost 20% up	-5,183.85	-256.7	-183.0	-6912.9	-6499.9	-1776.7	49.0	135.2	171.1	178.2	185.5	462.5	474.2	473.3	471.6	473.1	471.2	469.9	468.5	465.7	463.4	461.5	459.4	457.9	455.7	454.2	452.7	450.5	448.9	447.1	445.2	480.1	441.1	438.9	436.8	434.7	432.6	430.6	429.1	426.8	425.3
2	1 OM cost 10% up	-2,935.61	-213.9	-152.5	-5761.0	-5411.5	-1475.9	46.2	131.1	162.1	169.2	176.5	453.6	465.2	464.3	462.6	464.2	459.2	460.9	459.5	456.7	454.5	452.5	450.5	449.0	446.7	445.2	443.8	441.5	439.9	438.2	436.2	468.2	432.1	430.0	427.8	425.8	423.7	421.7	420.1	417.8	416.3
	2 OM cost 20% up	-3,173.88	-213.9	-152.5	-5766.4	-5419.0	-1484.8	37.2	122.1	153.2	160.2	167.5	444.6	456.3	455.4	453.7	455.2	447.2	451.9	450.6	447.8	445.5	443.5	441.5	440.0	437.8	436.2	434.8	432.6	431.0	429.2	427.2	456.2	423.2	421.0	418.9	416.8	414.7	412.7	411.1	408.8	407.4
3	1 Revenue 10% down	-3,909.13	-213.9	-152.5	-5764.1	-5419.1	-1484.1	37.6	114.7	145.0	151.4	158.0	407.3	417.8	417.0	415.5	416.9	412.1	413.9	412.7	410.2	408.1	406.3	404.5	403.2	401.2	399.8	398.5	396.5	395.0	393.5	391.7	420.2	388.0	386.1	384.1	382.3	380.4	378.6	377.2	375.1	373.8
	2 Revenue 20% down	-5,120.92	-213.9	-152.5	-5772.7	-5434.2	-1501.2	20.1	89.3	119.0	124.6	130.4	352.1	361.4	360.7	359.3	360.6	353.0	358.0	356.9	354.6	352.8	351.2	349.6	348.4	346.6	345.4	344.3	342.5	341.2	339.8	338.2	360.2	334.9	333.2	331.5	329.9	328.2	326.6	325.3	323.5	322.3

No.	Description	FIRR	Sensitivity indicator	Swiching value
1	1 Capital cost 10% up	0.01%	869.72	0.11%
	2 Capital cost 20% up	-0.42%	-21.50	-4.65%
2	1 OM cost 10% up	0.36%	3.34	29.91%
	2 OM cost 20% up	0.24%	10.17	9.84%
3	1 Revenue 10% down	-0.17%	-37.84	-2.64%
	2 Revenue 20% down	-0.89%	-15.38	-6.50%

Source: JICA Study Team, 2008

CHAPTER 14 PILOT PROJECT

14.1 Objectives and Verification Items of the Pilot Project

14.1.1 Objective of the Pilot Project

The objective of the pilot project is the verification of the operation and maintenance (O&M) organization (Option 1) and the effectiveness of the rehabilitation work of the rural water supply systems.

14.1.2 Verification Items

(1) Verification Items for Technical Aspects

1) Contribution to the water supply volume/hour improvement

Improvement of water supply quantities and hours contributed by the rehabilitation works will be verified.

2) Freeze protection methods

Several kinds of freeze protection measures which are applicable at the rural communities will be conducted and verified.

3) Improvement of common practice of water usage by installation of water meters

The improvement of common practice of leaving the taps opened by installation of water meters and taps will be verified.

(2) Verification Items for O&M

1) Establishment of O&M organization and assignment of staff

The applicability of O&M organizations in the rural communities, staffing, and O&M activities will be verified.

2) Annual budget and cost for the O&M works

The applicability of O&M activities will be verified from the view point of annual budget and cost.

3) Water tariff setting and fee collection

The appropriateness of water fees setting and collection methods for sustainable O&M activities will also be verified.

4) Chlorination

The ability and sustainability of chlorination by O&M organization will be verified.

14.1.3 Selection of Pilot Project Sites and Verification Model

(1) Given Conditions for Selection

The conditions for selection of the pilot project communities were as follows:

1) The construction period of the pilot project should last for only two months in the summer of 2008, and the budget was limited since the pilot projects were planned during the M/P study period; and
2) The participating communities should be able and be willing to pay for the O&M costs.

(2) Basic Criteria for Selection

The basic criteria for selection of the pilot project communities were identified based on the objective and basic conditions mentioned above.

1) Scale which can be done in two months

- The installation of distribution pipes is limited to priority section which can be done in two months. The maximum length should be 1 km and the maximum diameter should be 150 mm.
- The population and number of households should be sufficient for the installation of the water meters at the house service connections (approximately 100 households).

2) Accessibility and location of the pilot projects

- Good accessibility for monitoring by the SCWS after completion of the construction is a priority criterion for selection.
- The priority communities selected are those with know-how and experience in system rehabilitation of distribution lines as wells as in the operation and maintenance of rural water supply system.

3) An adequate quantity of water and “Water Use Permit”

- The existing reservoir should be adequate to meet the water demand.
- The “Water Use Permit” shall be secured from the Water Resources Management Agency of the Ministry of Nature Protection.

(3) Outline of the Project Sites

1) No.19 Lchavan (Gegharkunik Marz) - for Administration Model 1

Lchavan community is located in the eastern part of Gegharkunik Marz which is about 65 km by the national highway and some local roads from Gavar, the center of Gegharkunik Marz. Its altitude is approximately 2050 m above sea level.

2) No.12 Apnagyugh (Aragatsotn Marz) - for Administration Model 2

Apnagyugh community is located in the eastern part of Aragatsotn Marz which is about 20 km from Ashtarak by the national highway. Its altitude is approximately 1800 m above sea level.

The major features of the pilot project rural communities are presented in Table 14.1.1.

Table 14.1.1 Major Features of the Pilot Project Sites

Model	Model 1	Model 2
Marz	Gegharkunik	Aragatsotn
Community	No.19 Lchavan	No.12 Apnagyugh
1. Population	700	785
2. Number of households	104	140
3. Water demand (m^3/d)	96.4	100.3
4. Water supply rate (m^3/d)	129.6	518.4
5. Existing water supply system	Pump Up	Gravity
1) Transmission pipe (m)	800	3,500
2) Distribution pipe (m)	4,000	3,150
6. Water fee	Flat rate	Free
7.O&M organization	No	No

Source: JICA Study Team, 2008

(4) Verification Model of O&M for the Pilot Project

The pilot project has two sets of models to verify the operation and maintenance of the water supply system by metered water fee.

1) Model 1: The community authority applies metered rate transferring from flat rate

Lchavan has been collecting flat rate for water fees. However, the beneficiaries are not satisfied with the present conditions due to poor O&M and irregular water supply. Therefore, it was necessary to establish an appropriate O&M system. Under this model, the improvement of the water use practices and system efficiency will be verified by installation of water meters and collection of metered water fee from each household.

2) Model 2: The community authority applies metered rate transferring from free water use

The water supply condition in Apnagyugh is by gravity flow system. However, some residents felt unfairness due to imbalanced water supply. There was insufficient hydraulic pressure at the end of the distribution pipes since the water taps in the community were always left opened. Therefore, it was necessary to establish an appropriate operation and maintenance system. Under this model the improvement of the water use practices and system efficiency was verified by installation of water meters and collection of metered water fee from each household.

14.2 Activities of the Pilot Project

(1) Public Hearings

In order to identify the opinion of the local residents on the appropriateness of implementing the pilot project, public hearings were held in Apnagyugh and Lchavan rural communities. Questions and opinions were gathered from the participants of the public hearings.

1) Public hearing in Apnagyugh community on April 29, 2008

The hearing was attended by JICA Study Team members, a representative from SCWS and 16 local residents, including the rural community head and all five members of Avagani (Rural Community Council). The SCWS representative explained the overall scope of the pilot project, including the responsibilities of the rural community. All participants assured their willingness to pay for water use based on the reading of water meters to be installed. There was a concern that water bill would be high during winter, since the residents are leaving the taps open in order to avoid freezing of water pipes. The JICA Study Team members informed the residents that they will consider the problem of and will recommend possible solutions for freezing of pipelines during winter time. (At a later date, the following solutions were affirmed: 1) installation depth of water pipes should be more than one meter in order to avert freezing, 2) isolation material should be provided on the service pipes, and 3) water meter chambers should also be packed by isolation materials and will be closed during the winter months from early November to end of March. Many persons requested to leave their taps open a little during winter season to avoid freezing of pipelines, and the water will be used for the animal husbandries that cannot drink water outside. The village authorities decided to allow it.)

2) Public hearing in Lchavan community on April 30, 2008

The hearing was attended by the JICA Study Team members, a SCWS representative and 14 local residents including the rural community head and two members of Avagani. The SCWS representative explained the overall scope of the pilot project and the responsibilities of the rural community. The residents were interested whether the tariff would be the same as in the five existing water supply companies of Armenia. The JICA Study Team members informed them that the tariff would be most likely lower than the rates set by the water supply companies. All local residents agreed on the implementation of the pilot project and assured their willingness to pay.

(2) O&M Organization Setup

The O&M management offices in Lchavan and Apnagyugh were established in June 2008 under rural community administration with support of the Community Field Officer (CFO). The CFOs for the two pilot communities were appointed by JICA Study Team in May 2008 to support the establishment of local O&M organization and O&M planning. The organizational chart of the O&M organization was approved by the community councils (Avagani) of both communities. It is shown in Figure 14.2.1.

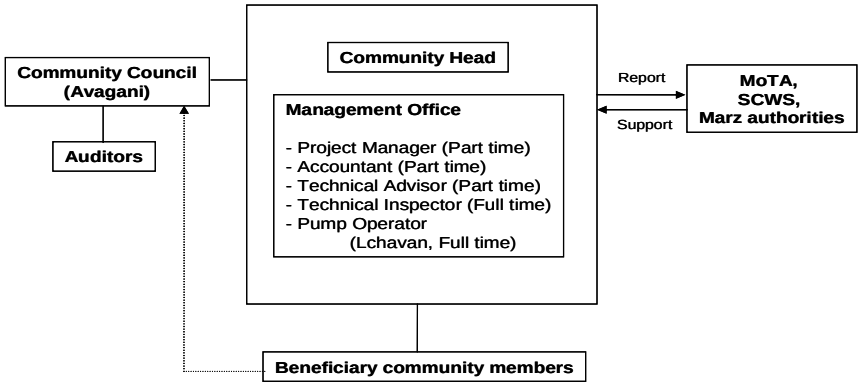


Figure 14.2.1 O&M Organization of the Pilot Project

Source: JICA Study Team, 2008

1) The community heads were appointed as Project Managers of management offices in Apnagyugh and Lchavan rural communities. Their responsibility is the overall supervision of all daily activities of the O&M organization.
2) The responsibility of the accountant, who also serves as an advisor to the project manager, is to prepare and submit all accounting documents of the O&M organization for auditing purposes. The accountant will receive, send and file all documents related to O&M activities.

3) The technical advisor is responsible for providing advice and recommendation to project management on technical matters of the O&M organization.
4) The technical inspector is in charge of reading water meters, preparation and distribution of billing statements, and collection of monthly water fees. The technical inspector is also in charge of inspecting the reservoir, water intake and pipelines on a regular basis. He is also responsible for the operation, monitoring and maintenance of the chlorine dosage of the water supply systems.
5) The pump operators in Lchavan O&M organization are responsible for the maintenance of water pump.

The O&M members of both communities were selected from the community staff and local residents based on joint discussions among the rural community and Avagani members, with the assistance of the CFOs.

Table 14.2.1 List of O&M Staff in Both Rural Communities

Lchavan		
Position of O&M Organization	Position in Community	Remarks
Project manager	Community head	Part-time without salary
Accountant	Community Accountant	
Technical Advisor	One from Community	
Technical Inspector	One from Community	Full-time with salary
Pump Operators	Two from Community	
Apnagyugh		
Position of O&M Organization	Position in Community	Remarks
Project manager	Community head	Part-time without salary
Accountant	Community Accountant	
Technical Advisor	One from Community	
Technical Inspector	One from Community	Full-time with salary

Source: JICA Study Team, October 2008

It is envisioned that the O&M organization will hold monthly management meetings to discuss pending items. Annual meetings will also be held during wherein the annual report of the O&M organization will be presented to the community council (Avagani) for approval. The annual report shall include the description of activities conducted, financial report, action plan and financial plan. The auditors for finance and technical performance of each pilot project communities were selected in November 2008 (after the election of new community councils on October 26, 2008).

(3) Implementation of the Construction Work

1) Implementation Policy

In both rural communities, 40-50% of households do not have house connections prior to implementation of the pilot project. One of the objectives of the pilot project is to connect these households to the existing distribution network. The volume of construction work for both projects was rather large and there was a risk of not completing the project on target date. To meet the target time for competion, the pilot project proposed to provide the pipe and isolation materials and JICA Study Team requested each household to install the service pipes by themselves. Both rural communities agreed to the proposal. Likewise, chlorine materials were provided for three months, which enabled both rural communities to have germ-free and hygienic condition of water immediately after completion of the pilot project.

2) Field surveys, design work, bidding, and selection of Contractor

The field surveys for Lchavan and Apnagyugh were conducted in April 2008. Preparation of the detailed design commenced in May 2008. The scope of work was explained to each rural community head after completion of the detailed design. Both rural communities agreed to the scope of work. After acceptance of the scope of work by the SCWS, the Study Team started the bidding process on May 29, 2008. Based on the results, the Contractor was selected on June 12, 2008.

3) Construction

The selected local contractor mobilized the equipment and materials to the sites in July 2008 and started the site work. The construction process went very smoothly in Lchavan, whereas in Apnagyugh, there was not enough cooperation from the local residents initially.

In July and August, there was no positive participation of residents in Apnagyugh rural community for the trench excavation for service pipe installation and three households were not in favor for water meter installation.

A second public hearing, which was held in Apnagyugh on August 28, 2008, was requested by JICA Study Team in order to discuss the issues related to the smooth implementation of the pilot project . The meeting was attended by representatives of Aragatsotn marzpetaran, SCWS, JICA Study Team members, head of Apnagyugh community, and 31 residents.

The meeting was opened by the head of Urban Construction Department of Aragatsotn Marzpetaran. He explained once again the purpose of the pilot project and the benefits it will bring to the community. The head of community stated that some people are against the implementation of the pilot project due to misunderstanding of the scope of the work, and most of the opponents already have 24-hour water supply. They opposed to the pilot project, and insisted on the necessity of rehabilitating the entire distribution network before installing the water meters. At the end of the meeting, it was decided to start immediately the digging of house service connections for those who are in favor of the implementation of the pilot project.

The construction works were completed by the end of September 2008 and the constructed facilities were handed over to the communities.

The scope of work of the pilot project is summarized in Table 14.2.2 below.

Table 14.2.2 Outline of Pilot Project Works

Community		Marz	Scope of Pilot Project	Work volume
19	Lchavan	Gegharkunik	1. Rehabilitation of distribution pipelines where house connection is not carried out.	
			1.1 Pipe diameter D=50mm with isolating material	600 m
			1.2 Pipe diameter D=32mm with isolating material	850 m
			2. Connection of service pipe to distribution pipelines for house connections	51 +32* units
			3. Construction of water meter chamber	100 unit
			4. Construction of chlorine equipment	1 unit
			5. Procurement works	
			5.1 PE pipe DN20mm for house connections	4000 m
			5.2 Isolating material for PE pipe	4000 m
			5.3 Chlorine agent	60 kg
12	Apnagyugh	Aragatsotn	1. Rehabilitation of distribution pipelines where house connection is not carried out	
			1.1 Pipe diameter D=50mm with isolating material	180 m
			1.2 Pipe diameter D=32mm with isolating material	150 m
			1.3 Pipe diameter D=25mm with isolating material	40 m
			2. Connection of service pipe to distribution pipelines for house connections	62+37* units
			3. Construction of water meter chamber	136 units
			4. Construction of chlorine equipment	1 unit
			5. Procurement works	
			5.1 PE pipe DN20mm for house connections	3000 m
			5.2 Isolating material for PE pipe	3000 m
			5.3 Chlorine agent	60 kg

Note: * The item 2 at Lchavan and Apnagyugh were executed in volumes more than the planned quantity due to the resident's request, by contractor's goodwill.

Source: JICA Study Team, 2008

(4) O&M Training and Capacity Building

1) Outline

Trainings were provided to the administrative staff of the O&M organization by CFOs in August and September 2008. The training portfolio include the methods of water fees introduction, development of water use regulations, collection of water fees, banking and financing functions, proper operation of the water supply system, etc.

2) Method

The O&M organization started recording of O&M documents from October 2008 using formats of O&M manual. The manual which was provided to the O&M staff includes management planning, O&M for pumped and gravity water supply systems, financial management, as well as various forms for financing, accounting, etc.

(5) Introduction of Water Tariff

The O&M organization members of both communities have estimated the tentative water tariff with guidance from the CFOs.

The water tariffs were approved by the community assemblies on 3 June 2008 at Lchavan and 20 May 2008 at Apnagyugh. The water tariffs were utilized from October 2008 after the completion of facility rehabilitation works.

1) Calculation Method

The basic approach for calculation of water fee is as follows:

a) Calculation of the cost of operation and maintenance (per month);
b) Estimation of the salary of staff members in O&M management office (per month);
c) Estimation of the amount of water to be used by beneficiaries (per month);
d) Calculation of the service costs per household (per month);
e) Consideration of the above mentioned costs as water fee; and
f) In case the cost is not applicable as water fee, the salary of the paid staff of O&M organization shall be reduced or deferred, after which the water tariff will be recalculated.

2) Calculation Result of Lchavan

The annual financial plan of Lchavan Water Supply O&M Organization for the period of October 2008-September 2009 is shown in Tables 14.2.3. The water tariff has been set at AMD 120/m^3.

Table 14.2.3 Annual Financial Plan of Lchavan Water Supply O&M Organization

(Unit: AMD)

Year and Month		Collected water tariff	Average monthly expenses	From which			Balance
				Operation expenses	Maintenance expenses	Salary	
2008	October	70,000	101,000	50,000	15,000	36,000	-31,000
	November	90,000	101,000	50,000	15,000	36,000	-11,000
	December	130,000	101,000	50,000	15,000	36,000	29,000
2009	January	140,000	121,000	55,000	20,000	46,000	19,000
	February	140,000	121,000	55,000	20,000	46,000	19,000
	March	140,000	121,000	55,000	20,000	46,000	19,000
	April	140,000	121,000	55,000	20,000	46,000	19,000
	May	130,000	111,000	50,000	15,000	46,000	9,000
	June	120,000	111,000	50,000	15,000	46,000	9,000
	July	120,000	111,000	50,000	15,000	46,000	9,000
	August	120,000	111,000	50,000	15,000	46,000	9,000
	September	120,000	111,000	50,000	15,000	46,000	9,000

Source: JICA Study Team, 2008

It is expected that during the first two months of O&M (October-November 2008), the collected water fee will be relatively small. Afterwards, it will gradually increase during the winter season.

The O&M organization plans that each household will leave the taps slightly open during the winter season in order to avoid freezing and obtain water for indoor animal husbandry. The organization will close all the water meter chambers and collect same monthly fee based on October billing. In the end of March of the following year, the organization will open the chambers and decide for additional water fee which should not exceed the budgeted monthly income from November to March. The community office will subsidize if the organization is in debt.

The salary of the technical inspector is comprised of a percentage of the water fee collected, in order to provide an incentive for the inspector to increase the water fee collection ratio.

Table 14.2.4 Average Monthly Income Plan of Lchavan Water Supply O&M Organization

Description	Unit	Quantity	Comments
Household Beneficiary	Nos	100	-
Average usage of water per household	m^3	10	-
Water tariff per m^3	AMD	120	
Water average monthly usage	m^3	1,000	100 household x10 m^3 = 1,000 m^3
Income total	AMD	120,000	AMD 120 x 1,000 m^3 =AMD 120,000

Source: JICA Study Team, 2008

Table 14.2.5 Monthly Expenses Plan of Lchavan Water Supply System O&M Organization

Description	Monthly usage (including accidents)	Unit price (AMD)	Monthly expenses	Comments
1.Operation expenses				
Electricity	1400 kW	25	35,000	for one engine (W=55 kW)
Chlorine agent	5 kg	2,000	10,000	
Other expenses	Lump Sum	5,000	5,000	include office equipment, stationary
		Sub total	50,000	
2.Maintainance expenses				
Pump station	1 pump	5,000	5,000	For current reconstruction works
Pipeline	50 m	200	10,000	For current reconstruction works
		Sub Total	15,000	
		Grand Total	65,000	

Note: Current reconstruction works are planned for maintenance of pump station, pipeline and reservoir.
Source: JICA Study Team, 2008

Table 14.2.6 Payments Plan to the Staff of Lchavan Water Supply System O&M Office

Description	Quantity	Monthly salary (unit, AMD)	Monthly salary (total, AMD)	Comments
Project manager	1	0	0	Voluntary Staff
Accountant	1	0	0	Voluntary Staff
Technical advisor	1	0	0	Voluntary Staff
Technical inspector	1	22,000	22,000	
Pump operators	2	12,000	24,000	
		Total	46,000	-

Source: JICA Study Team, 2008

2) Calculation Results of Apnagyugh

The annual financial plan of Apnagyugh water supply O&M organization for the period from October 2008 to September 2009 is shown in Table 14.2.7. The water tariff was set at AMD 20/ m^3. Based on initial assumptions, the payment collection ratio will be 50% in the first stage and will gradually reach 75-80% in September 2009.

Table 14.2.7 Annual Financial Plan of Apnagyugh Water Supply O&M Organization

Unit: AMD

Year and Month		Collected water tariff	Average monthly expenses	Breakdown of Expenses			Balance
				Operation expenses	Maintenance expenses	Salary	
2008	October	50,000	70,000	20,000	20,000	30,000	-2,000
	November	55,000	70,000	20,000	20,000	30,000	-15,000
	December	55,000	80,000	20,000	20,000	40,000	-25,000
2009	January	60,000	80,000	20,000	20,000	40,000	-20,000
	February	60,000	80,000	20,000	20,000	40,000	-20,000
	March	65,000	70,000	20,000	20,000	30,000	-5,000
	April	65,000	70,000	20,000	20,000	30,000	-5,000
	May	70,000	70,000	20,000	20,000	30,000	0
	June	70,000	70,000	20,000	20,000	30,000	0
	July	75,000	70,000	20,000	20,000	30,000	5,000
	August	75,000	70,000	20,000	20,000	30,000	5,000
	September	81,000	70,000	20,000	20,000	30,000	6,000

Source: JICA Study Team, 2008

As planned, each household will leave the taps slightly open during the winter season in order to avoid freezing. In this case, the water fee in winter (November to March) will be based on the actual water use in October. The additional cost in winter time is for the salary of repairing frozen pipes while the cost for operation will be increased.

As for the salary of the technical inspector, it is a percentage of the water fee collected similar to Lchvan.

Table 14.2.8 Average Monthly Income Plan of Apnagyugh Water Supply O&M Organization

Description	Unit	Quantity	Comments
Household Beneficiary	Nos	115	-
Companies/organization Beneficiary	Nos	6	-
Average usage of water per household	m^3	18	-
Average usage of water per organization	m^3	500	-
Water tariff per m^3	AMD	20	-
Average water use	m^3	5,070	115 household x 18 m^3 +6 organizations x 500 m^3 = 2,070 m^3+3,000 m^3=5,070 m^3
Income total	AMD	101,400	AMD 20 x 5,070 m^3 =AMD 101,400

Source: JICA Study Team, 2008

Table 14.2.9 Monthly Expenses Plan of Apnagyugh Water Supply System O&M Organization

Description	Monthly usage (including accidents)	Unit price (AMD)	Monthly expenses (AMD)	Comments
1.Operation expenses				
Chlorine agent	7 kg	2,000	14,000	-
Miscellaneous	Lump Sum	6,000	6,000	Note, copy, equipment, stationary
		Sub total	20,000	-
2.Maintainance expenses				
Pipeline	100 m	200	20,000	Including reservoir maintenance
		Sub Total	20,000	
		Grand Total	40,000	

Source: JICA Study Team, 2008

Table 14.2.10 Payment Plan for Apnagyugh Water Supply System O&M Office Staff

Description	Quantity	Monthly salary ,unit (AMD)	Monthly salary ,total (AMD)	Comments
Project manager	1	0	0	Voluntary Staff
Accountant	1	0	0	Voluntary Staff
Technical advisor	1	0	0	Voluntary Staff
Technical inspector	1	30,000	30,000	
		Total	30,000	

14.3 Monitoring of the Pilot Project

14.3.1 Methodology of Monitoring

A project monitoring survey was conducted in early November 2008 by interviewing the community head, O&M organization and 20 beneficiaries each from Lchavan and Apnagyugh. (Each community was subdivided into 20 blocks and one household was selected from each block.)

14.3.2 Technical Aspects

(1) Contribution to the water supply volume/hour improvement

1) Lchavan

Eighteen beneficiaries responded that the water supply amount and supply time have increased significantly. Specifically, five beneficiaries noted that water supply time has improved. It used to be 1-2 hours per every other day before the implementation of the pilot project, but it has changed to 15-24 hours per day.

2) Apnagyugh

Fifteen beneficiaries responded that the water supply amount and supply time have improved than before. Specifically, ten beneficiaries who live downstream of the distribution network noted that water supply time has improved from eight hours to 24 hours per day. Five beneficiaries who live near the reservoir answered that there is no change after installation.

(2) Freeze Protection Methods

Freeze protection methods were introduced to the beneficiaries in both communities by the community head and technical inspectors. It was decided that both communities will keep taps left slightly open in winter time to protect freezing of water taps during winter

season. They also instructed the beneficiaries to cover the water meter chamber with appropriate materials such as dung and used clothing to protect freezing of pipes and water meters. (It is desirable that the materials for filling are cost free and easily prepared. The use of dung is the traditional way of the local region. In case of dung utilization, JICA Study Team advised that the water meters should be protected by impervious material to avoid insanitation.) However, protection of outside taps was not considered well in Apnagyugh, and not well done in Lchavan.

1) Lchavan

Based on the result of interview survey, all 20 beneficiaries responded that they have plan to install some protections while three chambers are already protected. Some responded that they protected it using their experience before being instructed by the community head. For outside pipe, taps and service pipes, eight out of 20 beneficiaries used clothes or glass wools as isolation materials.

2) Apnagyugh

From the result of interview survey, 18 beneficiaries plan some protections, but not for outside taps and services pipes. Therefore, JICA Study Team requested the community head to provide further instructions to the beneficiaries.

(3) Improvement of Common Practice of Water Usage by Water Meters Installation

1) Lchavan

All the beneficiaries stop leaving their taps open when not in use. Furthermore, public tap was closed by the community.

2) Apnagyugh

Almost all beneficiaries stop leaving their taps open when not in use. However, public taps are still open in some places. As a result, some households use public tap instead of tap with water meter.

14.3.3 Operation and Maintenance (O&M)

(1) Establishment of O&M Organization and Assignment of Staff

1) Lchavan

Upon start of the pilot project, the O&M organization has been organized and activated. All staff has been working for operation and maintenance of water supply system since September 2008. The technical inspector and pump operator

work every day. Other members support and instruct them in case of need. Minor works are done by the residents through instructions from the O&M organization. Some water leakages are excavated and repaired by the residents with the assistance of the technical inspector. Therefore, the allocation of technical specialist for O&M is effective for the community.

2) Apnagyugh

There are only three members of the O&M organization because the system is simple gravity-type water supply system. The main tasks of the technical inspector are repairing pipeline leakages, reading water meters and collecting water fees. However, when the technical inspector is absent no one will replace him resulting to some delays in performing his duties. Even during the construction period, the absence of the technical inspector contributed to the delay in construction schedule.

(2) Annual budget for the O&M works

1) Lchavan

The actual money collected on the first month of operation was less than the planned amount and was used entirely to pay for pump electricity consumption. Therefore, no salary was paid to O&M staff. The actual amount of operation expense is AMD 40,000 for electricity of pump operation. The money collected was deposited to the community account separately from the general community account. It is necessary to revise either the water tariff or the current operating hours of the pumps in order to keep the balance of the budget. The community is planning to collect water fee above amount as monthly payment in winter time since the water meter chamber has already closed.

Table 14.3.1 Budget and Actual Amount of Lchavan

Units: AMD

Items	Planned amount	Actual amount of initial month	+ / -	Remarks
Collected water fee	70,000	50,000	-20,000	Collected amount was as of September 2008, collection ratio was 96%
Monthly expenses	101,000	40,000	-61,000	Total of the following 3 items
Operation expenses	50,000	40,000	-10,000	All amount was spent for electricity
Maintenance expenses	15,000	0	-15,000	No amount was spent for maintenance
Salary	36,000	0	-36,000	Technical Inspector and Pump operator did not receive their salary in September
Balance	-31,000	10,000	41,000	It will be used for repairing the burst pipe in November

Source: JICA Study Team 2008

2) Apnagyugh

The amount of collected money was only AMD 28,000. The technical inspectors did not receive salary. The money collected was deposited to O&M account, and was entirely used for the replacement in part of distribution pipeline in early November. In winter time, the community plans to collect water fees of October amount as monthly payment due to closure of the water meter chambers. It is expected that the O&M will be done based on the budget plan unless serious damage will occur in the water supply system.

Table 14.3.2 Budget of Apnagyugh

Items	Planned amount	Actual amount of initial month	+ / -	Remarks
Collected water fee	50,000	28,000	-22,000	Collected amount was as of October 2008, collection ratio was 72%
Monthly expenses	70,000	5,000	-65,000	The following total of three items
Operation expenses	20,000	0	-20,000	Nothing was spent
Maintenance expenses	20,000	5,000	-15,000	To buy some materials for repairing of pipes
Salary	30,000	0	-30,000	Technical Inspector did not receive his salary in October
Balance	-20,000	23,000	43,000	Deposit was remained, which was entirely used in November deposit for replacement of one pipeline

Source: JICA Study Team, 2008

(3) Water Tariff and Fee Collection

The results of water tariff and fee collection are summarized in the table 14.3.3.

Table 14.3.3 Summary of Water Tariff and Fee Collection

Item	Lchavan	Apnagyugh
Water tariff per m^3 (AMD)	120	20
No. of household/beneficially	100	136
No. of household invoiced (water system usage in October 2008)	79	120
No. of household paid	76	87
Water fee collection ratio (%)	96	72
Total amount of collected fee (AMD) per month	50,000	28,000
Average amount of water used per household per month (m^3)	6.1	12.3
Average amount of water fee per household per month (AMD)	732	246
Average amount of water used per person per day (L)	38	67

Source: JICA Study Team 2008

1) Lchavan

After the installation of water meters, the technical inspector took the initial reading on September 15, 2008 and the second reading was done on October 20, 2008. Out of 100 households in Lchavan, 79 households are invoiced while the remaining 21 households with water meters installed were not billed because they have not yet started to use water either because they are absent for long period or they take water from spring sources. The water fee was invoiced and collected by the technical inspector. Seventy-six households paid their bills or a collection ratio of 96%. The average amount of monthly water fee per household is about AMD 730.

From the results of interview survey, two households responded that they have not paid their water fees because they did not get the expected income and will pay after selling their agricultural products or when they get salary. Generally in early November, just after harvesting their potatoes, the residents have not much amount of money. After selling their products, they may get enough money to pay for water, electricity, gas and food.

The O&M organization collected water fees amounting AMD 50,000 in September. The accountant treated the collected money as separate income of O&M and separated it from the general community account. The cost of electricity for the pump in September was paid by the accountant using the collected money after approval of the project manager (community head) of O&M organization. The list of beneficiaries, invoices and receipts were prepared. However, these documents were not kept in the office and the accounting documents and balance sheet have not yet been prepared.

The average water consumption per day per person is 38.0 L while the average water consumption per month per household is 6.1 m^3 for Lchavan pilot project.

.

2) Apnagyugh

Initially, the community planned to collect water dues for the first month based on the meter reading from the beginning of October. However, some beneficiaries did not agree because they had not closed the taps yet after the installation of water meter. The technical inspector carried out the first reading on October 21, 2008 and the second reading was done on November 1, 2008. Finally, the amount of AMD 28,000 was collected as the three-fold amount of the 10-day fee as monthly

payment in October. The community planned to close all water meter chambers in the middle of November to protect them from freezing. Same amount of water fee in October will be applied for invoicing in winter time.

Out of 136 households, 120 households were invoiced while remaining 16 households were not because the beneficiaries were absent during the period. Water fee was invoiced orally and collected by the technical inspector. JICA Study Team prepared the invoices and receipts and handed it to him. The accountant managed the collected money as separate income of O&M and separated it from the general community account. Eighty-seven households paid during the two-week period and collection ratio was 72%. From the results of interview survey, two households have not paid water fee because they did not get the expected money in those days. They noted that they will pay when they get the money from their pension.

The entire amount was spent in the repairs of burst pipelines; therefore, the technical inspector could not get his salary in October. In this case, the community opined that they cannot subsidize the inspector's salary and his salary would be postponed. The technical inspector understood the opinion and agreed to get his salary in future through his O&M works. This is not a problem because he has another income. It is noted that the O&M organization prepared the list of beneficiaries, but invoices, receipts, accounting documents and balance sheet were not yet prepared. Even if they did not record the payment, the technical inspector only knows who paid or not based on his note book.

The average water consumption per day per person was 67.0 L while the average water consumption per month per household was 12.3 m^3 for Apnagyugh which is more than twice compared to Lchavan community. It seems that the beneficiaries in this community still have a habit for consuming too much amount of water.

(4) Chlorination

At present, there is no complaint regarding on hygienic condition in both communities. No drinking water related health problems were observed in the households (100%) during the last two years. (This was also confirmed by the rural community head). Some residents complain on the physical appearance of the supplied water.

1) Lchavan

An interview survey of water quality was conducted among 17 households on September 24-25, 2008 and the results of the survey are summarized as follows:

- Sometimes rust is seen in the water during the initial minutes of water supply (4 out of 17 households);
- Sometimes turbidity of water is observed (1 out of 17 households); and
- Water quality is very good (1 out of 17 household).

2) Apnagyugh

The interview survey of water quality for Apnagyugh was conducted among 15 households on September 26-27, 2008 and the results of the survey are summarized as follows:

- Sometimes rust is seen in the water during the initial minutes of water supply (10 out of 15 households); and
- Sometimes turbidity of water is observed (5 out of 15 households).

After the construction works were completed, the JICA Study Team together with the O&M organization of each community, conducted tests to measure the suitable amount of chlorine. After several trials and analysis by field kits, the amounts of chlorine were finally decided and agreed by all parties to be the suitable amounts for each water supply facility.

The residual chlorine ranges between 0.1 and 0.4 ppm at water taps after the tests for both communities. The amount of chlorine applied for each community is indicated in Table 14.3.4

Table 14.3.4 Amounts of Chlorination

Community	Amount of Chlorine (60% Calcium-hypochloride)	Remarks
Lchavan	90 to 100g / every other day	Equal to 18 to 20 tablets
Apnagyugh	110g / every other day	Equal to 22 tablets

Source: JICA Study Team, 2008

1) Lchavan

The pump operator is in charge for putting the right amount of chlorine and recording them based on the O&M manual. The CFO was able to calculate the amount for confirmation, to adjust the amount and to instruct the pump operator.

2) Apnagyugh

In the case of Apnagyugh, the technical inspector is in charge for chlorination; however, he did not take records of the chlorine amount. Confirmation of the amount of chlorine will be done by the Health Department twice a month, and it will be decided whether the amount of chlorine is appropriate.

14.4 Evaluation and Analysis of the Pilot Project

14.4.1 Evaluation

(1) Contribution to water supply volume/hour improvement

Increase of water supply duration, pressure and quantity was observed in both communities after installation of the water meters. In Lchavan, the water supply duration was significantly increased from 2 hours/every other day to 15-24 hours/day. Even in Apnagyugh wherein the system is natural gravity flow, the water supply duration has improved from 8 hours to 24 hours per day. Therefore, it is evaluated that the installation of water meters and water taps at each household contributed to the increase of water supply duration and amount.

(2) Freeze protection methods

The actual effect of the methods used will be evaluated by SCWS in the future.

(3) Improvement of common practice of water usage by water meters installation

After installation of the water meters, almost all beneficiaries in both communities stopped leaving the taps open when not in use. The public tap was closed in Lchavan community. It is evaluated that the water meter installation contributed to the change of residents' behavior in terms of water utilization.

(4) Establishment of O&M organization and assignment of staff

The O&M organizations have been established in both communities and have been effectively working in terms of meter reading and water fee collection. The scale of organization and allocation of specialists for the daily activities are deemed suitable for the water supply systems of both communities. However, the record keeping arrangement of various O&M data is insufficient in Apnagyugh. They do not entirely appreciate and understood the importance of data recording and keeping for O&M organization.

(5) Annual budget for the O&M works and the entire project cost

Both communities planned their budget for O&M with the assistance of the Community Field Officers (CFOs) and the JICA Study Team with regards to the initial water fee collection. However, the collected amount was less than planned. Therefore, the salaries for the technical inspector and pump operators were not paid in Lchavan. It is necessary to review and evaluate the planned budget and water tariff rate after three months, six months and one year. The Lchavan O&M organization has proposal of posting the balance of water fee collection and expenditures on the bulletin board of the community administration office.

(6) Water tariff and fee collection

The water tariff rate for each community was was decided by the respective community councils. In both communities, the first water fee collection was carried out in the beginning of November. Collection ratio in Lchavan and Apnagyugh was 84% and 66% respectively. The reason of unpaid water fee is shortage of money on the collection day. The collection ratio in Lchavan and Apnagyugh were increased up to 96% and 76%, respectively in mid November. It is evaluated that the beneficiaries of both communities recognized the obligation of payment through the explanation and guidance of their respective CFO and O&M organization.

(7) Chlorination

Both communities decided appropriate dosing quantity of chlorination supported by the JICA Study Team and CFO. The cost for chlorination is included in the O&M budget, and chlorine is available at neighboring cities.

14.4.2 Comparison and Analysis of the Pilot Communities

(1) Understanding of community members and leadership of community head

During the construction period, the community head in Lchavan provided close communication to each household. He participated in site confirmation works to the extent possible to explain to the concerned beneficiaries. In Apnagyugh, the work mainly depended on the technical inspectors and the community head who have little knowledge on the details of water fee collection. The reason might be due to the fact that there are no serious water supply issues in Apnagyugh compared to Lchavan. Even in simple gravity water supply system, like in Apnagyugh, the leadership of the community head is very important not only in the O&M stage, but also during the establishment of O&M organization and the construction stage.

(2) Water fee collection ratio

The water fee collection ratio in Lchavan reached up to about 96%. In the case of Apnagyugh, water fee collection ratio was only about 72%. The differences are based on the improvement of water supply conditions after installation of taps and water meters. The installation of household taps and water meters has been very convenient in both communities. The water supply duration in Lchavan has dramatically changed after the installation of taps and water meters. The water supply volume and duration in Apnagyugh has improved in some areas after the installation of taps and water meters while some households experience no improvement. It is this scenario that contributed to the higher water collection ratio in Lchavan than in Apnagyugh. The water collection ratio in Apnagyugh is higher than the existing water companies at the initial stage of water fee collection. The water tariff of Apnagyugh is reasonable for the beneficiaries for a pilot project with the condition of partial rehabilitation of transmission/service pipes and chlorination system without repaying the project funds.

(3) Water consumption

The water consumption rate of Lchavan (38 L/c/d) is about 56% of Apnagyugh (67 L/c/d). It is presumed that the beneficiaries of Lchavan have less water consumption due to the fact that they are used to having insufficient water supply and hence, they are more economical in water use practice. In addition, the higher water tariff in Lchavan (AMD 120/m3) also contributed on the water consumption rate. The residents in Apnagyugh have not encountered any serious water shortage so that water consumption rate of Apnagyugh is reasonable for them.

14.5 Recommendations for O&M Organizations of the Proposed Rural Water Supply Project

Based on lessons learned on the pilot projects, it is recommended that the following programs be applied to the proposed rural water supply project to be managed by the local organization.

(1) Agreement for project preparation from community members

Most of the existing rural water supply systems are gravity flow systems without pump operation cost. The case of Apnagyugh (Model 2) should be considered for the implementation of O&M in these communities. Public hearings should be conducted and recommendations for project implementation should be approved by the community council. The scope of work of the project should be properly explained to the community members to avoid misunderstandings during project implementation.

Unlike Apnagyugh, the residents of Lchavan (Model 1) fully understood and cooperated with the project because they were facing shortage of water supply at that time. In this kind of situation, the community members must submit agreement for the project and for water fee collection based on water meter record. The project should be started only when the submission of agreement reaches 80% of the entire households. This is the break-even value wherein the expected water fee collection will be sufficient to cover for the O&M expenses and repayment of loan amounts. The project will be suspended if the agreement did not reach the 80% mark. The community head will be responsible for explaining the project's benefits to the members and garnering the 80% target. Ultimately, the collection ratio will gradually increase through the combined effort of the O&M staff with the guidance and assistance of PIU and SCWS.

(2) Support for establishment of O&M organization by SCWS and marz

The management of the rural water supply is a responsibility of the community. However, there is no formal organization at present that manages the water service in any community. It is being managed by the rural community head. To provide a long-term operation and maintenance of the water supply facilities, the establishment of O&M organization for each rural community is deemed necessary. The establishment of the O&M organizations should emanate from the community head and the community council with the guidance and assistance from the concerned PIU, SCWS, CFO and marz office whenever necessary. The SCWS and marz office should monitor the current rural water supply project, plan the rehabilitation within the future loan project, and encourage the establishment of the O&M organizations.

(3) Training and capacity building of O&M organization

In the initial stage of project implementation, the O&M organization should be responsible for arrangement and coordination of construction works. Trainings of O&M staff should be conducted during the period of construction to make them ready for O&M works upon completion of construction. Manuals for operation, maintenance, finance, accounting, reports, forms, etc. should be provided to the staff. The training should be conducted by the Community Field Officers (CFOs) who are appointed by the PIU consultant. (It is included in the cost for the future program implementation). The following requirements are recommended for the selection of CFOs:

- He should have an experience in operation and maintenance of Water User Association (WUA) or a working experience in NGO and/or NPO for community development; and
- He should be familiar with the project site and residing near the community area.

(4) Securing sustainable O&M

When wages of paid staff (technical inspectors and pump operators) are unpaid due to tight financial situation, the staff might not be motivated and O&M is no longer sustainable. In order to keep their motivation, the O&M organization should set a minimum monthly basic wage and percentage share that corresponds to collection ratio or total amount of collected water fee.

(5) Recommendations for planning and management for rehabilitation works

After the installation of water taps, pouring water was decreased, water runoff on the road had also decreased, and erosion and muddy condition of gravel/earth road had improved. Furthermore, the decrease of pouring water may decrease landslide activities in landslide risk areas. These benefits may contribute to promoting the residents' participation and cooperation for the project.

In areas where the service pipes pass through agricultural fields, the works were postponed until after potato harvest season because some land owners did not allow the excavation. Planning of pipeline route should consider the land use in the area. If it is inevitable for water pipes to be installed on agricultural lands, construction work schedule for water pipes installation should take into consideration the timing of agricultural activities.

In Apnagyugh, some water chambers, near the area where there is pipe leakage, were filled with water and water cannot drain due to impervious soil condition. The leakage should be repaired first, but if it is difficult, chambers should be constructed far from the leakage portion or on the ground with banking.

Chlorination facility should be installed at the intake tank of pump station for pumping systems when accessibility to distribution reservoir is difficult during snow/cold seasons. This is the installation method applied to Lchavan.

14.6 Environmental and Social Considerations of the Pilot Project

14.6.1 Scoping for Environmental and Social Considerations

The scoping was conducted for the expected impacts of the pilot project and mitigation measures. The scoping was made using the format of the "Guidelines for Environmental and Social Consideration" (JICA, April 2004). The results of the scoping of Lchavan and Apnagyugh rural communities are presented in Table 14.6.1.

Table 14.6.1 Scoping of the Environmental and Social Impact Study of the Pilot Project in Lchavan and Apnagyugh

Environmental Items			Rating	Remarks
Social Environment	1	Resettlement	D	No need for any resettlement due to rehabilitation of existing small scale water supply facilities.
	2	Economic Activities	D	No negative impact by the rehabilitation project.
	3	Traffic/ Public Facilities	D	No traffic jams during the construction because no large scale construction using heavy construction machines is expected.
	4	Split of Communities	D	Pipe diameter is less than 50mm, no split of local area.
	5	Cultural Property	D	No cultural property in both communities.
	6	Water Rights and Rights of Common	D	Water rights for intake (spring) of both communities were confirmed
	7	Public Health Conditions	D	Water supply system provision will improve public health.
	8	Waste	B	No surplus soil will be generated because pipe diameter is less than 50mm.
	9	Hazards (Risks)	D	No landslide areas are located in both communities.
Natural	10	Topography and Geology	D	Pipe diameter is less than 50mm, no need to transform of topography
	11	Soil Erosion	D	No particular soil erosion is expected due to no surplus water will be produced during the pilot project work.
	12	Groundwater	D	No large-scale groundwater pumping will be undertaken
	13	Hydrological Situation	D	No change in river drainage system in both communities
	14	Coastal Zone	D	Both communities are inland areas
	15	Fauna and Flora	D	Pipe diameter is less than 50mm, no change in ecosystem,
	16	Meteorology	D	No impact is assumed due to the small scale water supply systems.
	17	Landscape	D	No large scale building construction.
Pollution	18	Air Pollution	D	No significant air pollution sources
	19	Water Pollution	D	Not produced materials for water pollution
	20	Soil Contamination	D	Not produced materials for soil pollution
	21	Noise and Vibration	D	No large scale construction expected using heavy machinery
	22	Land Subsidence	D	No large scale groundwater pumping will occur.
	23	Offensive Odor	D	No particular odor is expected from water supply facilities.

Note: Evaluation categories

A: serious impact is expected, B: some impact is expected, C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progress), D: No impact is expected. IEE/EIA is not necessary.

Source: JICA Study Team, 2008

14.6.2 Summary of Environmental and Social Impacts Consideration Due to Pilot Project and Mitigation Measures

As a result of scoping of the pilot project, no impact was expected in Lchavan and Apnagyugh, except on “waste”. This is due to the fact that the rehabilitation scale and

work volume in the pilot projects in both communities are very small and the work items are similar. Summary of impacts due to pilot project, mitigation measures and monitoring plan are shown below.

(1) Lchavan

Table 14.6.2 Mitigation and Monitoring Plan of the Pilot Project in Lchavan

Environmental Item	Waste
Rating	B
Impact	Generating waste soil from excavating the trench for pipe installation.
Conditions	• Distribution pipe diameter is less than 50mm, total length of distribution is 1,400m, • Service pipe diameter is 20 mm, total length of service pipe is 4,000 m.
Mitigation measures	Excavated soil was used mainly as backfill material during construction work of trench for pipes.
Monitoring plan	Check the surface of excavated lines after construction, No surplus soil will be produced because pipe diameter is less than 50mm.

Source: JICA Study Team, 2008

(2) Apnagyugh

Table 14.6.3 Mitigation and Monitoring Plan of the Pilot Project in Apnagyugh

Environmental Item	Waste
Rating	B
Impact	Generating waste soil from excavating the trench for pipe installation.
Conditions	• Distribution pipe diameter is less than 50mm, total length of distribution is 370 m, • Service pipe diameter is 20 mm, total length of service pipe is 3,000 m.
Mitigation measures	Excavated soil was used mainly as backfill material during construction work of trench for pipes.
Monitoring plan	Check the surface of excavated lines after construction, No surplus soil will be produced because pipe diameter is less than 50mm.

Source: JICA Study Team, 2008

CHAPTER 15 CONCLUSIONS AND RECOMMENDATIONS

15.1 Conclusions

1) Out of 153 surveyed communities, 149 communities were selected for the proposed project -- 61 communities in Aragatsotn Marz, 32 in Shirak Marz, 45 in Gegharkunik Marz, and 11 in Tavush Marz. The estimated population to be served by the project is 190,000. The estimated daily average water demand for all communities is 19,000m^3/day.

2) The majority of the existing rural water supply systems were constructed during the Soviet Union era. These are not properly maintained and water supply is inadequate. Pipelines are damaged in several places. In addition, water taps are not installed in most public and house connections resulting to water shortage for communities in the downstream areas. Therefore, rehabilitation works should be programmed as soon as possible .

3) A project with the following components is proposed for immediate implementation in order to improve the present water supply conditions.

- Rehabilitation of existing systems: The old and deteriorated intakes, transmission pipes, reservoirs, and distribution pipes will be rehabilitated.
- Installation of house connections and water meters: The water supply taps and the water meters will be installed at all households to collect the water fee in the target communities. The operation and maintenance of water supply facilities and recovery of the project cost will be covered by the water fees.
- Installation of disinfection facilities: Chlorination facility will be introduced at each distribution reservoir according to the regulation of the Department of Health.

4) The project cost estimates for Phase 1 and Phase 2 are as follows:

Component	Phase 1		Phase 2	
	AMD x10^6	USD x10^6	AMD x10^6	USD x10^6
Loan Portion	16,277	53.28	14,767	48.33
Local Portion	6,744	22.07	6,127	20.05
Total Cost	23,021	75.35	20,894	68.39

5) Since the project communities are dispersed in four marzes and the total project cost estimates are large amounts, implementation in two phases is recommended. Phasing was done considering the urgency, efficiency, and cost balance between

phases. As a result, the first phase consists of Gegharkunik Marz and Tavush Marz while Aragatsotn and Shirak Marz are included in the second phase.

6) Water tariff rate schedules were calculated for the cost recovery analysis. The water rate starts from the willingness to pay result (AMD 40/m^3), increases up to 3% of the average household income (AMD 70/m^3) on the 7th year and reaches the water tariff of the AWSC (AMD 115.65/m^3) on the 11th year. Based on the study, 140 rural communities (or 94% of total communities) can sustain the annual O&M costs while 47 rural communities (or 32%) can repay all the investment costs.

7) Both phases require government subsidy of 2% of the total revenue to sustain the O&M costs. Phase 1 requires the government subsidy from 3rd to 10th year and on the pump replacement years amounting to AMD 207.6 million in total for 40 years. Phase 2 requires government subsidy for the whole calculation period amounting to AMD 202.2 million in total for 40 years.

8) Phase 1 requires government subsidy of 15% of the total revenue for the investment costs. The government subsidy is required from 1st to 6th year and from 11th to 32nd year amounting to AMD 3,689.3 million in total. The surplus cash will be generated from 7th to 10th years and after 33rd year amounting to AMD 736.3 million in total. In Phase 2, the required subsidy is 42% of the total revenue for the investment costs. The government subsidy is required for the whole calculation period amounting to AMD 7,709.6 million in total. No surplus cash is generated over the 40-year cash flow projection.

9) The FIRR for Phase 1 and Phase 2 have positive figures of 0.93% and 0.48% in the financial evaluation while the EIRR of Phase 1 and Phase 2 are 15.71% and 11.60% in the economic evaluation. EIRR values are almost equivalent to 12%, normally applying to other development projects.

10) The water fee collection ratio has the most significant impact for the project's viability so that high water fee collection ratio is required during the project implementation.

11) Ensuring reliable supply of safe water in adequate volume is a challenge to meet one of the basic human needs. However, water supply conditions in the study area are unsatisfactory. Therefore, the execution of the project foresees social and economic benefits to the residents in the communities.

12) Each community is responsible for O&M of its own water supply facilities. However, there is neither an organization nor a system that manages the rural water supply facilities. It is managed according to the ability of the rural community

heads. The water in majority of the villages is currently free of charge. The residents' awareness on the O&M of water supply facilities is very low.

13) To enable a sustainable operation of water supply facilities, it was proposed to establish internal O&M organizations in the communities. The community head is responsible for managing the operation and maintenance of the rural water supply system.

14) The O&M organization in the community is important for the project implementation. Therefore, verification of the roles and functions of management and the O&M organization was carried out by the pilot project.

15) According to the pilot project, increased service hours, service pressure and quantity was confirmed in both communities after installation of the water meters. Especially in Lchavan, water supply duration was significantly increased from two hours per every other day to 15-24 hours per day. Even in Apnagyugh with natural gravity flow water supply system, duration was improved from eight hours to 24 hours per day. Therefore, it is evident that the installation of water meters and water taps in all households contributes to the improvement of water supply service level.

16) In both communities, the first water fee collection within the pilot project was carried out at the beginning of November. Collection ratio in Lcavan was 84% and was 66% in Apnagyugh. The reason of unpaid water fee is shortage of money on the collection day. The beneficiaries of both communities recognized the obligation of payment. Therefore, the collection ratios in Lchavan and Apnagyugh were increased to 96% and 72%, respectively in mid November.

15.2 Recommendations

The SCWS is responsible for the implementation of rural water supply services in Armenia. The community heads are responsible for their community under the direction and supervision of SCWS. The SCWS should clarify the role and the range of responsibility of SCWS and community heads prior to execution of the project.

1) The SCWS should commence immediately the loan application procedures for project implementation.

2) After completion of the Study, the SCWS should submit the Final Report to MONP for IEE level assessment of the Project.

3) The Project Implementation Unit (PIU) should be established in the SCWS for project implementation. When the project is executed, the implementing agency should be the SCWS under the Ministry of Territorial Administration.

4) It is recommended that each household in the communities should submit agreement for the project and water fee collection according to water meter record after public hearings for arrangement of the project. When the submission of agreement reaches 80% of all households, project implementation should be started. If it does not reach the agreement of 80%, the project should be suspended.

5) The O&M organization should be established during the detailed design stage in a community. It is necessary to understand the purpose of the project and cost bearing by beneficiaries when the project is executed. Based on the proposed operation and maintenance program, there must be a properly established and recognized O&M organization of water supply facilities in a community, responding directly to a community head.

6) The training and capacity building of O&M organization of communities should be carried out by Community Field Officers (CFOs) to be appointed by the PIU. The following requirements are recommended for selection of CFOs:

- He should have an experience in operation and maintenance of Water User Association (WUA) or a working experience in NGO and/or NPO for community development; and
- He should be familiar with the project site and residing near the community area.

7) It is recommended that the regulations governing the water supply management at each community should be established to ensure the community based operation and maintenance works.

8) The residents and related local agencies (marz and community) should show self-help efforts for the establishment of management and O&M organization.

9) The PIU and its consultant should review the conditions of the existing facilities in each community at the beginning of the detailed design stage. There are no available proper drawings of the existing facilities in the communities.

APPENDIX 1 — List of Rural Communities

Appendix 1 – List of Rural Communities

Aragatsotn Marz

No.	***Name in English***	District	Armenian	Russian
1	Akunq	1	Ակունք	Акунк
2	Aghdzq	2	Աղձք	Ахдзк
3	Antarut	2	Անտառուտ	Антарут
4	Ashnak	1	Աշնակ	Ашнак
5	Avan+Khnusik	2	Ավան+Խնուսիկ	Аван+Хнусик
6	Avtona	1	Ավթոնա	Автона
7	Avshen	3	Ավշեն	Авшен
8	Aragats	4	Արագած	Арагац
9	Aragats	1	Արագած	Арагац
10	Arayi	4	Արայի	Ара
11	Arteni	1	Արտենի	Артени
12	Apnagyugh	4	Ափնագյուղ	Апнагюх
13	Baysz	1	Բայսզ	Байсз
14	Byurakan	2	Բյուրական	Бюракан
15	Garnahovit	1	Գառնահովիտ	Гарнаовит
16	Geghadir	3	Գեղադիր	Гехадир
17	Gegharot	3	Գեղարոտ	Гехарот
18	Getap	1	Գետափ	Гетап
19	Davtashen	1	Դավթաշեն	Давташен
20	Derek	3	Դերեկ	Дерек
21	Dian	1	Դիան	Диан
22	Yeghipartush	4	Եղիպատրուշ	Ехипатруш
23	Yeghnik	1	Եղնիկ	Ехник
24	Yernjatap	4	Երնջատափ	Ернджатап
25	Nor Yedesia	2	Նոր Եդեսիա	Нор Едесиа
26	Zovasar	1	Զովասար	Зовасар
27	Ttujur	4	Թթուջուր	Ттуджур
28	Tlik	1	Թլիկ	Тлик
29	Irind	1	Իրինդ	Иринд
30	Lernapar	3	Լեռնապար	Лернапар
31	Lernarot	2	Լեռնարոտ	Лернарот
32	Lusagyugh	4	Լուսագյուղ	Лусагюх
33	Lusakn	1	Լուսակն	Лусакн
34	Tsaghkahovit	3	Ծաղկահովիտ	Цахкаовит
35	Tsaghkashen	4	Ծաղկաշեն	Цахкашен
36	Tsilqar	3	Ծիլքար	Цилкар
37	Katnaghbyur	1	Կաթնաղբյուր	Катнахбюр
38	Karmrashen	1	Կարմրաշեն	Кармрашен
39	Kaqavadzor	1	Կաքավաձոր	Какавадзор
40	Hartavan	4	Հարթավան	Артаван
41	Dzoraglukh	4	Ձորագլուխ	Дзораглух
42	Dzoragyugh	1	Ձորագյուղ	Дзорагюх

No.	***Name in English***	District	Armenian	Russian
43	Meliqgyugh	3	Մելիքգյուղ	Меликгюх
44	Miraq	3	Միրաք	Мирак
45	Mulqi	4	Մուլքի	Мулки
46	Nigavan	4	Նիգավան	Нигаван
47	Norashen	4	Նորաշեն	Норашен
48	Norashen	3	Նորաշեն	Норашен
49	Shenavan	4	Շենավան	Шенаван
50	Shgharshik	1	Շղարշիկ	Шраршик
51	Vosketas	1	Ոսկետաս	Воскетас
52	Chqnagh	4	Չքնաղ	Чкнах
53	Jamshlu	3	Ջամշլու	Джамшлу
54	Saralanj	4	Սարալանջ	Сараланж
55	Sipan	3	Սիփան	Сипан
56	Vardenis	4	Վարդենիս	Варденис
57	Vardenut	4	Վարդենուտ	Варденут
58	Verin Sasunik	2	Վերին Սասունիկ	Верин Сасуник
59	Tegher	2	Տեղեր	Техер
60	Orgov	2	Օրգով	Оргов
61	Ortachya	3	Օրթաճյա	Ортачья

District		
1	Talin	21
2	Ashtarak	9
3	Aragats	13
4	Aparan	18
	Total	61

Shirak Marz

No.	***Name in English***	District	Armenian	Russinan
1	Alvar	1	Ալվար	Алвар
2	Aghvorik	1	Աղվորիկ	Агворик
3	Ardenis	1	Արդենիս	Арденис
4	Arpeni	2	Արփենի	Арпени
5	Bandivan	2	Բանդիվան	Бандиван
6	Bashgyugh	2	Բաշգյուղ	Башгюх
7	Garnaritch + Yeghnajur	1	Գառնառիճ+Եղնաջուր	Гарнарич + Ехнаджур
8	Kamkhut	1	Կամխուտ	Камхут
9	Zari Shat	1	Զարիշատ	Заришат
10	Zorakert+Darik	1	Զորակերտ+Դարիկ	Зоракерт+Дарик
11	Lernakert	5	Լեռնակերտ	Лернакерт
12	Lernut	3	Լեռնուտ	Лернут
13	Tsaghkut	1	Ծաղկուտ	Цахкут
14	Kamo	3	Կամո	Камо
15	Karmraqar	3	Կարմրաքար	Кармракар
16	Kaqavasar	2	Կաքավասար	Какавасар
17	Krashen	3	Կրաշեն	Крашен

No.	***Name in English***	District	Armenian	Russinan
18	Krasar	2	Կրասար	Красар
19	Mayisyan Kayaran	3	Մայիսյան կայարան	Маисян Кайаран
20	Hovit	3	Հովիտ	Овит
21	Dzorashen	2	Ձորաշեն	Дзорашен
22	Akhuryan Kayaran	3	Ախուրյան կայարան	Ахурян Кайаран
23	Mets Sariar	2	Մեծ Սարիար	Мец Сариар
24	Musaelyan	3	Մուսայելյան	Мусаелян
25	Shaghik	1	Շաղիկ	Шахик
26	Shirak	3	Շիրակ	Ширак
27	Pemzashen	5	Պեմզաշեն	Пемзашен
28	Jajur	3	Ջաջուռ	Джаджур
29	Jajur Kayaran	2	Ջաջուռ կայարան	Джаджур Кайаран
30	Jrarat	3	Ջրառատ	Джрарат
31	Sarnaghbyur	5	Սառնաղբյուր	Сарнахбюр
32	Sarapat	2	Սարապատ	Сарапат
33	Sizavet	2	Սիզավետ	Сизавет
34	Tzoghamarg	2	Ցողամարգ	Цохамарг
35	Poqr Sariar	2	Փոքր Սարիար	Покр Сариар

District		
1	Amasia	9
2	Ashotsk	12
3	Akhurian	11
4	Ani	-
5	Artik	3
	Total	35

Gegharkunik Marz

No.	***Name in English***	District	Armenian	Russian
1	Akunq	1	Ակունք	Акунк
2	Aghberq	5	Աղբերք	Ахберк
3	Aygut	5	Այգուտ	Айгут
4	Ayrq	1	Այրք	Айрк
5	Antaramej	5	Անտառամեջ	Антарамедж
6	Astghadzor	2	Աստղաձոր	Астхадзор
7	Artsvanist	2	Արծվանիստ	Арцванист
8	Geghamabak	1	Գեղամաբակ	Гехамабак
9	Geghamavan	4	Գեղամավան	Гехамаван
10	Gegharkunik	3	Գեղարքունիք	Гегаркуник
11	Geghhovit	2	Գեղհովիտ	Геховит
12	Ddmashen	4	Դմաշհեն	Ддмашен
13	Dprabak	5	Դպրաբակ	Дпрабак
14	Drakhtik	5	Դրախտիկ	Драхтик
15	Yerenos	2	Երանոս	Еранос
16	Zolaqar	2	Զոլաքար	Золакар
17	Zovaber	4	Զովաբեր	Зовабер

No.	***Name in English***	District	Armenian	Russian
18	Tazagyugh	2	Թազագյուղ	Тазагюх
19	Lchavan	1	Լճավան	Лчаван
20	Lusakunq	1	Լուսակունք	Лусакунк
21	Khachaghbyur	1	Խաչաղբյուր	Хачахбюр
22	Tsaghkashen	3	Ծաղկաշեն	Цахкашен
23	Tsaghkunq	4	Ծաղկունք	Цахкунк
24	Tsovagyugh	4	Ծովագյուղ	Цовагюх
25	Tsovak	1	Ծովակ	Цовак
26	Tsovinar	2	Ծովինար	Цовинар
27	Kalavan	5	Կալավան	Калаван
28	Barepat	5	Բարեպատ	Барепат
29	Karchaghbyur	1	Կարճաղբյուր	Карчахбюр
30	Dzoragyugh	2	Ձորագյուղ	Дзорагюх
31	Dzoravanq	5	Ձորավանք	Дзораванк
32	Madina	2	Մադինա	Мадина
33	Maqenis	1	Մեքենիս	Мекенис
34	Mets Masrik	1	Մեծ Մասրիկ	Мец Масрик
35	Norakert	1	Նորակերտ	Норакерт
36	Shatjreq	1	Շատջրեք	Шатджрек
37	Shatvan	1	Շատվան	Шатван
38	Shorzha	5	Շորժա	Шоржа
39	Jaghatzadzor	1	Ջաղացաձոր	Джагацадзор
40	Semyonovka	4	Սեմյոնովկա	Семеновка
41	Vaghashen	2	Վաղաշեն	Вагашен
42	Vardadzor	2	Վարդաձոր	Вардадзор
43	Verin Getashen	2	Վերին Գետաշեն	Верин Геташен
44	Torfavan	1	Տորֆավան	Торфаван
45	Pokr Masrik	1	Փոքր Մասրիկ	Покр Масрик

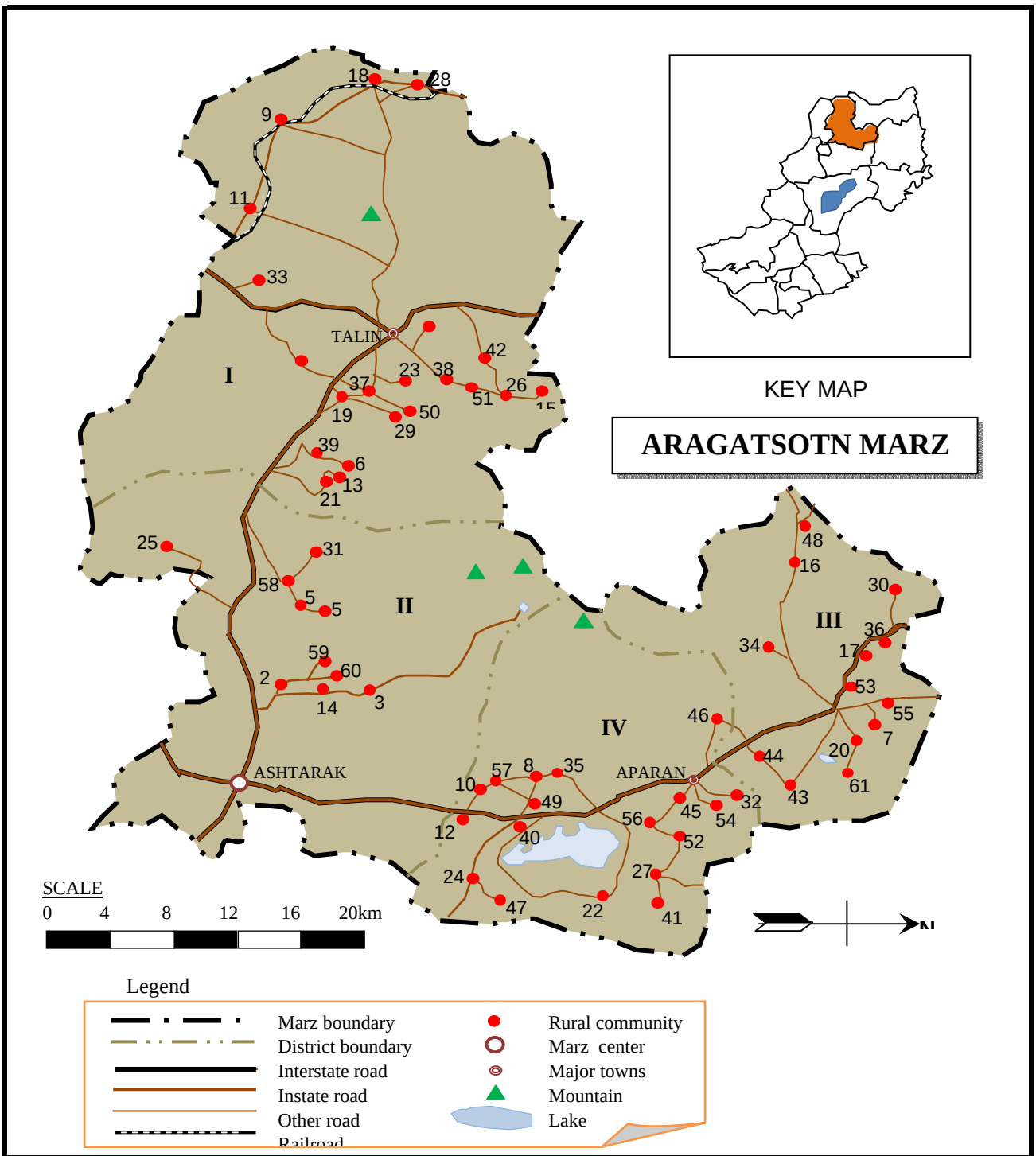
District		
1	Vardenis	16
2	Martuni	12
3	Kamo	2
4	Sevan	6
5	Krasnoseisk	9
	Total	45

Tavush Marz

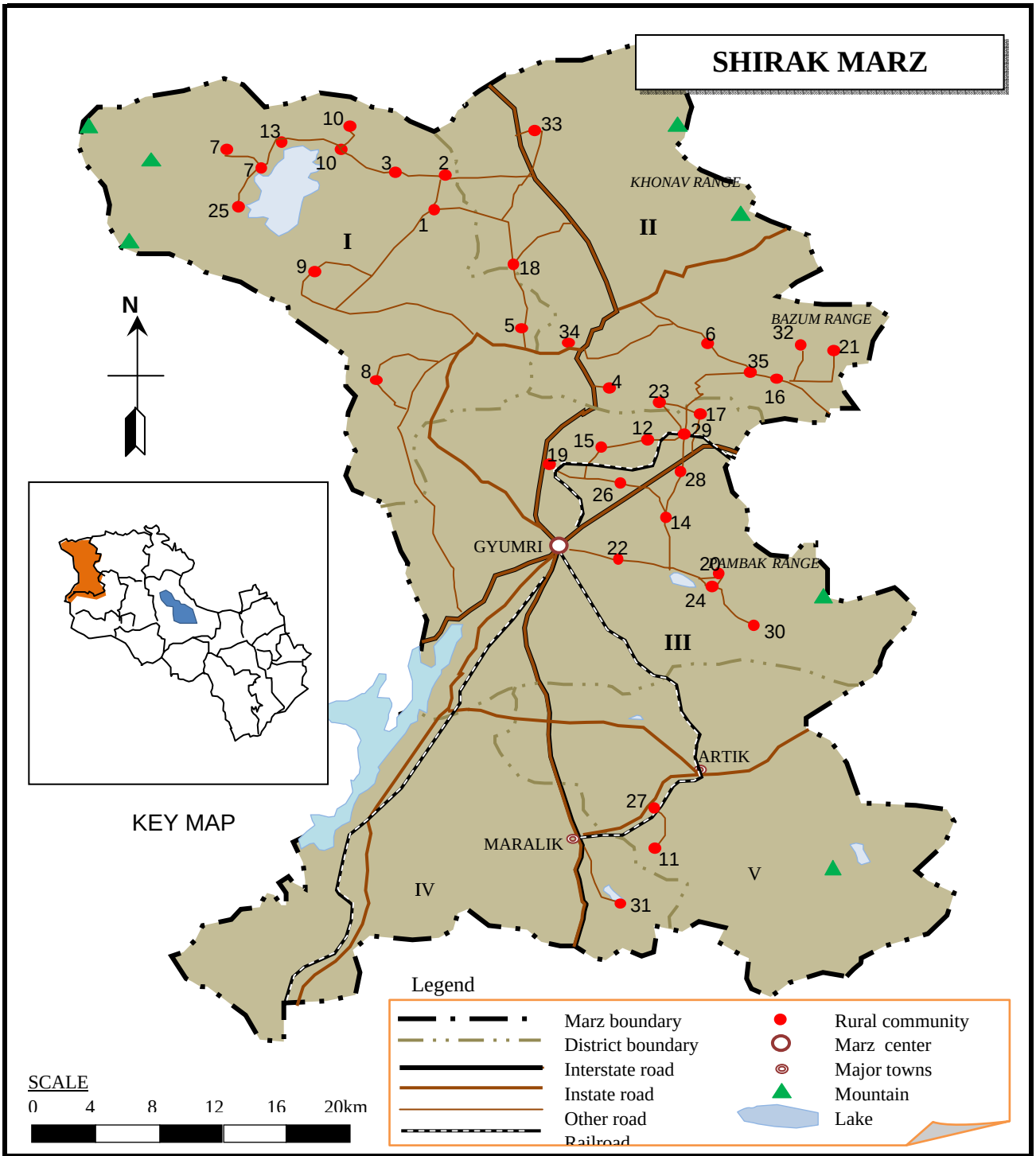
No.	***Name in English***	District	Armenian	Russian
1	Aghavnavanq	1	Աղավնավանք	Агавнаванк
2	Gandzaqar	1	Գանձաքար	Гандзакар
3	Getahovit	1	Գետահովիտ	Гетаовит
4	Gosh	1	Գոշ	Гош
5	Yenoqavan	1	Ենոքավան	Енокаван
6	Teghut	1	Թեղուտ	Техут
7	Itsakar	3	Իծաքար	Ицакар
8	Lusahovit	1	Լուսահովիտ	Лусаовит
9	Lusadzor	1	Լուսաձոր	Лусадзор
10	Khachardzan	1	Խաչարձան	Хачардзан
11	Hovq	1	Հովք	Овк
12	Navur	3	Նավուր	Навур

District		
1	Idjevan	10
2	Noyemberyan	-
3	Tavush	2
	Total	12

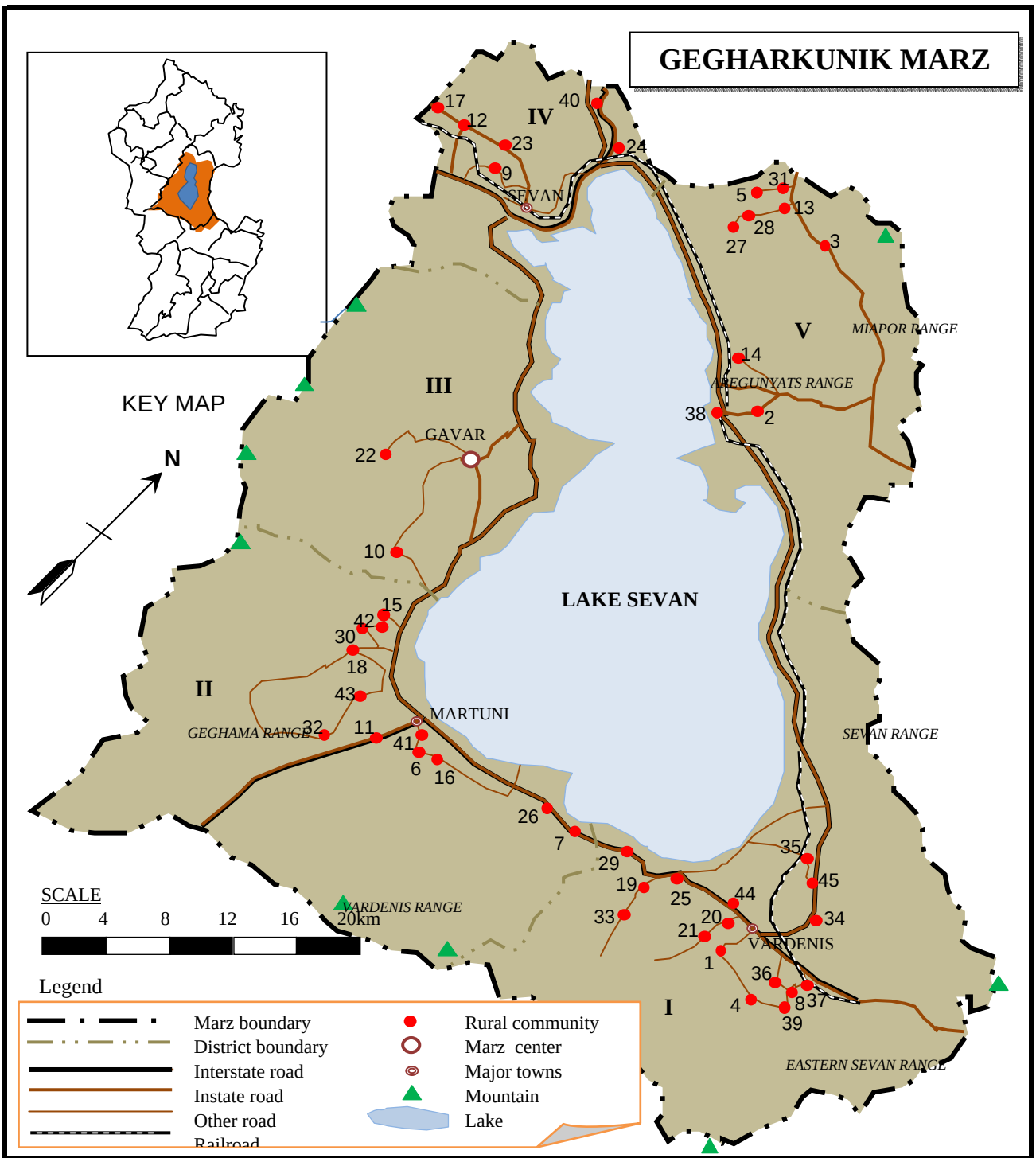
APPENDIX 2 — Rural Community Maps



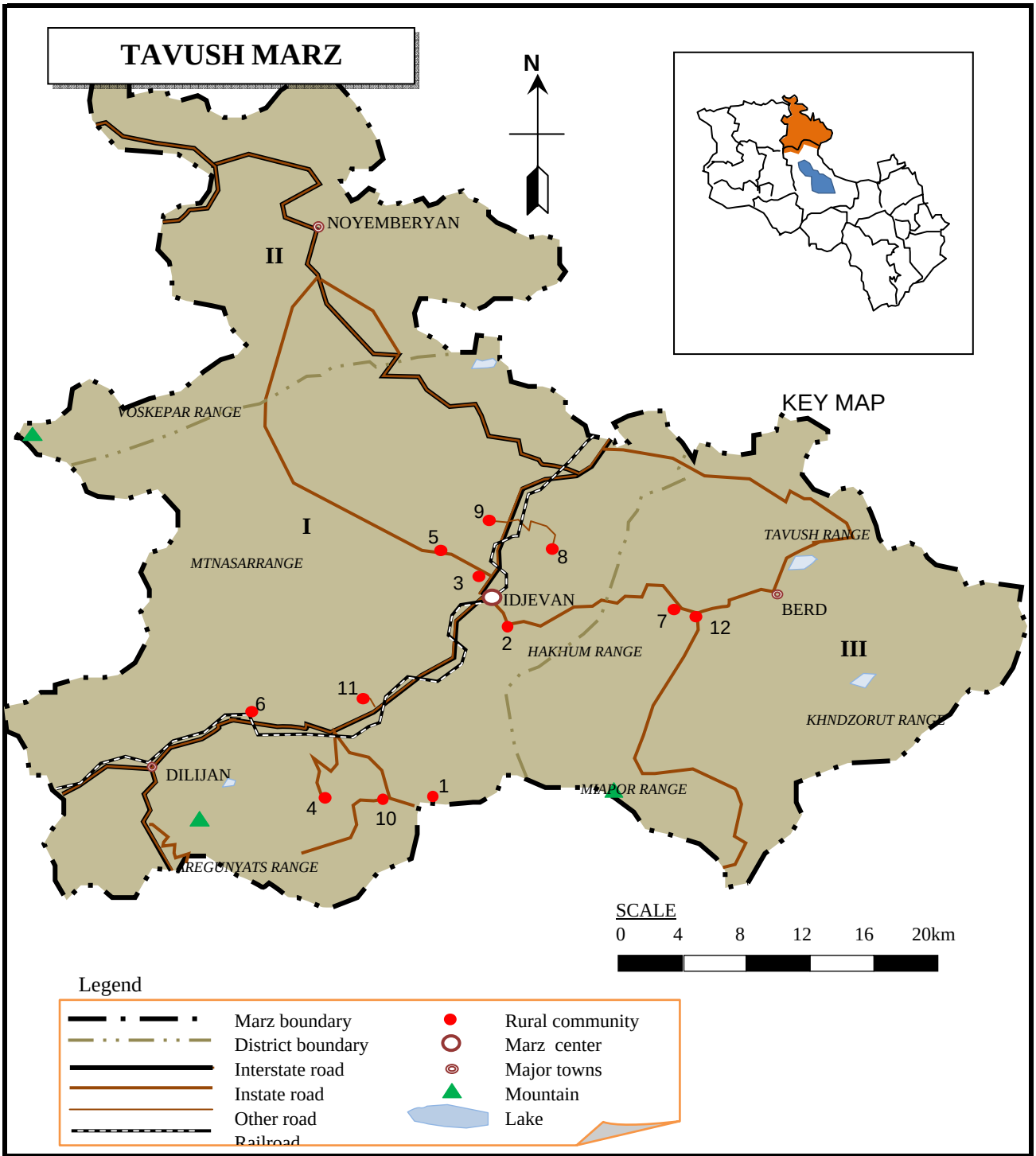
1.Akunq	13.Baysz	25.Nor Yedesia	37.Katnaghbyur	49Shenavan 61Ortachya
2.Akhdzq	14.Byurakan	26.Zovasar	38.Karmrashen	50.Shgharshik
3.Antarut	15.Garnahovit	27.Ttujur	39.Kaqavadzor	51.Vosketas
4.Ashnak	16.Geghadir	28.Tlik	40.Hartavan	52.Chqnagh
5.Avan+Khnusik	17.Gegharot	29.Irind	41.Dzoraglukh	53.Jamshlu
6.Avtona	18.Getap	30.Lernapar	42.Dzoragyugh	54.Saralanj
7.Avshen	19.Davtashen	31.Lernarot	43.Meliqgyugh	55.Sipan
8.Aragats	20.Derek	32.Lusagyugh	44.Miraq	56.Vardenis
9.Aragats	21Dian	33.Lusakn	45.Mulqi	57.Vardenut
10.Arayi	22.Yeghipartush	34.Tsaghahovit	46.Nigavan	58.Verin Sasunik
11.Arteni	23.Yeghnik	35.Tsaghashen	47.Norashen	59.Tegher
12.Apnagyugh	24.Yernjatap	36.Tsilqar	48.Norashen	60.Orgov



1.Alvar	11.Lernakert	21.Dzorashen	31.Sarnaghbyur
2.Aghvorik	12.Lernut	22.Akhuryan Kayaran	32.Sarapat
3.Ardenis	13.Tsaghkut	23.Mets Sariar	33.Sizavet
4.Arpeni	14.Kamo	24.Musaelyan	34.Tzoghamarg
5.Bandivan	15.Karmraqar	25.Shaghik	35.Poqr Sariar
6.Bashgyugh	16.Kaqavasar	26.Shirak	
7.Garnarich+Yeghnajur	17.Krashen	27.Pemzashen	
8.Kankhut	18.Krasar	28.Jajur	
9.Zari Shat	19.Mayisyan Kayaran	29.Jajur Kayaran	
10.Zorakert+Darik	20.Hovit	30.Jrarat	



1.Akunq	11.Geghhovit	21.Khachaghbyur	31.Dzoravanq	41.Vaghashen
2.Aghberq	12.Ddmashen	22.Tsaghkashen	32.Madina	42.Vardadzor
3.Aygut	13.Dprabak	23.Tsaghkunq	33.Maqenis	43.Verin Getashen
4.Ayrq	14.Drakhtik	24.Tsovagyugh	34.Mets Masrik	44.Torfavan
5.Antaramej	15.Yerenos	25.Tsovak	35.Norakert	45.Pokr Masrik
6.Astghadzor	16.Zolaqar	26.Tsovinar	36.Shatjreq	
7.Artsvanist	17,Zovaber	27.Kalavan	37.Shatvan	
8.Geghamabak	18.Tazagyugh	28.Barepat	38.Shorzha	
9.Geghamavan	19.Lchavan	29.Karchaghbyur	39.Jaghatzadzor	
10.Gegharkunik	20.Lusakunq	30.Dzoragyugh	40.Semyonovka	



1.Aghavnavanq
2.Gandzaqar
3.Getahovit
4.Gosh
5.Yenoqavan
6.Teghut
7.Itsakar
8.Lusahovit
9.Lusatzor
10.Khachardzan
11.Hovk
12.Navur

APPENDIX 3 — References

Appendix 3 – Reference

1. Armenian Water and Sewerage Company. 2006. Annual Report

2. EAP. 2005. Key Findings and Recommendations of the Peer Review of the Environmental Compliance Assurance System in the Republic of Armenia.

3. Government of Republic of Armenia. 2003. Poverty Reduction Strategy Paper, approved by the Order of the Government N994-N dated 8 August.

4. Government of the Republic of Armenia. 1995. Law of the Republic of Armenia on Environmental Impact Assessment.

5. Government of the Republic of Armenia. 2002. Law of the Republic of Armenia on Local Self-Government.

6. Government of the Republic of Armenia. 2002. Water Code of the Republic of Armenia. Official Bulletin of the Republic of Armenia.

7. Government of the Republic of Armenia. 2003. Law of the Republic of Armenia on Public Services Regulatory Commission.

8. Government of the Republic of Armenia. 2005. Constitution of the Republic of Armenia.

9. Government of the Republic of Armenia. 2005. Gegharkunik Marz Regional Development Plan: 2006-2008.

10. Government of the Republic of Armenia. 2005. Law of the Republic of Armenia on Fundamental Provisions of the National Water Policy.

11. Government of the Republic of Armenia. 2005. Tavush Marz Regional Development Plan: 2006-2008.

12. Government of the Republic of Armenia. 2006. 2007-2009 Medium Term Public Expenditure Framework.

13. Government of the Republic of Armenia. 2007. Draft Law on Drinking Water

14. Government of the Republic of Armenia. 2007. Law of the Republic of Armenia on National Water Program.

15. International Fund for Agricultural Development. 2003. IFAD Database.

16. International Monetary Fund. 2006. Republic of Armenia - Poverty Reduction Strategy Paper Progress Report.

17. IWACO et al, 2001. Integrated Water Resources Management Planning. Stage II Final Technical Report. Integrated Water Resources Management Plan Armenian, funded by World Bank.

18. JICA/Nippon Koei. 2007. The Study for Improvement of Rural Water Supply and Sewage Systems in The Republic of Armenia - Progress Report 1.

19. Lori Water and Sewerage Company. 2006. Annual Report

20. Millennium Challenge Corporation – Armenia. 2007. Water-to-Market Activity (available from http://www.mca.am)

21. Ministry of Labor and Social Issues. 2005. Database of "Nork" Information-Analytical Center.

22. National Demographic and Health Survey. 2003

23. National Demographic and Health Survey. 2005

24. National Statistical Service of the Republic of Armenia. 2001. RA 2001 Population and Housing Census Results: Aragatsotn marz.

25. National Statistical Service of the Republic of Armenia. 2001. RA 2001 Population and Housing Census Results: Gegharkunik marz.

26. National Statistical Service of the Republic of Armenia. 2001. RA 2001 Population and Housing Census Results: Shirak marz.

27. National Statistical Service of the Republic of Armenia. 2001. RA 2001 Population and Housing Census Results: Tavush marz.

28. National Statistical Service of the Republic of Armenia. 2003. Armenian Statistical Yearbook.

29. National Statistical Service of the Republic of Armenia. 2004. Armenian Statistical Yearbook.

30. National Statistical Service of the Republic of Armenia. 2005. Armenian Statistical Yearbook.

31. National Statistical Service of the Republic of Armenia. 2006. Armenian Statistical Yearbook.

32. National Statistical Service of the Republic of Armenia. 2004. Armenia in Figures.

33. National Statistical Service of the Republic of Armenia. 2005. Armenia in Figures.

34. National Statistical Service of the Republic of Armenia. 2005. Women and Men in Armenia – A Statistical Booklet.

35. National Statistical Service of the Republic of Armenia. 2006. Armenia in Figures.

36. National Statistical Service of the Republic of Armenia. 2006. Demographic Handbook of Armenia.

37. National Statistical Service of the Republic of Armenia. 2006. Food Security and Poverty.

38. OECD, 2004. Financing Strategy for Urban Waste Water Collection and Treatment Infrastructure in Armenia.

39. OECD. 2006. Financing Strategies on Rural Water Supply and Sanitation in Armenia Millennium Development Goals and Minimal Water Supply Standards.

40. Official Bulletin of the Republic of Armenia. 2004. State Budget of the Republic of Armenia for 2004.

41. Official Bulletin of the Republic of Armenia. 2006. State Budget of the Republic of Armenia for 2006.

42. Official Bulletin of the Republic of Armenia. 2007. State Budget of the Republic of Armenia for 2007.

43. Public Services Regulatory Commission of the Republic of Armenia. 2005. Decision No. 128A on Issuing Water System Use Permit to Nor Akunq Water and Sewerage Company.

44. Public Services Regulatory Commission of the Republic of Armenia. 2005. Decision No. 68A on Issuing Water System Use Permit to Lori Water and Sewerage Company.

45. Public Services Regulatory Commission of the Republic of Armenia. 2006. Decision No. 88A on Issuing Water System Use Permit to Yerevan Water and Sewerage Company.

46. Shirak Water and Sewerage Company. 2006. Annual Report

47. State Committee of Water Systems, Ministry of Finance and Economy of the Republic of Armenia, EAP Task Force, OECD. 2004. Financing Strategy for Urban Wastewater Collection and Treatment Infrastructure in Armenia.

48. UNDP/GoA. 2005. Armenian Social Trends – Vulnerable Population in the Regions of RA.

49. UNDP/GoA. 2005. Human Poverty and Pro-poor Policies in Armenia.

50. UNDP/SIDA. 2005. Gender Issues in Water Resource Management in the Kura-Aras Rvier Basin.

51. United Nations Office in Armenia. 1999. Poverty of Vulnerable Groups in Armenia.

52. USAID. 2005. Program for Institutional and Regulatory Strengthening of Water Management in Armenia – Strategy and Action Plan for the National Water Program.

53. USAID. 2005. Program for Institutional and Regulatory Strengthening of Water Management in Armenia – Legal and Institutional Review of Water Management in Armenia.

54. USAID. 2006. Program for Institutional and Regulatory Strengthening of Water Management in Armenia - An Introduction to the Armenian Water Sector.

55. USAID/PA Program for Institutional and Regulatory Strengthening of Water Management in Armenia. 2005. Tariff Guidelines Based on Standards.

56. USAID/PA Program for Institutional and Regulatory Strengthening of Water Management in Armenia. 2006. Tariff Policy Options - International Experience and Options Applicable for Armenia.

57. World Bank. 1994. Armenia Irrigation Rehabilitation Project. Project Appraisal Document, Report No. 12811-AM.

58. World Bank. 1995. Armenia Agriculture and Food Sector Review. Report No. 13034-AM.

59. World Bank. 1999. Armenia's Private Agriculture: 1998 Survey of Family Farms. ECSSD Working Paper No. 17.

60. World Bank. 2000. Armenia Social Investment II Project. Project Appraisal Document, Report No. 20326-AM. April 2000.

61. World Bank. 2001. Armenia Irrigation Development Project. Project Appraisal Document, Report No. 22599-AM.

62. World Bank. 2002. Natural Resources Management and Poverty Reduction Strategy. Project Appraisal Document, Report No. 24043-AM

63. World Bank. 2004. Country Assistance Evaluation. Report No. 29335. June, 2004.

64. World Bank. 2004. Rural Infrastructure in Armenia: Addressing Gaps in Service Delivery.

65. World Bank. 2005. Armenia's Rural Economy – From Transition to Development.

66. Yerevan Water and Sewerage Company. 2006. Annual Report