CHAPTER 10 ECONOMIC AND FINANCIAL ANALYSIS

10.1 GENERAL

From an economic and financial point of view, two water supply projects, Rural Water Supply Project (RWSP) and Vakhsh Conduit Water Supply Project (VCWSP), are analyzed and evaluated.

The currency exchange rate, as of July 2008, used here is as follows --- One (1) Tajikistan Somoni (TJS) = 0.294 US$ = 31.5 Japan Yen (JPY).

Unless otherwise specified, the yearly increase rate is to be based on the GDP growth rate. The GDP growth rate in 2009 and there after is projected to be 5% whereas the previous years were 7.8% for 2007 and 5% for 2008 (IMF).

The project period to be evaluated is from 2009 to 2028.

Implementation of the rehabilitation and expansion plan of the Vakhsh conduits and rural water supply systems will make it possible to supply safe water to community people. It will lead decreasing water borne diseases. However, this benefit is not considered in the economic analysis because there is no available data.

10.2 VAKHSH CONDUIT WATER SUPPLY PROJECT (VCWSP)

10.2.1 COMMON ITEMS AND CONDITIONS

The project investments for constructing facilities are planned in 7 stages. Each stage requires 4 years to complete, and start of the first stage is 2009 and the end of stage 7 is 2021. Because of the long period to complete seven stages, before starting stage 7 implementation, water demand, economic conditions, etc. shall be reviewed and necessary adjustments made in the engineering specifications of the water supply facilities.

Costs of respective stages are shown below. These amounts include 5% of physical and price contingencies.

It is supposed that the total cost of each stage is allocated by 15%, 15%, 60% and 10% for the implementation consisting of construction, procurement, etc., in the respective years.

The results of the allocation of the total investment cost, 136,220 thousand US$, are shown in *Table 10.2.1*.

The life cycle of the facilities and equipment to be installed by the project are assumed to be 30 years. And residual value of these facilities and equipment at year 2028 is included in the financial and economic evaluation calculation.

Regarding operation and maintenance costs, 0.02 US$/m3 (obtained from IBNET (The International Benchmarking Network for Water and Sanitation Utilities) of the World Bank) is to be used as the operation and maintenance cost from discussing the present water supply situation.

The VCWS system does not have distribution facilities and distribution conduits, thus in economic and financial analysis the cost of water distribution is not included. The VCWS system will not supply directly to water consumers. VCWSP provides water to the rural people through water distribution systems mostly owned by Jamoats and to the town people through the water distribution system operated by Vodokanal.

Table 10.2.1 VCWSP Construction Costs (= Initial investment)

Unit: 1000 US$

Year	Stage 1	Stage 2, 3	Stage 4, 5	Stage 6	Stage 7	Total
2009	5,108					5,108
2010	5,108					5,108
2011	20,433					20,433
2012	3,406					3,406
2013						0
2014		5,108				5,108
2015		5,108	5,108			10,217
2016		20,433	5,108			25,541
2017		3,406	20,433	2554.1		26,393
2018			3,406	2554.1	2554.1	8,514
2019				10217	2554.1	12,771
2020				1702.8	10217	11,919
2021					1702.8	1,703
Total	34,055	34,055	34,055	17,028	17,028	136,220

Note: Price and physical contingency (5%) are included in costs above

10.2.2 ECONOMIC ANALYSIS

Two kinds of benefits are employed for economic analysis. Both benefits will not be able to be employed at the same time. One is the labor costs as employed in the rural water supply project as the benefits of the VCWSP, another is the cost of transportation of water from the water pickup point to the water distribution points by water supply trucks. Volume of water to be transported by trucks is the water demand which exceed the current flow rate of the Vakhsh conduits (23,500 m^3/day, outflow rate at Sarband settling basin).

Regarding the saving cost of water fetching from open wells, it is considered a benefit, and the value of this benefit calculated in rural water supply project (Refer to Clause 10.3) is to be employed in VCWSP.

The way of cost calculation of water transportation by trucks is basically the same as described in the RWSP evaluation. However, the following two matters are peculiar with the VCWSP, that no charge shall be made for water intake at the water loading point and there are many water distribution points to where trucks transport water. For estimating the benefits, the number of

distribution points is supposedly 18 from that the total conduit length of VCWSP to around 180km. Intake point of the trucks is two (2), the Stalin Canal at Sarband and the Kumsangir Canal at Kolkhozobod.

Total benefits of the project can be obtained from multiplication of the unit value of the benefit by the estimated water demand which is to be the same volume of the planned water supply.

Table 10.2.2 shows the EIRR with the benefits equivalent to reduction of water fetching labor cost. EIRR is 16.2%.

Table 10.2.2 EIRR of VCWSP (1/2)

w/ water fetching labor cost

Unit: 1000 US$

Year	Construction cost	O&M cost	Residual value	Benefit	Balance
2009	-5,108	0	0	0	-5,108
2010	-5,108	0	0	0	-5,108
2011	-20,433	0	0	0	-20,433
2012	-3,406	0	0	0	-3,406
2013	0	-124	0	5,144	5,019
2014	-5,108	-157	0	6,808	1,543
2015	-10,217	-189	0	8,626	-1,780
2016	-25,541	-222	0	10,608	-15,155
2017	-26,393	-254	0	12,767	-13,880
2018	-8,514	-286	0	15,115	6,315
2019	-12,771	-319	0	17,667	4,577
2020	-11,919	-351	0	20,435	8,165
2021	-1,703	-341	0	20,859	18,815
2022	0	-372	0	23,837	23,466
2023	0	-402	0	27,061	26,659
2024	0	-432	0	30,548	30,116
2025	0	-462	0	34,315	33,853
2026	0	-492	0	38,383	37,891
2027	0	-523	0	42,772	42,250
2028	0	-553	85,705	47,504	132,656
NPV	-62,246	-1,238	8,885	73,813	EIRR = 16.2%
	19,214 (B/C = 1.35)				

Note: NPV, at the beginning of 2009, is calculated with 12% discount rate. Residual value is grouped in the cost in B/C.

Table 10.2.3 shows EIRR calculation with assuming the cost of water transportation as benefit. The cost is the water transportation by trucks from the water loading point, Sarband, to water distribution points. As indicated in *Table 10.2.3*, EIRR is 26.2%.

As shown in *Table 10.2.2* and *10.2.3*, EIRR calculation results are positive with either benefit, the benefit of water fetching labor cost reduction or benefit of water truck transportation cost saving. NPV is plus and B/C is more than 1. Thus, this project is feasible from an economic view point.

Table 10.2.3 EIRR of VCWSP (2/2)

w/ water transportation by trucks

Unit: 1000 US$

Year	Construction cost	O&M cost	Residual value	Benefit	Balance
2009	-5,108	0	0	0	-5,108
2010	-5,108	0	0	0	-5,108
2011	-20,433	0	0	0	-20,433
2012	-3,406	0	0	0	-3,406
2013	0	-124	0	0	-124
2014	-5,108	-157	0	0	-5,265
2015	-10,217	-189	0	5,411	-4,995
2016	-25,541	-222	0	15,325	-10,438
2017	-26,393	-254	0	25,239	-1,408
2018	-8,514	-286	0	35,153	26,353
2019	-12,771	-319	0	45,067	31,977
2020	-11,919	-351	0	54,981	42,710
2021	-1,703	-341	0	51,987	49,943
2022	0	-372	0	61,217	60,845
2023	0	-402	0	70,447	70,045
2024	0	-432	0	79,677	79,245
2025	0	-462	0	88,907	88,445
2026	0	-492	0	98,137	97,645
2027	0	-523	0	107,367	106,845
2028	0	-553	85,705	116,597	201,750
NPV	-62,246	-1,238	8,885	156,696	EIRR = 26.2%
	102,097 (B/C = 1.87)				

Note: NPV, at beginning of 2009, is calculated with 12% discount rate. Residual value is grouped in the cost in B/C calculation.

10.2.3 FINANCIAL ANALYSIS

The revenue source of the VCWSP is a water supply charge collected from the water distributers who distribute water to the water end consumers. The revenue amount of the project is calculated with water volume supplied by the water rate (per m^3). The supplied water volume is assumed the same as the water demand volume of the service area of VCWSP. And based on the water rate of RWSA being charged to Vodokanal, the water rate to charge to water distributors is supposedly set at 0.08 TJS/m3 and a 10% yearly increase after 2008 for financial analysis.

The result of calculation of FIRR with the water rate of 0.08 TJS/m^3 in 2008 and 10% yearly increase indicates that, because of the size of the initial investment being large, the project is not feasible from a financial point of view. However, if the yearly increase ratio of the water rate is

changed to 20% from 10%, FIRR changes to a positive, 3.2%, and the project changes to becoming financially feasible.

Table 10.2.4 FIRR of VCWSP

Unit: 1000 US$

Year	Construction cost	O&M cost	Residual value	Revenue	Balance
2009	-5,108	0	0	0	-5,108
2010	-5,108	0	0	0	-5,108
2011	-20,433	0	0	0	-20,433
2012	-3,406	0	0	0	-3,406
2013	0	-124	0	236	111
2014	-5,108	-157	0	327	-4,938
2015	-10,217	-189	0	434	-9,972
2016	-25,541	-222	0	559	-25,204
2017	-26,393	-254	0	704	-25,942
2018	-8,514	-286	0	874	-7,926
2019	-12,771	-319	0	1,070	-12,020
2020	-11,919	-351	0	1,297	-10,974
2021	-1,703	-341	0	1,386	-658
2022	0	-372	0	1,660	1,288
2023	0	-402	0	1,974	1,572
2024	0	-432	0	2,334	1,902
2025	0	-462	0	2,747	2,285
2026	0	-492	0	3,219	2,727
2027	0	-523	0	3,758	3,236
2028	0	-553	85,705	4,373	89,525
NPV	-62,246	-1,238	8,885	5,004	FIRR = N/A
	-49,595 (B/C = 0.09)				

Note: NPV, at beginning of 2009, is calculated with 12% discount rate.

Without changing0.1 TJS/m3 of the water rate in 2008, if the water tariff increases by 45% yearly in the period from 2009 to 2028, the FIRR will change to positive (FIRR=5.8%).

Table 10.2.5 FIRR of VCWSP with Water Rate Change

Rate for 2008 (assumption)	Yearly rate raising rate after 2008	FIRR
0.1 TJS/m^3	+10%	Unable to get FIRR
	+20%	4.6%
0.08 TJS/m^3	+10%	Unable to get FIRR
	+20%	3.2%

10.3 RURAL WATER SUPPLY PROJECT

10.3.1 COMMON ITEMS FOR ANALYSIS

RWSP consists of several sub-projects independent of each other. However, in the economic and financial analysis, these sub-projects are combined into one. Each group is planned to be implemented in four years and the investment consist of 15% of the group total for the first year and second respectively, and 60% and 10% for the construction to be carried out there after. The table below shows the construction costs of the groups.

Table 10.3.1 RWSP Construction Cost (= Initial investment)

Unit: 1000 US$

	Group 1	Group 2	Total
2009	2,341	0	2,341
2010	2,341	0	2,341
2011	9,364	2,476	11,840
2012	1,561	2,476	4,036
2013	0	9,903	9,903
2014	0	1,650	1,650
Total	15,607	16,505	32,112

Note: Price and physical contingency (5%) are included in costs above.

The operation and maintenance (O&M) cost is assumed to be 5% of the total construction cost for ten years after the service operation starts, and 10% for the 11th year and afterwards. Costs of renewing the water supply facilities and equipment to be carried out within the evaluation period are considered included in the O&M expense (O&M cost).

Because water supply systems to be constructed by RWSP are properties of public entities, no tax burden is expected for the project.

It is supposed that the water supply volume of RWSP is the forecast water demand specified in Chapter 6.

10.3.2 ECONOMIC ANALYSIS

The economic feasibility of RWSP is discussed using two costs. One is labor the cost of the rural people in fetching water, and the other is the cost of water transportation by water supply trucks. Bothe costs are considered benefits in that the costs would be saved if the project is implemented.

(1) Economic internal rate of return (EIRR) with the water fetching labor cost

The economic benefit is calculated based on how many labor hours of the rural peoples in water fetching can be reduced.

The labor hours for water fetching 40 liters is 15.4 minutes (data obtained by interviewing rural people in 2008). And the labor hour value is assumed to be 65% of the average salary of the Khatlon Oblast, with consideration of unemployment rates and the unskilled labor wage. And, the water fetching labor value can be calculated as 2.2 TJS/m^3. This labor time value is considered an economic benefit of RWSP.

The table below shows EIRR calculation results of RWSP. As shown in *Table 10.3.2*, expense (sum of construction costs and administrative and maintenance expense) far exceeds the benefits, so that EIRR calculation is not possible. Also in comparison of the current value in 2009 using the discount rate 12%, NPV is minus and C/B is less than 1. However, if the costs of construction and O&M are set to one sixth (1/6), the EIRR calculation is able to become narrowly possible (EIRR = 0.9%). Even in this case, neither NPV of cost and benefit becomes plus.

Table 10.3.2 EIRR of RWSP (1/2)

w/ water fetching labor reduction Unit: 1000 US$

Year	Construction cost	O&M cost	Benefit	Balance
2009	-2,341	0	0	-2,341
2010	-2,341	0	0	-2,341
2011	-11,840	0	0	-11,840
2012	-4,036	0	0	-4,036
2013	-9,903	-780	257	-10,427
2014	-1,650	-780	275	-2,156
2015	0	-1,606	521	-1,084
2016	0	-1,606	559	-1,047
2017	0	-1,606	598	-1,007
2018	0	-1,606	641	-965
2019	0	-1,606	686	-919
2020	0	-1,606	734	-871
2021	0	-1,606	786	-820
2022	0	-1,606	840	-765
2023	0	-2,386	898	-1,488
2024	0	-2,386	960	-1,426
2025	0	-3,211	1,026	-2,186
2026	0	-3,211	1,095	-2,116
2027	0	-3,211	1,170	-2,041
2028	0	-3,211	1,249	-1,962
NPV	-21,404	-7,295	2,784	EIRR = N/A
	-25,915 (B/C = 0.10)			

Note: NPV, at beginning of 2009, is calculated with 12% discount rate.

(2) EIRR with water transportation by water supply trucks

Suppose the water demand forecasted is to be provided with transportation by water supply trucks. And the cost of water transportation by trucks is considered the equivalent value to the benefits of the project. The following conditions are applied to cost calculation of the water transportation by water supply trucks: Water supply truck burden = 10 m^3/truck; Fuel efficiency of a truck = One (1) TJS/km; Truck price = 635,000TJS (yearly depreciation: 63,500TJS); Water price at water loading point = 0.1TJS/m^3; Distance, average, between water loading point and village = 25km; Total water volume to transport = Demand total volume. The EIRR calculation result is shown in *Table 10.3.3*.

The cost of the transportation by water supply trucks is calculated at about 3 times the water fetching labor value mentioned before. This means that the benefit of RWSP increases by 3 times in the case of water fetching labor reduction. However, still the amount of construction costs and O&M costs is too large for the benefit, so that EIRR will not become positive. If the construction costs and O&M costs are set to one half of the planned amount, the EIRR is able to change to narrowly positive (EIRR = 4.3%) although NPV is minus and C/B is less than 1, and economic rationality will become securable.

Table 10.3.3 EIRR of RWSP (2/2)

w/ water transportation by water supply trucks

Unit: 1000 US$

Year	Construction cost	O&M cost	Benefit	Balance
2009	-2,341	0	0	-2,341
2010	-2,341	0	0	-2,341
2011	-11,840	0	0	-11,840
2012	-4,036	0	0	-4,036
2013	-9,903	-780	1,234	-9,450
2014	-1,650	-780	1,261	-1,169
2015	0	-1,606	2,276	671
2016	0	-1,606	2,326	720
2017	0	-1,606	2,376	770
2018	0	-1,606	2,426	820
2019	0	-1,606	2,476	871
2020	0	-1,606	2,527	922
2021	0	-1,606	2,579	973
2022	0	-1,606	2,631	1,025
2023	0	-2,386	2,683	297
2024	0	-2,386	2,736	350
2025	0	-3,211	2,790	-421
2026	0	-3,211	2,844	-367
2027	0	-3,211	2,900	-311
2028	0	-3,211	2,956	-255
NPV	-21,404	-7,295	9,792	EIRR = N/A
	-18,908 (B/C = 0.34)			

Note: NPV is of at the beginning of the year 2009. Discount rate is 12%.

10.3.3 FINANCIAL ANALYSIS

The revenue of the RWSP is the amount only collected from water users, village people. The amount is calculated by multiplication of the water volume supplied and the water rate. And water supply charges shall be collected timely and completely.

In the financial analysis, the water rate of this project is set at 0.1 TJS/m^3 in 2008 taking account of the present water supply rate of RWSA. And the rate is to increase 10% yearly in previous years. So that, in 2013, the service inaugural year, the water rate would be 0.16 TJS/m^3. The cost for

operation and maintenance of the water supply system is covered by this water rate. The FIRR calculation is done with the condition mentioned here, and the result is shown in the table below.

The expense (construction costs and operation and maintenance costs) of RWSP far exceeds revenue, and the calculation in the period in 2009 to 2028 cannot be carried out to obtain FIRR. Excluding construction costs in the calculation, the cost of O&M still far exceeds revenue.

Table 10.3.4 FIRR of RWSP

Unit: 1000 US$

Year	Construction cost	O&M cost	Revenue	Balance
2009	-2,341	0	0	-2,341
2010	-2,341	0	0	-2,341
2011	-11,840	0	0	-11,840
2012	-4,036	0	0	-4,036
2013	-9,903	-780	15	-10,669
2014	-1,650	-780	17	-2,414
2015	0	-1,606	33	-1,573
2016	0	-1,606	37	-1,569
2017	0	-1,606	41	-1,564
2018	0	-1,606	46	-1,559
2019	0	-1,606	52	-1,554
2020	0	-1,606	58	-1,547
2021	0	-1,606	65	-1,540
2022	0	-1,606	73	-1,532
2023	0	-2,386	82	-2,304
2024	0	-2,386	92	-2,294
2025	0	-3,211	103	-3,109
2026	0	-3,211	115	-3,096
2027	0	-3,211	128	-3,083
2028	0	-3,211	144	-3,067
NPV	-21,404	-7,295	226	FIRR = N/A
	-28,474 (B/C = 0.01)			

Note: NPV is of at the beginning of year 2009, Discount rate is 12%.

Without changing 0.1TJS of water rate in 2008, if the water tariff increase by 45% yearly, in the period 2009 to 2028, the FIRR will change to positively (FIRR = 5.8%) although NPV is minus and C/B is less than 1.

Table 10.3.5 FIRR of RWSP with Water Rate Raising

Rate for 2008 (assumption)	Yearly raising rate after 2008	FIRR
0.1 TJS/m^3	+10%	Unable to get FIRR
	+45%	5.8%

Though there is a 10% yearly increase of the water rate, it is surely foreseen that financial difficulties would be in the water supply operation, to cover the O&M costs financial support (subsidy) by the central and/or local governments shall be necessary. In addition, considering the

financial difficulties, a fund for the capital investment for construction and renewing water supply systems, shall be provided by the government.

10.4 FUND RAISING AND REPAYMENT

For the VCWSP initial investment, a large amount of funds is required because it must construct a very large scale water conduit system. Thus a long term loan and low interest from an international lending agency shall be taken into account for fund provisions.

The following table shows how much interest and principal repayment would be necessary if funds for all initial investment are raised through a loan with a 40 year loan period with a 10 year grace period and interest rate of 0.55% a year. Since the period of the project initial investment requires ten years or more to complete, it is supposed the fund for the project is to be raised by two loans. The first loan is for stage 1 to stage 5, and the second loan for stage 6 and 7.

Table 10.4.1 Loan and Repayment Schedule

Unit: 1000 US$

Year	Loan disbursement	Interest pay & repayment	Loan balance
2009	5,108	28	5,108
2010	5,108	56	10,217
2011	20,433	169	30,650
2012	3,406	187	34,055
2013	0	187	34,055
2014	5,108	215	39,163
2015	10,217	272	49,380
2016	25,541	412	74,921
2017	26,393	557	101,314
2018	8,514	604	109,827
2019	12,771	3,816	119,456
2020	11,919	3,881	128,217
2021	1,703	3,891	126,743
2022 -- 2025	0	3,891	----
2026	0	3,891	110,598
2027 -- 2047	0	5,506	----
2048	0	5,506	9,636
2049 -- 2055	0	1,803	----
2056	0	1,803	0

CHAPTER 11 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

11.1 REGULATIONS AND LAWS CONCERNING ENVIRONMENTAL CONSIDERATIONS

Tajikistan started to develop an environmental legal framework, regulation and laws since 1992 when the independent state was established. The laws and regulations, mainly concerned with environmental problems, which provides the role and operation of the government for the pollution, land use, development were enacted.

In the Central Asian republics, "The cooperative agreement for rational natural utilization and the environmental protection" and "Intergovernmental agreement for regulation about the problem around the Aral Sea" were concluded in the convention among the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Uzbekistan and the Republic of Tajikistan. In addition, the government ratifies nine (9) global conventions concerning environmental consideration with involvement of regulations for protection of the ozone layer, climate change and prevention of desertification.

The regulations and laws concerning environmental considerations in Tajikistan are shown in *Table 11.1.1*, and the environmental global conventions which the government approves ratification are shown in *Table 11.1.2*.

Table 11.1.1 Regulation and Laws Concerning Environmental Consideration in Tajikistan

Regulation or Law (Year)
Resolution on the Unauthorized Collection of Substances (1990)
Land Code of the Republic of Tajikistan (1992)
Law on Foreign Investment (1992)
Law on Land Charges (1992)
Forestry Code of the Republic of Tajikistan (1992)
Resolution on the Ministry of Environment (1992)
On Protection and Use of the Animal World (1993)
Resolution on State Ecological review (1994)
Law on Mining (1994)
Law on Utilization of Wildlife (1994)
Resolution on State Control of Environmental Protection and Use of resources (1994)
Resolution on State Ecological Review (1994)
Law on Air Protection (1996)
Resolution on State Ecological Program (1997)
Water Code of Republic of Tajikistan (2001)
Resolution on State Ecological Program (2003)
Law of Government Ecological Expertise (2003)
Resolution on Commission on Chemical Security of the Republic of Tajikistan (2003)
Law of Plants Quarantine in Tajikistan (2003)

Law of The Republic of Tajikistan on Environmental Evaluation (2003)
EIA Procedure (2006)

Table 11.1.2 Environmental Global Conventions which the Government Approves Ratification

Global Convention
United Nations Convention on Biological Diversity
United Nations Convention to Combat Desertification
United Nations Convention on Climate Change44
Vienna Convention to Protect the Ozone Layer
Convention on Migratory Species
Convention on Environmental Impact Assessment in a Transboundary Context
Aarhus Convention on Public Participation
Ramsar Convention on Wetlands Protection
Stockholm Convention on Persistent Organic Pollutants (POPs)

11.2 ENVIRONMENTAL IMPACT ASSESSMENT IN TAJIKISTAN

11.2.1 REGULATIONS AND LAWS ON ENVIRONMENTAL IMPACT ASSESSMENT

The regulations of environmental impact assessment for new development action were established as a “Law of Natural Conservation” in 1993 and a “Law of Environmental Impact Study” in 2003. The Law of Natural Conservation provides a regulation in chapter 5, article 33-35: “New development project which has prospects of environmental impact has to implement an environmental impact study at the planning phase”. In 1994, the State Committee for Environmental Protection and Forestry (SCEP) was designated by the ministerial conference as the organization which implements and carries out the environmental impact study. The principal responsibilities of SCEP are shown as follows:

- To devise and implement unified environmental policy with coordination among relevant ministries and agencies.
- To study and provide information of hydrometeorology and environment, and to operate, improve warning systems of natural disasters and environment contamination.
- To establish monitoring regulation for natural conservation with coordination among relevant ministries and agencies.
- To formulate guidelines for rational utilization of natural resources.
- To promote environmental education of the public.

As mentioned earlier, SCEP takes a leading part to develop regulations and laws in cooperation with relevant ministries and agencies. At first laws, both new and revised, are tabled in the Lower Chamber. Then, they will be ratified in the Upper Chamber after approval by the Lower Chamber. Public Health Service, Social Policy Committee, Special Committee on Environment and Environmental Affairs Committee have been established in both chambers.

11.2.2 PROCEDURE OF ENVIRONMENTAL IMPACT ASSESSMENT

An organization, which is going to implement new development work, is obligated to apply for the initiation of environmental review to SCEP. On this occasion, a project summary and document of preliminary prediction for environmental impact should be attached. This application process is the Initial Environmental Examination (IEE).

After the process, SCEP holds a meeting with relevant ministries and agencies to make a decision about the necessity of EIA. The relevant ministries and agencies are shown in *Table 11.2.1*. The outcome of the review will be sat back to the project execution organization within 45 days from the application day.

In addition, in case the project execution organization needs assistance to carry out the IEE due to lack of experience, it is possible to request the dispatch of environment expert from SCEP.

Table 11.2.1 Consultative Organization for Environmental Impact Assessment

Relevant Ministries and Agencies
HYDROMET
Department of Environment and Emergency Situations (DEES) , President Office
State Committee for Land Management
Tajik Geological Agency (Tajikgeologia)
Ministry of Melioration and Water Resources
Forestry Agency (Tsajikles), Ministry of Agriculture
Sanitation and Epidemiology Station (SES), Ministry of Health
Ministry of Industry
Ministry of Interior
Municipal Water Authorities (Vodokanals)

The IEE procedure in Tajikistan is shown in *Figure 11.2.1*.

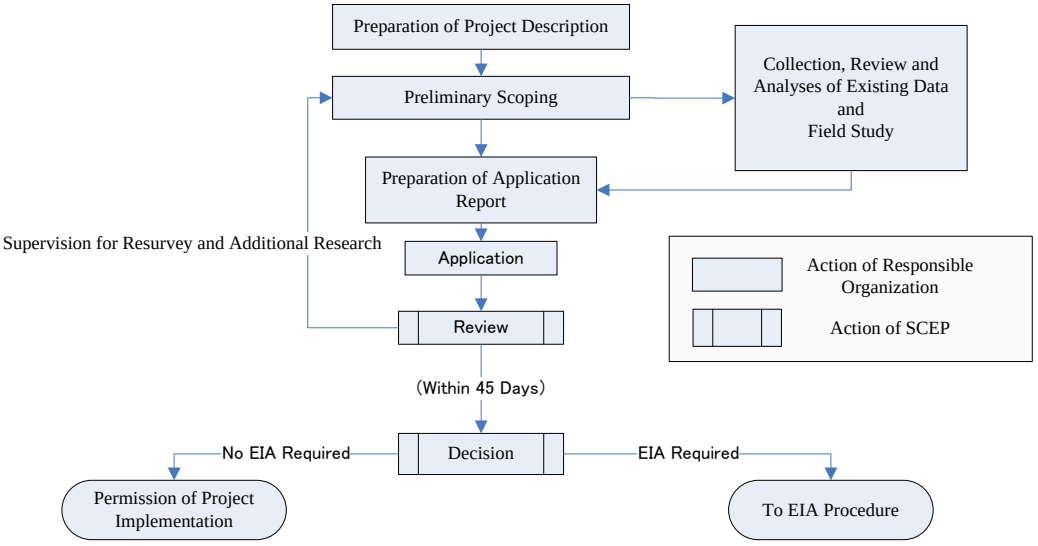

Figure 11.2.1 IEE Procedure in Tajikistan

The responsible organization carries out the IEE which contains a preliminary scoping, collection, review, and analyses of existing data, field study and application within its own guidelines and methods. SCEP supervises the organization and makes suggestions for resurveys and additional research after the review of the application. Eventually, SCEP decides for the implementation of the project.

11.2.3 ISSUES IN CURRENT ENVIRONMENTAL REGULATIONS

The issues in current environmental regulations are shown as follows;

- Application date and period of investigation are not specified.
- Number of specialists for socio economy is not enough.
- The double role of SCEP to carry out investigation and to review it will give rise to doubts about fair judgment.
- The procedure might be performed without the participation of residents.

11.3 INITIAL ENVIRONMENTAL EXAMINATION (IEE) FOR THE IMPLEMENTATION OF THE PILOT PROJECT

The pilot project in this project is carried out at Borshevik village in order to recover the function of the water supply system. The rehabilitation work has started in June 2008.

11.3.1 APPLICATION PROCEDURE OF INITIATION ENVIRONMENTAL REVIEW TO SCEP

In case of application for initial environmental review to the State Committee for Environmental Protection and Forestry (SCEP), as shown in Chapter 11.2, the responsible organization has to submit the project summary and the report of preliminary prediction of environmental impact at least 45 days before the initiation of the construction work.

The responsible organization has to restudy and reapply if the result of the review requests further investigation. It is possible to kick off the construction work in accordance with the authorization of SCEP.

11.3.2 IMPLEMENTATION OF IEE AND APPLICATION TO SCEP

The application for initiation environmental review was carried out in April 2008. Prior to the application in February and March 2008, two environmental items (Groundwater, Fauna and Flora) were studied through the preliminary environmental scoping under the JICA guideline for environmental and social considerations. RWSA submitted the result of the study and summary of the rehabilitation plan.

About one month after the submission, the implementation of the pilot project was approved by SCEP on May 20th, 2008.

11.4 INITIAL ENVIRONMENTAL EXAMINATION (IEE) FOR THE MASTER PLAN

Initial environmental examination (IEE) is carried out by the responsible organization, Ministry of Melioration and Water Resources (MMWR) and Tajik Rural Water Supply Authority (RWSA), in cooperation with the JICA Study Team. Initially, environmental items which should be considered are screened by scoping. Secondly, necessary collection, review and analyses of existing data and field investigation will be implemented. As mentioned in chapter 11.3, the result of IEE and project summary will be submitted to SCEP for initial environmental review with the same procedure as that of the pilot project.

11.4.1 COMPONENTS OF THE PROJECT

The master plan of replacement and extension of the rural water supply systems and rehabilitation of Vakhsh Conduits will be formulated. The contents of construction work and geographical situation between rural water supply systems and Vakhsh Conduits are different.

Therefore, IEE for the master plan will be carried out by dividing into the rural water supply component and the Vakhsh Conduits component.

11.4.2 ENVIRONMENTAL SCOPING

Preliminary scoping which may have impact on environment was implemented by existing information on rural water supply system component and the Vakhsh Conduits component. The result of scoping is shown in *Table 11.4.1 and 11.4.2.*

Table 11.4.1 Environmental Scoping (Rural Water Supply System Component)

No.	Environmental Item	Evaluation	Reasons
	Social Environment		
1	Resettlement	C	Water supply system will be small structure. It is possible to be installed out of the area of residence.
2	Economic activities	C	Water vendors for daily water are not active in the study area. There is a possibility that service business for operation and maintenance of water supply systems become activated.
3	Land use and Resource use	C	Implementation of rehabilitation, reconstruction, and extension for the selected systems produces no serious change in the current situation of land use and resource.
4	Social organization	C	This project does not impact the social organization.
5	Existing infrastructure	C	The project will improve the capability of existing water supply system.
6	Poverty group, Indigenous people and Ethnic minority	C	The poverty group is one of the target beneficiaries of the project. It will involve their life.
7	Irregularly-distributed damage and benefit	C	Irregularly-distributed damage and benefit does not come into existence in consideration of fair distribution.
8	Split of community	C	Split of community does not come into existence in consideration of fair distribution.
9	Gender	C	Implementation of the pilot project will improve the situation of women.
10	Rights of the child	C	Children are target beneficiary the project. They will be released from fetching water.
11	Cultural property	C	In the study area, there is no valuable cultural heritage to be considered.
12	HIV / AIDS	C	There is not causal connection between the implementation of the project and HIV／AIDS.
13	Water rights and Rights of common	B	The ownership of the water supply system is unclear. It has to be studied with Water Code.
14	Public health condition	C	The project will have positive impact to improve currently affected public health and sanitation.
15	Waste	C	Implementation of rehabilitation, reconstruction, and extension of the water supply systems has no concern with waste.
16	Hazards (risk)	C	Large -scale construction concerning with natural hazards is not carried out in the Water Supply Plan.
	Natural Environment		
17	Topography and geology	C	The plan is not such a large scale. It should not effect a change in topography and geology.
18	Soil erosion	C	Not relevant (the Plan is not such a large scale)
19	Groundwater	B	If the groundwater is pumped up too much, it has the potential of lowering of groundwater level and water degradation at the boreholes.
20	Hydrological situation	C	The Plan is not such a large scale. The project will cause no change in hydrological situation.
21	Coastal zone	C	The study area is located in the inland area, not facing the coast.
22	Fauna and flora	B	The natural reserve and species management area are designated in the Khatlon Oblast. The investigation for further information about the impact to the protected area should be implemented.
23	Meteorology	C	The Plan is not such a large scale. The project will cause no change in meteorological situation.
24	Landscape	C	The Plan is not such a large scale. The project will cause no change in landscape.
25	Air pollution	C	The project will not cause air pollution.
26	Water contamination	C	The plan contains improvement and education of public health and sanitation for the community resident. The positive impact will be expected by the implementation of the project.
27	Soil contamination	C	Rural water supply system should not discharge harmful substance which causes soil contamination.
28	Noise and vibration	C	The implementation of rehabilitation, reconstruction, and extension for the selected systems may produce a bit of noise and vibration. It will be negligible small.
29	Land subsidence	C	The Plan is not such a large scale. Land subsidence should not come up with appropriate operation of amount of pumping.
30	Offensive odor	C	Not relevant (the water supply system does not give off offensive smells)

A : Serious impact is expected

B : Potential impact may occur or Extent of impact is unknown.

C : No impact is expected.

Table 11.4.2 Environmental Scoping (Vakhsh Conduits Component)

No.	Environmental Item	Evaluation	Reasons
	Social Environment		
1	Resettlement	B	In case that water treatment plant will be planned, resettlement will have to be considered with caution.
2	Economic activities	C	Water vendors for daily water are not active in the study area. There is a possibility that service business for operation and maintenance of water supply systems become activated.
3	Land use and Resource use	C	Implementation of construction and extension for the Vakhsh Conduits produces no serious change in the current situation of land use and resource.
4	Social organization	C	This project does not impact the social organization.
5	Existing infrastructure	C	The project will improve the capability of existing water supply system.
6	Poverty group, Indigenous people and Ethnic minority	C	The poverty group is one of the target beneficiaries of the project. It will involve their life.
7	Irregularly-distributed damage and benefit	C	Irregularly-distributed damage and benefit does not come into existence in consideration of fair distribution.
8	Split of community	C	Split of community does not come into existence in consideration of fair distribution.
9	Gender	C	Implementation of the pilot project will improve the situation of women.
10	Rights of the child	C	Children are target beneficiary the project. They will be released from fetching water.
11	Cultural property	C	In the study area, there is no valuable cultural heritage to be considered.
12	HIV / AIDS	C	There is not causal connection between the implementation of the project and HIV／AIDS.
13	Water rights and Rights of common	B	The water rights of Vakhsh Conduits have to be made sure with Water Code.
14	Public health condition	C	The project will have positive impact to improve currently affected public health and sanitation.
15	Waste	C	Implementation of rehabilitation, reconstruction, and extension of the water supply systems has no concern with waste.
16	Hazards (risk)	C	Large -scale construction concerning with natural hazards is not carried out in the Water Supply Plan.
	Natural Environment		
17	Topography and geology	C	The plan is not such a large scale. It should not effect a change in topography and geology.
18	Soil erosion	C	Not relevant (the Plan is not such a large scale)
19	Groundwater	C	Water supply system of Vakhsh Conduits does not pump up ground water.
20	Hydrological situation	C	The Vakhsh Conduits has source of water from Vakhsh river. However, the quantity of water intake is less than that of river flow. It is expected that hydrological situation will not be effected.
21	Coastal zone	C	The study area is located in the inland area, not facing the coast.
22	Fauna and flora	B	The natural reserve and species management area are designated in the Khatlon Oblast. The investigation for further information about the impact to the protected area should be implemented.
23	Meteorology	C	The Plan is not such a large scale. The project will cause no change in meteorological situation.
24	Landscape	C	The Plan is not such a large scale. The project will cause no change in landscape.
25	Air pollution	C	The project will not cause air pollution.
26	Water contamination	C	The plan contains improvement and education of public health and sanitation for the community resident. The positive impact will be expected by the implementation of the project.
27	Soil contamination	C	Drinking water supply system should not discharge harmful substance which causes soil contamination.
28	Noise and vibration	C	The implementation of rehabilitation, reconstruction, and extension for the selected systems may produce a bit of noise and vibration. It will be negligible small.
29	Land subsidence	C	Water supply system of the Vakhsh conduits does not pump up groundwater. It does not cause land subsidence.
30	Offensive odor	C	Not relevant (the water supply system does not give off offensive smells)

A : Serious impact is expected

B : Potential impact may occur or Extent of impact is unknown.

C : No impact is expected.

11.4.3 ENVIRONMENTAL ITEMS TO BE STUDIED FOR IEE

Environmental items which should be particularly inspected were identified in the scoping. These items will be studied by collection, review and analyses of existing data and the field survey along with preparation of the master plan for the rehabilitation of the existing water supply system. The activities which may cause impact on the environment should be prevented and mitigated. If a new item is found in the process of the preparation of master plan, it will be studied in a similar way.

Results of preliminary scoping are as follows.

(1) Rural Water Supply System Component

1) Water rights and Rights of common

No.	Environmental Item	Evaluation	Reasons
13	Water rights and Rights of common	B	The ownership of the water supply system is unclear. It has to be studied with Water Code.

In the water supply system of which source is groundwater, it is required to study the Water Code about application of groundwater use and some trouble which may occur among organizations about the water rights.

2) Groundwater

No.	Environmental Item	Evaluation	Reasons
19	Groundwater	B	If the groundwater is pumped up too much, it has the potential of lowering of groundwater level and water degradation at the boreholes.

The water source of the water supply systems is groundwater, therefore, proper management in the production of groundwater and water quality is required. Pumping tests and water quality analyses were carried out at the project sites. These results will be examined to clarify whether or not rehabilitation and extension of the systems causes any negative impact to the groundwater environment.

3) Fauna and flora

No.	Environmental Item	Evaluation	Reasons
22	Fauna and flora	B	The natural reserve and species management area are designated in the Khatlon Oblast. The investigation for further information about the impact to the protected area should be implemented.

The confluence of the Vakhsh and the Pyandzh Rivers is designated as a natural reserve. In addition, a species management area is designated near the border of Pyandzh and Farkhor Rayons. A distribution map and detail information will be collected to grasp the positional relationship with the project site. If the project site is included in a the natural reserve, it will be studied whether the project causes any negative impact on the environment or not.

(2) Vakhsh Conduits Component

1) Resettlement

No.	Environmental Item	Evaluation	Reasons
1	Resettlement	B	In case that water treatment plants will be planned, the resettlement will have to be considered with caution.

If construction of a new water treatment plant is planned, the proposed location and required area will be identified. If the construction of a treatment plant requires the resettlement of the community people, no forced resettlement shall be considered.

2) Water rights and Rights of common

No.	Environmental Item	Evaluation	Reasons
13	Water rights and Rights of common	B	The water rights of the Vakhsh Conduits have to be made sure with Water Code.

In the water supply system of the Vakhsh Conduits, it is required to study the Water Code about ownership of the system, number of the water right of water intake and some trouble which may occur among organizations about water rights.

3) Fauna and flora

No.	Environmental Item	Evaluation	Reasons
22	Fauna and flora	B	The natural reserve and species management area are designated in the Khatlon Oblast. The investigation for further information about the impact to the protected area should be implemented.

The confluence of the Vakhsh and the Pyandzh Rivers is designated as a natural reserve. In addition, a species management area is designated near the border of Pyandzh and Farkhor Rayons. A distribution map and detail information will be collected to grasp the positional relationship with the project site. If the project site is included in the natural reserve, it will be studied whether the project causes any negative impact on the environment or not.

11.4.4 RESULT OF THE STUDY

(1) Rural Water Supply System Component

1) Water rights and Rights of common

As mentioned in chapter 7, undefined ownership of rural water supply systems, particularly which were once owned by collective farms, complicates issues pertaining to operation and maintenance of the rural water supply system.

Since state ownership is principle in the Water Code, in fact, these rural water supply systems once owned by former state and collective farms are owned and managed by Vodacanal, RWSA, state entity or Jamoat.

The project suggests that the role and responsibility of the operation and maintenance of the water supply system will be made clear among the owner, operator, Water User Association, local community. Then, the water supply systems of undefined ownership should be transferred to competent state entity, Vodacanal and RWSA.

The Water Code regulates water rights of groundwater for water supply in accordance with administrative authorities in article 33. The state entity, owner of the water supply system, is able to pump up the groundwater under the permit approval of State Geological Survey Authority each three years. In addition, the water for agricultural use including irrigation water is taken from surface water.

For this reason, it is estimated that conflict over the water rights will not be caused.

2) Groundwater

The result of pumping test is shown in *Table 11.4.3* and *Appendix-1in chapter 6*.

Groundwater yield is generally very high, from 22.3 to 37.8m^3/hour. Drawdown against the maximum yield ranges between 1.28 and 7.65m. The lowering of water level was not found in process of the step drawdown test and constant discharge test. In addition, time for recovery of water level after stopping the pumping is fast, it is from 1 to 60 minutes. For the result of the test, the groundwater potential of the target area is evaluated as high. The situation of the groundwater potential in Jarkurgan village (K-7), that was impossible to carry

out the test, is estimated as enough high by the result of the test in the nearby village, Yangi Yul (K-2) and Borshevik (K-11).

Water demand on the priority water supply system in target area is shown in *Table 11.4.4*.

Compared with the water demand per day on the target village, the groundwater potential is evaluated as enough to fulfill the demand in each village.

For this reason, it is assumed that the pumping plan for groundwater usage in target area will not cause lowering of groundwater.

Table 11.4.3 Result of the Pumping Test

No.	Rayon	Village	STEP 1		STEP 2		STEP 3		STEP 4		STEP 5		Constant Discharge		Recovery
			2 hours		2 hours		2 hours		2 hours		2 hours		48 hours		
			Q1	DD	Q2	DD	Q3	DD	Q4	DD	Q5	DD	Qc	DD	Minutes
			m^3/h	m	m^3/h	m	m^3/h	m	m^3/h	m	m^3/h	m	m^3/h	m	
K-2	Kabodiyon	Yangi Yul	22.7	2.13	28.4	2.5	33.1	3.73	35.3	4.43	37.8	5.02	37.8	***5.08***	***2***
K-5	Kabodiyon	Navruz	14.8	5.29	17.3	6.63	18.4	7.29	21.6	7.48	22.3	7.61	22.3	***7.65***	***6***
K-7	Kabodiyon	Jarkurgan	N.A												
K-9	Kabodiyon	Kabla (Boshkala)	3.2	0.2	18	1	36	2.3	N.A	N.A	N.A	N.A	36	***2***	***60***
K-11	Kabodiyon	Bolshevik	22.7	0.87	28.4	1.16	33.1	1.57	35.3	1.82	37.8	1.92	37.8	***2.01***	***6***
N-1	Nosiri Khisrav	44 Chashma (Oltinsoy, Olzu, Bahor, Traganov)	22.7	1.42	25.2	2.15	28.4	2.47	33.1	3.01	37.8	3.44	37.8	***3.65***	***1***
S-4	Shakhritus	Vatan	22.7	0.73	25.2	0.83	28.4	1.07	33.1	1.17	37.8	1.28	37.8	***1.32***	***3***
S-5	Shakhritus	Sultanabod	22.7	0.62	28.4	0.96	33.1	1.26	35.3	1.41	37.8	1.55	37.8	***1.59***	***3***
S-9	Shakhritus	Binokor (Gidrostroiteley)	3.6	0.21	10.8	0.53	18	1.35	25.2	1.46	36	1.51	36	***1.28***	***4***
P-13	Pyandzh	Sarmantoy	22.7	1.11	28.4	2.33	33.1	4.08	35.3	5.02	37.8	6.17	37.8	***5.47***	***23***

Table 11.4.4 Water Demand on the Priority Water Supply System

Rayon	Jamoat	No.	Village	Population to be Served (2007)		Water Demand (m^3/day)
Kabodiyon	S. Khudoikulov	K-2	Yangi Yul	3,618	3,618	72.4
	Navobod	K-5	Navruz	820	820	16.4
	S. Khudoikulov	K-7	Jarkurgan	3,917	3,917	78.3
	U. Nazarov	K-9	Kabla	6,180	6,180	123.6
			Boshkala	6,874		
			Chaparyq-1	3,200	11,384	227.7
			Chaparyq-2	1,310		
	S. Khudoikulov	K-11	Bolshevik	3,816	3,816	76.3
Nosiri Khisrav	Istiklol	N-1	Oltinsoy	1,500		
			Olzu	900	7,100	170.0
			Bahor	3,400		
			Traganov	1,300		
Shakhritus	Obshoron	S-4	Vatan	5,300	5,300	106.0
	Pakhtaobod	S-5	Sultanabod	3,750	6,065	123.0
			Yangabod	2,400		
	Obshoron	S-9	Binokor	2,642	4,902	98.0
			Gidrostroiteley	2,260		
Pyandzh	Sarmantoy	P-13	Sarmantoy-1	2,500	5,900	118.0
			Sarmantoy-2	3,400		

3) Fauna and flora

Distribution map of natural reserve in Tajikistan is shown in *Figure 11.4.1*.

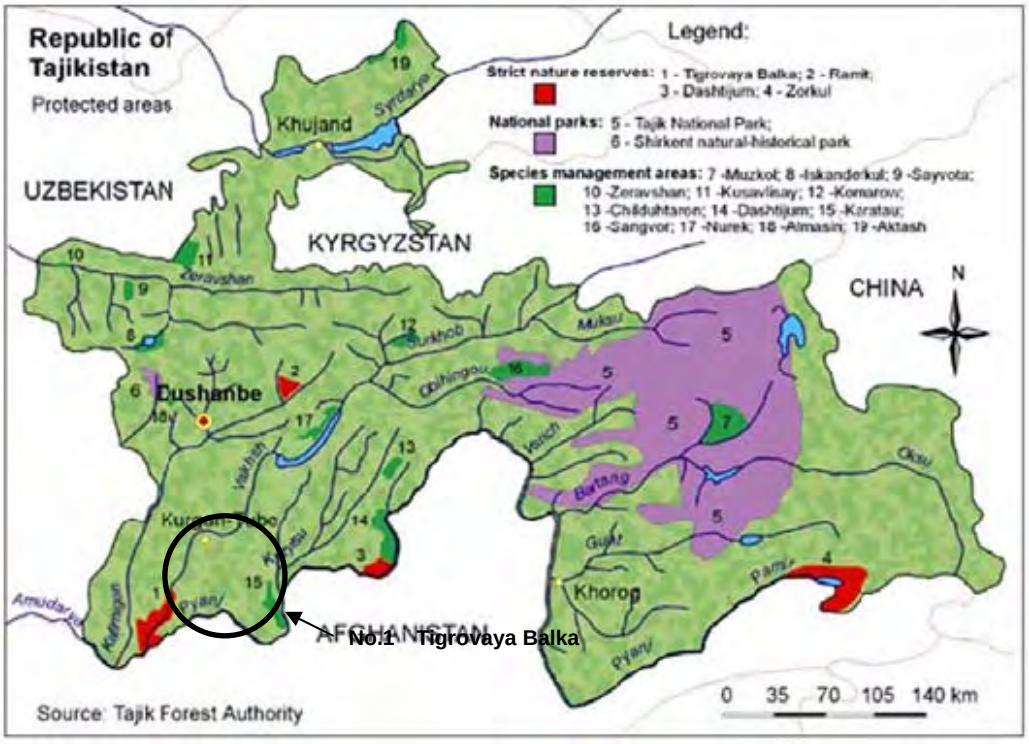

Figure 11.4.1 Distribution Map of Natural Reserve in Tajikistan

The protected area in the southern Khatlon Oblast, is “State Natural Reserve Tigrovaya Balka”. The reserve “Tigrovaya Balka” was established on 4 of November, 1938. It is located from merge of the Pyandzh and the Vakhsh rivers to the area along the river Vakhsh for 40 km. The area of the reserve is 49,700 hectares.

Target villages of the rural water supply component are located in Kabodiyon, Nosiri Khisrav, and Shakhritus Rayons. These Rayons are located in the Kofarnihan-river basin which is out of the area of the natural reserve.

(2) Vakhsh Conduits Component

1) Resettlement

Water treatment plants are planned in the master plan. Positional relation between the locations of construction plan and district of residence should be investigated. The rehabilitation plan of Vakhsh Conduits contains replacement and repair of existing pipelines. However, resettlement is not required because the extension of the pipelines will not be carried out.

15 water treatment plants are planned as shown in *Table 11.4.5*.

Table 11.4.5 List of the Planed Water Treatment Plant

No.	Code	Rayon	Size
1	WTPR01	Kolkhozobod	47(m)×47(m)
2	WTPJ01	Dzilikul	59(m)×59(m)
3	WTPKo01	Kolkhozobod	68(m)×68(m)

4	WTPR24	Kolkhozobod	47(m) × 47(m)
5	WTPV15	Vakhsh	120(m) × 120(m)
6	WTPR12	Kolkhozobod	68(m) × 68(m)
7	WTPR15	Kolkhozobod	56(m) × 56(m)
8	WTPR07	Kolkhozobod	53(m) × 53(m)
9	WTPQ04	Kumsangil	68(m) × 68(m)
10	WTPQ05	Kumsangil	68(m) × 68(m)
11	WTPQ06	Kumsangil	53(m) × 53(m)
12	WTPQ02	Kumsangil	50(m) × 50(m)
13	WTPJ12	Dzilikul	50(m) × 50(m)
14	WTPJ13	Dzilikul	50(m) × 50(m)
15	WTPJ08	Dzilikul	68(m) × 68(m)

The location map for planned water treatment plants is shown in *Figure 11.4.2*.

15 water treatment plants are planned near the existing water supply system at separated area from the residential area. It is possible to construct the plants inside of the existing water supply system or in the agricultural field. Therefore, the plants will be constructed out of the residential area. Pictures of the proposed construction site for water treatment plant are shown in *Figure 11.4.3*.

These results show that no resettlement will be caused by the construction of the water treatment plant.

In case that proposed construction site is outside of the area of existing water supply system, RWSA, owner and responsible organization of the system, applies to governor of Khatlon Oblast for appropriation of land under the Land Code. Then, Khatlon Oblast applies to Rayons in a similar way.

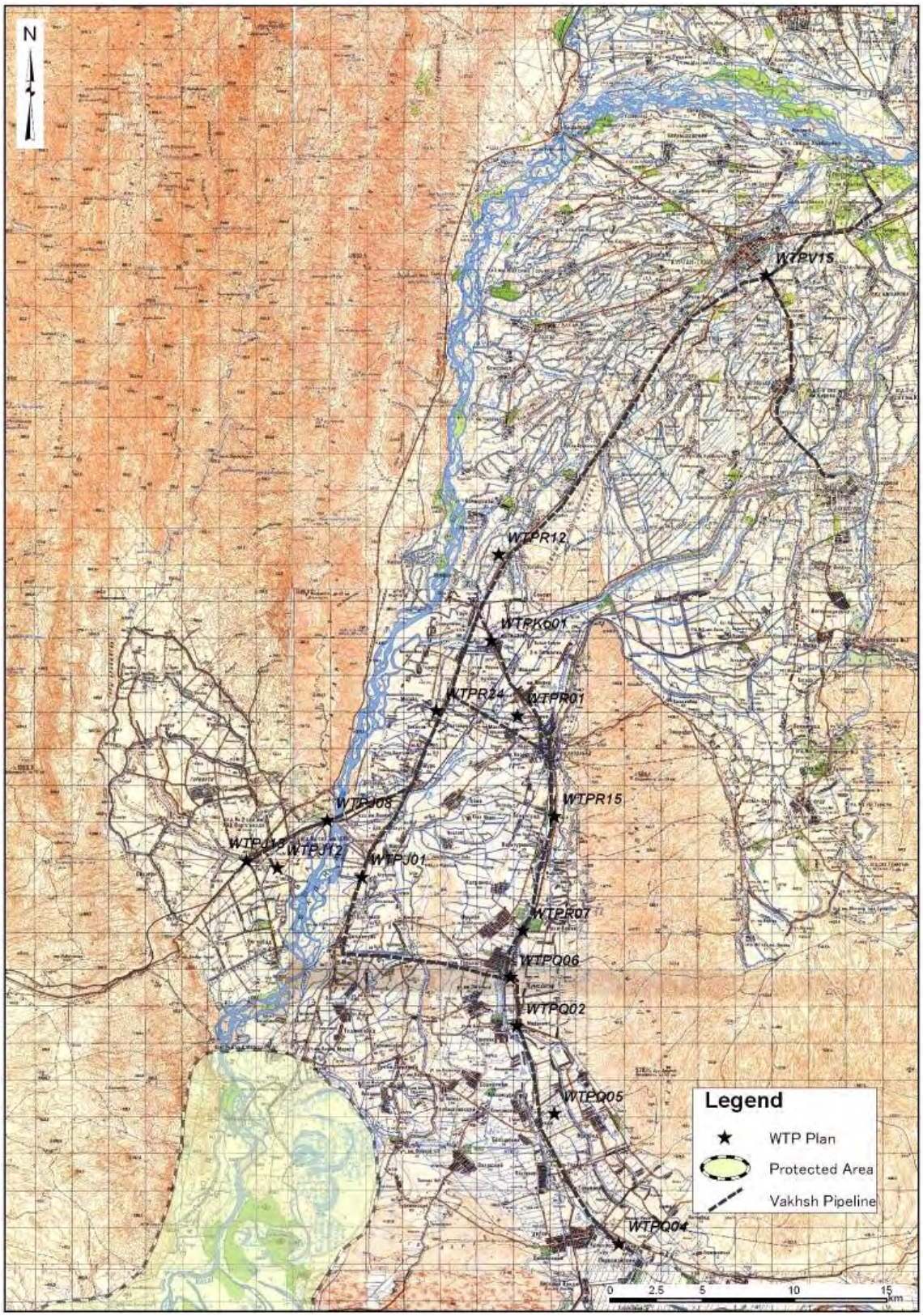

Figure 11.4.2 Location Map of Proposed Water Treatment Plant and Vakhsh Conduits

	
WTPR-01 Cotton field	**WTPJ-01** Cotton field
	
WTPKo-01 Cornfield	**WTPR-24** Cotton field
	
WTPV-15 Possible construction inside the existing facilities	**WTPR-12** Cotton field
	
WTPR-15 Cotton field	**WTPR-07** Cotton field

Figure 11.4.3-1 Picture of Proposed Construction Site for Water Treatment Plant

	
WTPQ-04 Possible construction inside the existing facilities	**WTPQ-05** Possible construction inside the existing facilities
	
WTPQ-06 Cotton field	**WTPQ-02** Cornfield
	
WTPJ-12 Possible construction inside the existing facilities	**WTPJ-13** Cotton field
	
WTPJ-08 Abandoned cultivated area	

Figure 11.4.3-2 Picture of Proposed Construction Site for Water Treatment Plant

2) Water rights and Rights of common

The Vakhsh Conduits was constructed in 1977 of which water source is from the Stalin canal around 7km downstream from the Sarband dam which is located around 15km to the East-North-East of Kurgan-Tyube.

The Water Code regulates that "Water bodies will be given for use firstly to satisfy drinking and social needs of population". The state entity administrating water supply system has the authority to take the water for water demand in accordance with the approved water right. Once the authority was under Ministry of Melioration and Water Resources, however, currently SCEP assumes the role. The water right has to be reapplied each five years.

Water right for the Vakhsh Conduits is authorized to RWSA, owner and responsible organization of the system, through the procedure for application. In fact, RWSA has authorization of 105,000m^3/day for taking water from the Vakhsh River.

For this reason, it is estimated that no conflict over the water rights will be caused.

3) Fauna and flora

As mentioned above, the protected area in the southern Khatlon Oblast is "State Natural Reserve Tigrovaya Balka". It is located from the merge of the Pyandzh and Vakhsh Rivers and lasts along the Vakhsh River for 40 km.

The distribution map of State Natural Reserve "Tigrovaya Balka" is shown in *Figure 11.4.4*.

The map shows that the border of the natural reserve passes the southern part of Dzilikul village. The area of the natural reserve is overlapped as the protected area on the Location Map of Planning Water Treatment Plant and Vakhsh Conduits (*Figure 11.4.2*).

The map shows that the proposed construction site of the Vakhsh Conduits is out of the area of natural reserve "Tigrovaya Balka". Therefore, the proposed rehabilitation plan will cause no negative impact on the Fauna and Flora in the reserve.

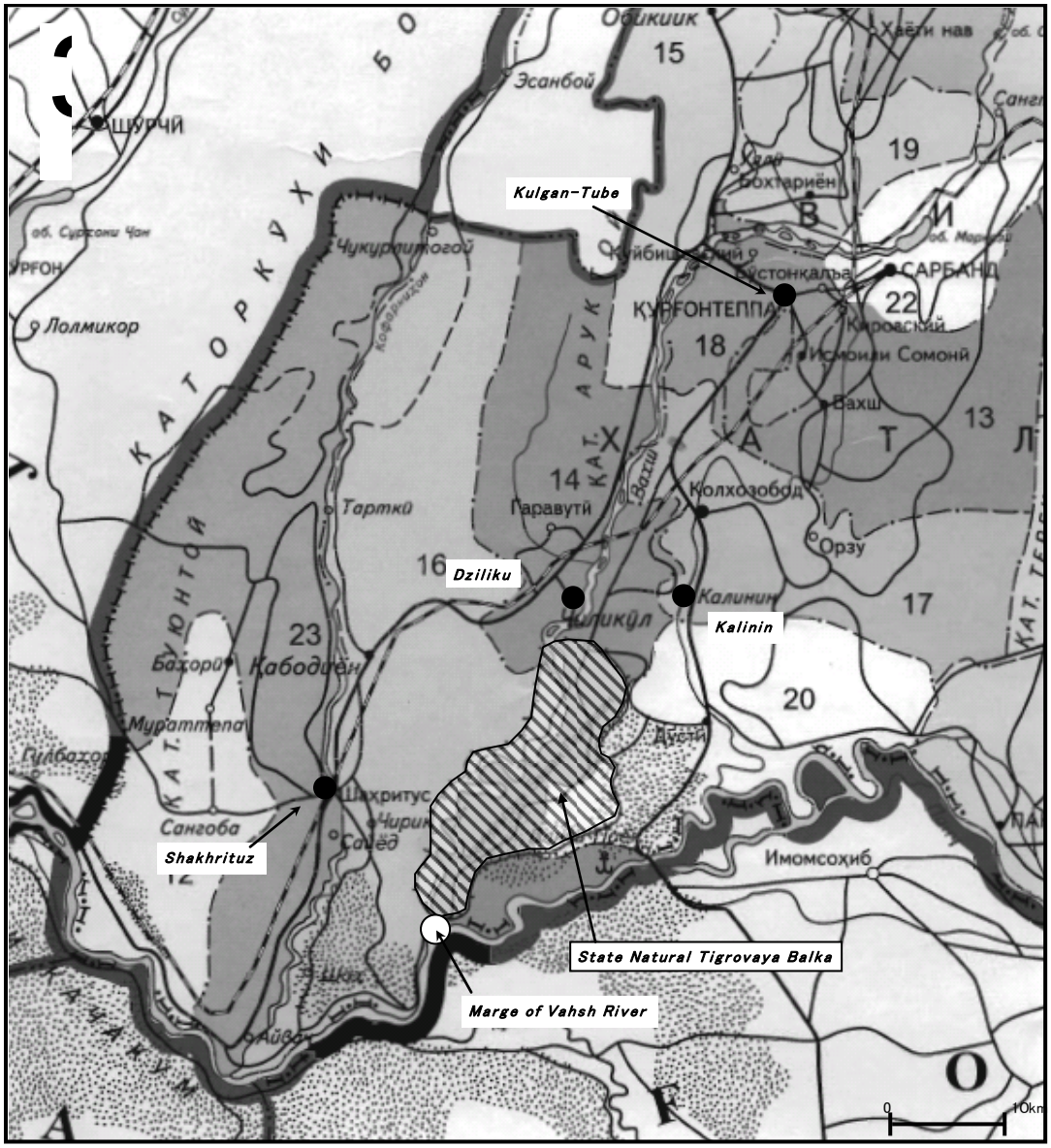

Figure 11.4.4 Distribution Map of State Natural Reserve "Tigrovaya Balka"

(Source: Border Dividion of the Repblic of Tajikistan)

11.4.5 FINAL RESULT OF SCOPING

The final results of scoping based on the study are shown in *Table 11.4.6 and 11.4.7*.

It is expected that environmental items reviewed in the scoping list in both components of rural water supply system and the Vakhsh Conduits have no negative impact to the environment.

Table 11.4.6 Final Result of Scoping (Rural Water Supply System Component)

No.	Environmental Item	Evaluation	Reasons
	Social Environment		
1	Resettlement	C	Water supply system will be small structure. It is possible to be installed beyond place of residence.
2	Economic activities	C	Water vendors for daily water are not active in the study area. There is a possibility that service business for operation and maintenance of water supply systems become activated.
3	Land use and Resource use	C	Implementation of rehabilitation, reconstruction, and extension for the selected systems produces no serious change in the current situation of land use and resource.
4	Social organization	C	This project does not impact the social organization.
5	Existing infrastructure	C	The project will improve the capability of existing water supply system.
6	Poverty group, Indigenous people and Ethnic minority	C	The poverty group is one of the target beneficiaries of the project. It will involve their life.
7	Irregularly-distributed damage and benefit	C	Irregularly-distributed damage and benefit does not come into existence in consideration of fair distribution.
8	Split of community	C	Split of community does not come into existence in consideration of fair distribution.
9	Gender	C	Implementation of the pilot project will improve the situation of women.
10	Rights of the child	C	Children are target beneficiary the project. They will be released from fetching water.
11	Cultural property	C	In the study area, there is no valuable cultural heritage to be considered.
12	HIV / AIDS	C	There is not causal connection between the implementation of the project and HIV／AIDS.
13	Water rights and Rights of common	C	Groundwater use on rural water supply system is protected by Water Code as priorities. The water rights will be approved in accordance with appropriate application procedure.
14	Public health condition	C	The project will have positive impact to improve currently affected public health and sanitation.
15	Waste	C	Implementation of rehabilitation, reconstruction, and extension of the water supply systems has no concern with waste.
16	Hazards (risk)	C	Large -scale construction concerning with natural hazards is not carried out in the Water Supply Plan.
	Natural Environment		
17	Topography and geology	C	The plan is not such a large scale. It should not effect a change in topography and geology.
18	Soil erosion	C	Not relevant (the Plan is not such a large scale)
19	Groundwater	C	The result of the pumping tests shows that the boreholes in this project area have enough potential. The project does not cause drawdown of ground water level with appropriate administration of pumping rate.
20	Hydrological situation	C	The Plan is not such a large scale. The project will cause no change in hydrological situation.
21	Coastal zone	C	The study area is located in the inland area, not facing the coast.
22	Fauna and flora	C	Selected priority water supply systems are located out of the protected area.
23	Meteorology	C	The Plan is not such a large scale. The project will cause no change in meteorological situation.
24	Landscape	C	The Plan is not such a large scale. The project will cause no change in landscape.
25	Air pollution	C	The project will not cause air pollution.
26	Water contamination	C	The plan contains improvement and education of public health and sanitation for the community resident. The positive impact will be expected by the implementation of the project.
27	Soil contamination	C	Rural water supply system should not discharge harmful substance which causes soil contamination.
28	Noise and vibration	C	The implementation of rehabilitation, reconstruction, and extension for the selected systems may produce a bit of noise and vibration. It will be negligible small.
29	Land subsidence	C	The Plan is not such a large scale. Land subsidence should not come up with appropriate operation of amount of pumping.
30	Offensive odor	C	Not relevant (the water supply system does not give off offensive smells)

A : Serious impact is expected

B : Potential impact may occur or Extent of impact is unknown.

C : No impact is expected.

Table 11.4.7 Final Result of Scoping (Vakhsh Conduits Component)

No.	Environmental Item	Evaluation	Reasons
	Social Environment		
1	Resettlement	C	The water treatment plants will be planned inside the existing water supply system or in cotton field, abandoned cultivate field. The project will not cause resettlement in target area.
2	Economic activities	C	Water vendors for daily water are not active in the study area. There is a possibility that service business for operation and maintenance of water supply systems become activated.
3	Land use and Resource use	C	Implementation of construction and extension for the Vakhsh Conduits produces no serious change in the current situation of land use and resource.
4	Social organization	C	This project does not impact the social organization.
5	Existing infrastructure	C	The project will improve the capability of existing water supply system.
6	Poverty group, Indigenous people and Ethnic minority	C	The poverty group is one of the target beneficiaries of the project. It will involve their life.
7	Irregularly-distributed damage and benefit	C	Irregularly-distributed damage and benefit does not come into existence in consideration of fair distribution.
8	Split of community	C	Split of community does not come into existence in consideration of fair distribution.
9	Gender	C	Implementation of the pilot project will improve the situation of women.
10	Rights of the child	C	Children are target beneficiary the project. They will be released from fetching water.
11	Cultural property	C	In the study area, there is no valuable cultural heritage to be considered.
12	HIV / AIDS	C	There is not causal connection between the implementation of the project and HIV／AIDS.
13	Water rights and Rights of common	C	The responsible organization, RWSA, has water rights of the Vakhsh Conduits.
14	Public health condition	C	The project will have positive impact to improve currently affected public health and sanitation.
15	Waste	C	Implementation of rehabilitation, reconstruction, and extension of the water supply systems has no concern with waste.
16	Hazards (risk)	C	Large -scale construction concerning with natural hazards is not carried out in the Water Supply Plan.
	Natural Environment		
17	Topography and geology	C	The plan is not such a large scale. It should not effect a change in topography and geology.
18	Soil erosion	C	Not relevant (the Plan is not such a large scale)
19	Groundwater	C	Water supply system of Vakhsh Conduits does not pump up ground water.
20	Hydrological situation	C	Vakhsh Conduits has source of water from Vakhsh river. However, the quantity of water intake is less than that of river flow. It is expected that hydrological situation will not be effected.
21	Coastal zone	C	The study area is located in the inland area, not facing the coast.
22	Fauna and flora	C	The Vakhsh Conduits are located out of the protected area.
23	Meteorology	C	The Plan is not such a large scale. The project will cause no change in meteorological situation.
24	Landscape	C	The Plan is not such a large scale. The project will cause no change in landscape.
25	Air pollution	C	The project will not cause air pollution.
26	Water contamination	C	The plan contains improvement and education of public health and sanitation for the community resident. The positive impact will be expected by the implementation of the project.
27	Soil contamination	C	Drinking water supply system should not discharge harmful substance which causes soil contamination.
28	Noise and vibration	C	The implementation of rehabilitation, reconstruction, and extension for the selected systems may produce a bit of noise and vibration. It will be negligible small.
29	Land subsidence	C	Water supply system of Vakhsh conduits does not pump up groundwater. It does not cause land subsidence.
30	Offensive odor	C	Not relevant (the water supply system does not give off offensive smells)

A : Serious impact is expected

B : Potential impact may occur or Extent of impact is unknown.

C : No impact is expected.

11.4.6 APPLICATION SCHEDULE TO SCEP

Following the procedure shown in *Figure 11.2.1*, the initial environmental review for the master plan will be applied to SCEP. The application schedule is shown in *Figure 11.4.5*.

Ministry of Melioration and Water Resources and RWSA, the responsible organization of the project, will apply. The documents for application should be submitted at the end of September, 2008. If additional survey and comments are requested by SCEP in the process of the review, it will be carried out on the extension period shown in *Figure.11.4.5*

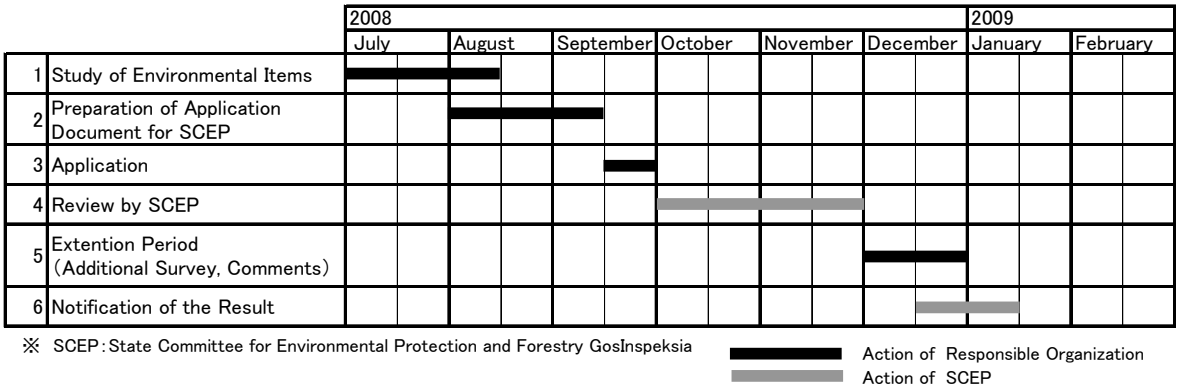

Figure 11.4.5 Application Schedule of Initial Environmental Review to SCEP

Part 4 Verification of the Proposals on the Development Issues, and Conclusion and Recommendation

CHAPTER 12 PROPOSAL THROUGH THE RESULTS OF THE PILOT PROJECT

12.1 IMPLEMENTATION OF THE PILOT PROJECT

12.1.1 SELECTION OF CANDIDATE FOR PILOT PROJECT

The pilot project aims to verify the effectiveness of operation and maintenance method to be proposed in the Study. The condition of candidates for the pilot project is as follows:

Drilling of new borehole is not required (Development of borehole and replacement of pump are required).

Large scale of rehabilitation work is not required (only small scale of replacement of transmission line and distribution lines are required).

From these points, the system in Bolshevik Village, S. Khudoikulov Jamoat in Kabodiyon Rayon is selected as the candidate of the pilot project.

Current situation of the system is as follows:

Water supply target population: 3,816 persons

Borehole is reusable.

Distribution tank requires no rehabilitation work.

Transmission line requires rehabilitation

Small scale of rehabilitation for distribution lines is required.

In Bolshevik village, community people are paying the tariff for electricity. It is considered that the community people are willing to pay the water tariff. Population of Bolshevik is 3, 816 persons, this scale of population seems to be suitable for the implementation of the pilot project.

Implementation of the Pilot Project was agreed under the conditions below between the Tajikistan side and the Japanese side on 23rd January, 2008. Therefore, it will be carried out in the Phase 2 Study period (May 2008 - March 2009).

<Condition of Implementation of the pilot project>

The water tariff proposed by the Study Team for the sustainable operation and maintenance of the water supply system shall be accepted by the State Committee of Anti-Monopoly Control and Entrepreneurship Support before commencement of the pilot project.

The proposed roles of stakeholders for operation and maintenance of the water supply system shall be accepted by Bolshevik village, Hukmat of Kabodiyon Rayon and Rural Water Supply Authority (RWSA) before commencement of the pilot project.

It shall be confirmed by the leakage test that major replacement of transmission and distribution pipes is not required to supply the planned volume of water to the village.

12.1.2 IMPLEMENTATION PLAN OF PILOT PROJECT

A pilot project will be implemented in the Bolshevik Village, Kabodiyon Rayon. The procedure of implementation is as shown in *Figure 12.1.1*. The pilot project aims to clarify the following issues under the working condition of the water supply system.

To clarify the effectiveness of the operation and maintenance plan to be proposed in the Study.

To improve knowledge and practice on safe water use of village peoples through sanitary education.

The procedure of the pilot project started in May 2008 and was completed in December 2008.

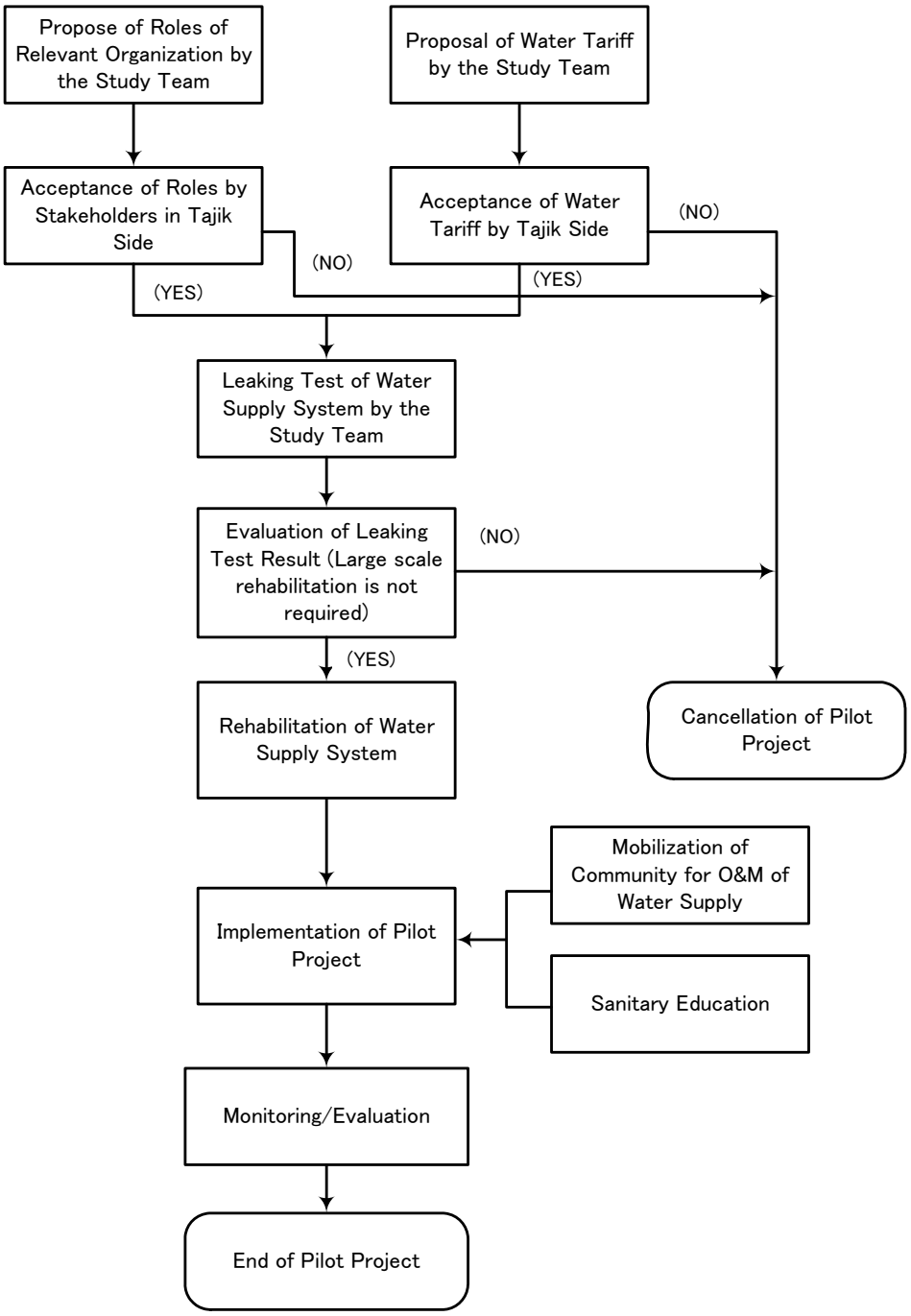

Figure 12.1.1 Procedure of Implementation of Pilot Project

12.1.3 Conditions for Implementation of Pilot Project

The Study Team held a stakeholder meeting on 27 May 2008 with relevant organizations. Main attendances are the representatives of MMWR, RWSA, Jamoat Khudoikulov, Bolshevik village and Kolkhoz Avesto. Role of each organization was proposed by the Study Team and it was accepted by all the participant. Agreements of roles of relevant organization were concluded to confirm the agreement (Refer to Appendix A of this Chapter). Contents of Agreements are as follows.

– Ownership and Management Agreement

- Community Management Entity Agreement
- Local Authority Agreement
- System Operation and Maintenance Agreement
- System Operation and Maintenance Cost Agreement

Therefore, Item No. 2 of the conditions was cleared.

In order to confirm the scale of the rehabilitation work, rehabilitation of borehole (pumping station), transmission line, a distribution tank (500 m^3), and the leakage test was started in June 2008 and completed on 6 August 2008. The leakage test revealed that following rehabilitation works were required to recover the existing water supply system (*Table 12.1.1*).

Table 12.1.1 Required Rehabilitation Work

Rehabilitation Work	Quantity
Rehabilitation of Distribution Pipe	
Steel pipe（φ15）	9 m
Steel pipe（φ20）	44 m
Steel pipe（φ25）	35 m
Steel pipe（φ32）	251 m
Steel pipe（φ100）	140 m
Steel pipe（φ159）	30 m
Total	593 m
Additional Installation of Public Water Tap	4 taps
Other Works	
Valve Box Rehabilitation	5 boxes
By-pass line Installation for Transmission Line	1 lot
Rehabilitation of water taps in the school	1 lot

Total length of required rehabilitation work of pipes is 593 m, which exceed the expected length of 500 m. Rehabilitation works mentioned in Table 12.1.1 will be completed in the end of September 2008. Taking this matter into consideration, it is considered that the rehabilitation work is worth for attaining the purpose of the pilot project. After the consultation with the Government of Japan, it is decided to carry out the rehabilitation works.

As for the water tariff, the Study Team estimated as 1 diram/m^3, only considering the consumption of electricity. Water tariff is estimated using following conditions.

Water demand

- Service population (2007) : 3,816
- Unit water demand (Domestic use) : 20 L/c/d
- Institutional water demand : 15 % of unit water demand
- Daily water demand : 104 m^3/d

Submersible pump

- Yield of pump : 20 m^3/hour
- Input power : 6.3 kwh
- Operation time : 5.2 hours

– Electricity consumption : 32.8 kw

Electric charge (from 1 May 2008) : 2.91 diram/kwh

Water tariff per m^3 : 0.91 diram/ m^3-----1.00 diram/ m^3

12.2 IMPLEMENTATION OF COMPONENT PROGRAM FOR IMPROVED OPERATION AND MAINTENANCE IN PILOT PROJECT

In order to verify the feasibility and applicability of the strategy mentioned above in operation and maintenance of the water supply system, a component program for improved operation and maintenance has been introduced and implemented in Bolshevik village since August 2008, where the pilot project is implemented.

Under the component program, activities for improved operation and maintenance described above (Stage 1 to Stage 5) are duly undertaken through employing international NGO, ACTED, which is competitive and experienced in such community mobilization for improved operation and maintenance in water supply and sanitation projects in the Study Area. The component program will last until January 2009 to complete all activities. The following are output observed and challenges identified through implementation of the component program. Reviewing these outputs and challenges, lessons learnt and recommendations are provided in this section, and further elaborated in strategy and a plan for improved operation and maintenance in the Draft Final Report.

12.2.1 OUTPUTS FROM IMPLEMENTATION OF PROGRAM

(1) Defined Roles and Responsibilities among Stakeholders for Improved Operation and Maintenance

Prior to the implementation of the pilot project, all actors involved in operation and maintenance of the supply system, namely village representatives, Jamoat, system owner (i.e. farm organization), and RWSA and Ministry of Land Reclamation and Water Resources concluded an agreement on system management. Based on the strategy for improved operation and maintenance described above, this agreement defines basic principles in system ownership and management, establishment of community management entity, as well as roles and responsibilities of each entity in system operation and maintenance including operation and maintenance costs, as follows.

System Ownership and Management Agreement

- ☐ It is agreed by all parties involved in the stakeholder meeting held on 27 May 2008 that the target rural water supply facility in Bolshevik Village, Kabodiyon Rayon are legally owned by Kolkhoz “Avesto”.
- ☐ It is also agreed that legal status for the system owner shall be vested with procedure and registration determined under the Law.
- ☐ The system owner shall take prime responsibility for system management.
- ☐ The system owner is responsible for the duties and tasks decided in this Agreement and the following consultative meetings among all entities involved in system management.

Community Management Entity Agreement

- ☐ It is agreed by all parties involved in the stakeholder meeting held on 27 May 2008 that the Water User Group (WUG) is organized in Kolkhoz Avesto.
- ☐ The major role and responsibility of WUG shall be a focal point for community participation in system management, and operation and maintenance..
- ☐ WUG is responsible for the duties and tasks decided in this Agreement and the following consultative meetings among all entities involved in system management.

Local Authority Agreement

- ☐ It is agreed among all parties involved in the stakeholder meeting held on 27 May 2008 that Jamoat, as state administrative entity, shall oversee system management, operation and maintenance, for the general benefit of entire community.
- ☐ Jamoat is responsible for the duties and tasks decided in this Agreement and the following consultative meetings among all entities involved in system management.

System Operation and Maintenance Agreement

- ☐ It is understood by all parties involved in the stakeholder meeting held on27 May 2008 that there are the following categories in system maintenance.
- ☐ It is basically agreed among all parties that primal responsibilities to be undertaken for each category of system maintenance are assigned to each entity as described below.
- ☐ However, further clarification and final decision in responsibility sharing among entity in system maintenance shall be made in the following consultation among all entities.

Category	Description	Responsible Entity
Service activities	This may include but not be limited to: chlorination at regular intervals, inspection of all system components; cleaning of any system components except wells, reservoirs, etc.; caretaking of installations at the site of the water source including the surrounding; leakage testing of minor sections and disinfection.	Kolkhoz Avesto
Routine / annual maintenance	This may include but not be limited to minor repairs such as replacement of taps; cleaning of reservoir including disinfection; leakage testing; regular painting and insulation tasks; winter operation; and minor structural repairs.	Kolkhoz Avesto (O & M Group)
Breakdown maintenance / refurbishment	This may include but not be limited to activities executed of a broader cycle of 5 years and/or when the lifetime of major components are exceeded or when emergency maintenance is to be carried out: repair/replacement of pumping equipment and any related installation; repairs necessitating temporary closure of major parts of the distribution system; repair of reservoir installations including disinfection; system pressure tests.	Kolkhoz Avesto (O & M Group)

System Operation and Maintenance Cost Agreement

- ☐ It is recognized by all parties involved in the stakeholder meeting held on 27 May 2008 that there are the following categories in system operation and maintenance cost.
- ☐ It is also understood among all entities that cost for each category and further breakdown is estimated in detail in the following consultation among all entities.
- ☐ Meanwhile, it is basically agreed among all entities that primal responsibilities to be borne for each category of system operation and maintenance cost are assigned to each entity as described below.
- ☐ However, further clarification and the final decision in responsibility sharing among entities in system operation and maintenance cost shall be made in the following consultation among all entities and the user fee shall be determined.

Category	Description	Responsible Entity
System operation cost	Must be calculated separate for summer and winter operation, includes at least all direct operation costs: electricity, fuel, and any other regular consumable items but not lubricants; operator cost, fee collection staff cost; there may be other costs not mentioned here.	Consumers
System service cost	Includes at least all costs related to works and activities specified under “service activities”, selection system maintenance including but not limited to lubricants, and regular consumable items; skilled and unskilled labour cost to execute works; labour cost to inspect works; there may be other costs not mentioned here.	Kolkhoz Avesto

System routine / annual maintenance cost	Includes at least all costs related to works and activities specified under "routine/annual maintenance", section "system maintenance" plus including but not limited to spare parts; skilled and unskilled labour cost to execute works; labour cost to inspect completed works; there may be other costs not mentioned here.	Kolkhoz Avesto
Major system component refurbishment cost	Includes at least all costs related to works and activities specified under "breakdown maintenance/refurbishment", section "system maintenance" plus including but not limited to spare parts; technical advisor cost, procurement cost, skilled and unskilled labour cost to execute works; labour cost to inspect completed works; there may be other costs not mentioned here.	Kolkhoz Avesto
Investment recovery cost	An estimate to establish the total system replacement cost, this may assume an overall lifetime for the whole system including all components, or separate assessments for different system components; e.g. concrete works 50 years, pipe work 30 years, mechanical equipment 5-10-15 years; based on estimates, the total required investment may be stated at a future time, but this may also be translated into an annual cost contribution and a monthly fee rate.	Kolkhoz Avesto Local Government

As it is observed in the agreement, system ownership belongs to Kolkhoz "Avesto", assuming thereby major responsibility for operation and maintenance in close collaboration with Water User Association and other relevant stakeholders.

This is the first step that determines those basic principles in the system operation and maintenance with stakeholders, and it will be further elaborated through actual system management. In addition, capacity gaps of each stakeholder to perform tasks and duties defined in the agreement have been identified, which were utilized for development of a proper training package for each stakeholder.

(2) Formation of Water User Association

A series of consultative meetings was held among community representatives (i.e. representatives of Mahalla Committee), representative of Kolkhoz, and Jamoat for improvement of operation and maintenance, through which the necessity and significance to create small Water User Groups (WUGs) that fall under the umbrella of the Water User Association (WUAs) was confirmed.

A small Water User Group (WUG) is formed at each public water supply point (i.e. communal tap). Under the pilot project, a total of 66 communal taps were installed, so that 66 numbers of WUG were newly established. A total of 66 small-scale meetings were held by community representatives to facilitate formation of WUA at each public water supply point. Each newly established WUG has two representatives, one of which serves as a technician and the other serves as community promoter to take care of its respective tap. The main task of the WUGs is to monitor the state of its designated taps, distribution pipeline, and its sanitary conditions. The underlying aim of the WUGs is to ensure community participation in the operation and maintenance of the supply system. As of December 2008, these have assembled 132 members, half of which are female.

The assembly of WUGs is called as Water User Association, which served as a decision making and auditing body in supply scheme management of significance, such as account and financial management, undertakings for maintenance and repair, conflict resolution among user communities, and so forth. WUA is represented by the vice chairperson of Kolkhoz to facilitate participation both from Kolkhoz and community in system management. The following chart explains the structure of WUGs and WUA.

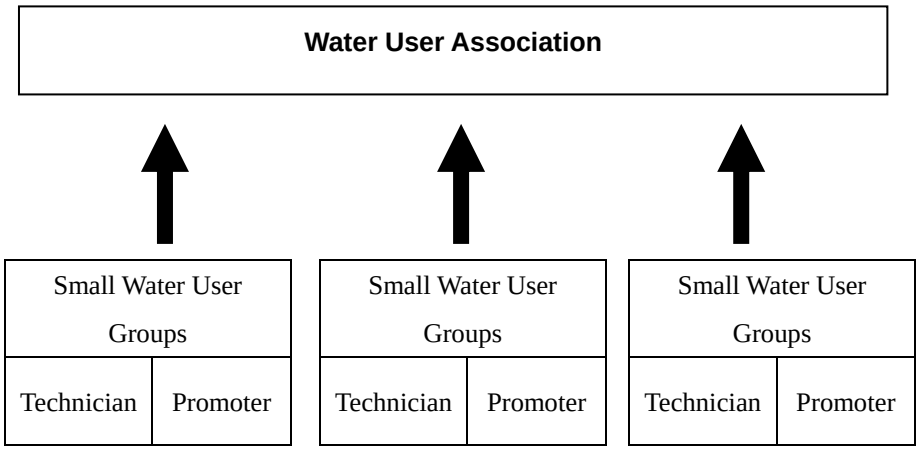

Figure 12.2.1 A Scheme of Water User Association

Each member of WUA were provided with training for capacity development in the supply system management. The training package ranged from a course for organizational management, improved water and sanitation, and technical issues related in operation and maintenance of the system as mentioned below.

(3) Establishment of Water Fees

In the given socio-economic condition in Bolshevik village where rural poverty is obvious, it is reviewed under the Study that full cost recovery from user communities for operation and maintenance, including cost for major maintenance and replacement of the supply scheme, could evidently aggravate rural poverty. However, instituting a payment for water supply services, even if it can not cover the cost for major maintenance and replacement, can be an important contribution toward sustainability and may deepen a sense of ownership in a symbolic manner among the user community towards the rural water supply system. Thus, considering their household economy, the water fee is determined among Water User Association (WUA) and system owner, limiting the amount enough to cover the cost for daily operation and minor repair of the supply system. Thus, the water fee is set at 1.0 Diram per m^3, to cover the expense for electricity to operate a submersible pump and miscellaneous for minor repair, while deciding a fund for major maintenance and replacement shall be borne by the system owner of Kolkhoz that has financial capability.

The water fee is estimated according to the consumption at each public tap. Water consumption is monitored by WUA through reading the meter installed on each public tap. Since all households in the Bolshevik village have at least one employee working for Kolkhoz, it is decided among WUA and Kolkhoz management that the record of consumption at each tap is submitted to Kolkhoz, and relevant estimated fee is redacted from their salary. Although there might be a difference in water consumption among user households sharing a particular public tap, the user fee in equally divided and charged to the household sharing the tap. Such a reduction of the water fee from their salary is first implemented in December 2008, to collect the fees for November.

(4) Development of Operation and Maintenance Manual and Provision of Training for Water User Associations

The newly established Water User Association and system operators were provided with several training programs to improve capacity for system management. There are three major training programs provided for the relevant target group. “Technical Training” was provided for system operators and WUG technicians, to improve their capacity to operate and maintain the water supply

system in a technical sense. This training included technical regulation for pump operation, record keeping, meter reading, and preventive and minor repairs. "Organizational Development Training" was provided to WUA to facilitate their organizational management, including group administration, financial and accounting management, development of organizational regulation, task and responsibility sharing with other stakeholders, and water fee collection. "Hygiene and Sanitation Training" is also provided for WUA members under this component program to improve their sense of hygiene and sanitation. This training was conducted in collaboration with health promoters from the Sanitary and Epidemiological Station (SES).

Through implementation of this training to the stakeholders, methodology and approach employed in provision of training are elaborated in the Operation and Maintenance Manual. The manual was developed for those who provide training for establishment of community-oriented management in water supply system. The manual is available in Russian and English.

12.2.2 LESSON LEARNT AND SUGGESTION

It is observed important to determine ownership of the rural water supply system and roles and responsibilities in system management through consultative meetings with stakeholders. Initially, the system owner (i.e. Kolkhoz) and Jamoat provided little support for the implementation of the pilot project and component program in collaboration with user communities. However, through consultative meetings with stakeholders to define ownership of the supply system as well as tasks and duties in system management, all stakeholders duly recognized the significance on their shared responsibilities in system management and committed themselves for improved operation and maintenance.

It was understood that utilization of existing technical and financial capacity of state entity for system management, operation and maintenance is efficient and effective. The system operation of the pilot project relies largely on the technical and financial staff members of Kolkhoz who are already trained under the entity. It is also considered that establishment of community-based water supply entity to run the system is not cost effective, taking account its transaction cost for its establishment and training. In addition, a community-based entity could not financially sustain its management in the rural area where full cost recovery for operation and maintenance could not be expected, while state entities are supported by their financial backbone. Considering less capacity of local governments and communities to provide technical and financial undertakings for the system operation and maintenance, involvement and commitment of those entities competent for water supply is inevitable.

It becomes obvious that community's capability to pay for water is extremely low to satisfy operation and maintenance costs except direct cost for daily operation (i.e. expense for electricity). Therefore, financial backup of Kolkhoz and other state entity as the system owner to cover cost of major maintenance and replacement is necessary to sustain the supply scheme. However, introduction of the water fees, although small, enhanced a sense of community ownership in a symbolic manner as well as participation in operation and maintenance of the supply system. Indeed, four taps and water meters were damaged by vandals in the pilot project. However, soon after it was reported, WUA coped with the matter and the damaged items were repaired quickly.

Creation of WUA also facilitates community participation in the system operation and maintenance, with provision of training for capacity building. Wherever possible, it is advocated to register WUA as a public association in accordance with relevant law, so as their responsibilities and organizational regulations are defined with preparation of their bylaws. It also facilitates partnership and sharing responsibility with Kolkhoz and other supply entity in operation and maintenance of the supply system. Community leadership in the pilot project was raised through provision of "Technical Training", "Hygiene and Sanitation Training", and "Organizational Development Training". It is expected that relevant governmental organizations monitor and follow-up community participation and partnership with Kolkhoz. It is also advocated to utilize the "Operation and Maintenance Manual" developed under the Study in the implementation and rehabilitation of the rural water supply system.

12.3 IMPLEMENTATION OF PUBLIC HEALTH COMPONENT PROGRAM

12.3.1 ORGANIZATION OF ACTIVITIES

The activities were implemented by ACTED under contract with the JICA study team. Their main office supervised the activities and prepared a report to the JICA Study Team. Their branch in Kurgan-Tyube communicated with the village, sent expert health educators, developed contents of a drama and other events, and assisted the communities through the end of September.

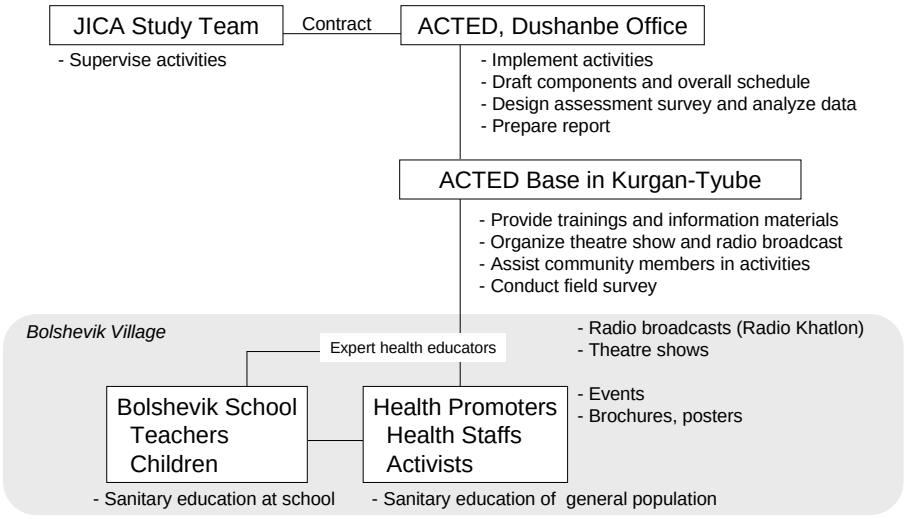

Figure 12.3.1 Organization of Activities

12.3.2 MAIN ACTORS OF ACTIVITIES

The health promoters, school teachers and school children were main actors in the activities.

The health promoters in the village were health staff and activists. The former was a group of nurses and midwives of the health facility located in the village. The members of the latter group were religious leaders, school teachers, workers of Kolkhoz, and others. Basically, the health staff conducted the education sessions, and the activists assisted them in gathering communities for sessions. Both groups of health promoters cooperated in overall implementation of activities.

In the sanitary education at Bolshevik School, the teachers had hygiene education classes in the school curricula. School children took a role of health promoters in their family and among children in the village.

These main actors were supported by the health experts of Healthy Life Style Centre of Kabodiyon Rayon as well as the experts of ACTED.

12.3.3 PROGRESS

The members of ACTED held a kick off meeting immediately after the contract was signed, and then the refresher training for health promoters started. The training was held during three days from 11 to 13-Jun. The expert health educators provided an intensive seminar on the selected topics to one group of 15 health staff (one doctor, nine nurses, three midwives and others) and to the other group of 13 activists (one religious leader, five teachers, two kolkhoz workers, two community leaders and others). Their education sessions started in June.

The health promoters held their monthly meetings with their supporters around the 20th day of June, July, August and September, and they decided the schedule of theatre shows and events to be held in the village.

The theatre shows, showing an episode of a boy developed typhoid fever caused by unsafe drinking water and unclean fruit, by a drama company of Kurgan-Tyube were performed on 30-Jul, 31-Jul and 19-Sep according to the plan decided in the monthly meeting. Many children and their mothers watched the play. On the same days, they had events with a senior student of the Bolshevik School as a master of ceremonies. They enjoyed quizzes of causes, risk factors and prevention of water-borne diseases; voting on a drawing competition; and singing a campaign song of health and sanitation.

Radio programs were broadcast through the Radio Khatlon once each in June, July, August and September. Typhoid fever was featured in June, dysentery in July, hepatitis in August, helminthiasis in September. There was a little delay in printing brochures and posters unfortunately, and the distribution in the village started in early August.

Sanitary education at school is held in September. Two teachers of Bolshevik School attended the refresher training in June. In September, they started teaching four selected topics to the children three times a month, with teaching materials they developed. In addition, "Healthy Stars" program was implemented. 10 students were selected to conduct peer to peer health promotion among children.

The progress of sanitary education is shown in *Figure 12.3.2.*

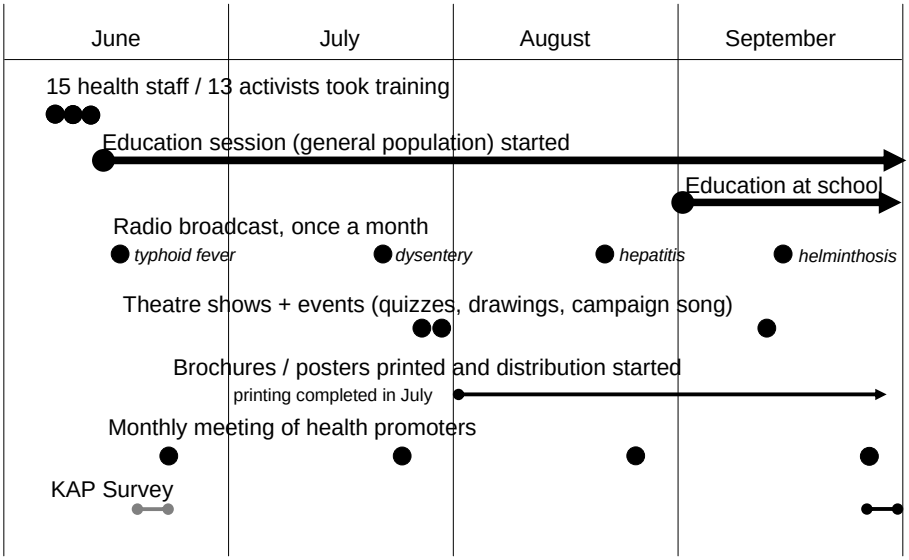

Figure 12.3.2 Progress of Activities

12.3.4 KAP SURVEYS

KAP surveys were planned to be conducted after the series of activities in Bolshevik village and in a control village in order to evaluate the impact of activities. Jarkurgan village was chosen as a control village where there had been no such intensive training on health and hygiene.

The health experts of ACTED main office carefully conducted the survey in Bolshevik Village in the end of September. They conducted another survey with same questionnaire in Jarkurgan village at the beginning of October. The effects of activities were examined using the data from these surveys.

(1) Survey Method

Data covering the following domains was collected through the structured interview.

- To assess the target population's awareness of water-borne diseases including disease transmission, symptoms, risk factors and prevention practice,

- To assess the target population's awareness of priority health risks such as children's excreta disposal, lack of hand washing, and the hygiene practice that create greatest risk to health,

- To assess household access to safe drinking water, including water treatment practices, and

- To assess awareness and good practice in dealing with children's diarrheal episodes.

The survey was designed with a sampling frame including all households in Bolshevik village, which was estimated 557 as of June 2008, and the required sample size was determined 94 households (95% confidence, 10% error rate). Data with same sample size was collected in Jarkurgan.

(2) Respondents

100 respondents were obtained in the respective villages. The respondents by age and by education level are shown in *Table 12.3.1* and *12.3*.2 Average number of children per family was 5.1 in Bolshevik and 4.8 in Jarkurgan.

Table 12.3.1 Respondents of KAP Surveys by Age

	Bolshevik			Jarkurgan		
Age	Male	Female	Total	Male	Female	Total
<20	0	2	2	3	3	6
20-29	3	12	15	6	7	13
30-39	2	21	23	8	11	19
40-49	2	37	39	7	17	24
50-59	1	8	9	6	17	23
60-69	2	5	7	1	9	10
>70	1	4	5	3	2	5
Total	11	89	100	34	66	100

Source: Result of KAP Survey

Table 12.3.2 Respondents of KAP Surveys by Education Level

	Bolshevik	Jarkurgan
Primary	7	5
9th level	61	61
Secondary	8	10
Higher level	21	5
Vocational/Technical	3	7
Total	100	100

Source: Result of KAP Survey

(3) Knowledge of Diseases

Respondents named the diseases that they believed could be transmitted through water. In Bolshevik, more respondents correctly brought up diarrheal diseases, hepatitis, typhoid, dysentery, and helminthiasis, and less answered they knew none.

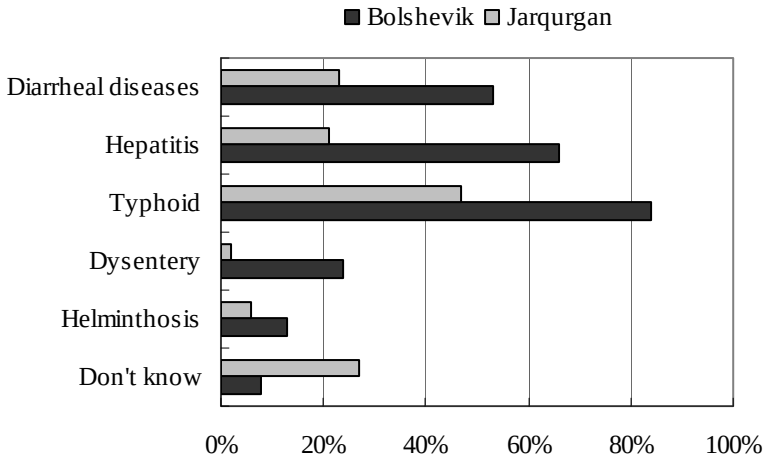

Figure 12.3.3 Knowledge of Diseases Transmitted through Water

Their understanding of causes of water-born diseases showed a significant effect of the activities. The gap between two villages was relatively small in the percentages of respondents who thought the environmental conditions including unsafe drinking water were the causes, while the percentage of Bolshevik respondents thinking personal behavior could be a cause of disease was evidently bigger than those in Jarkurgan.

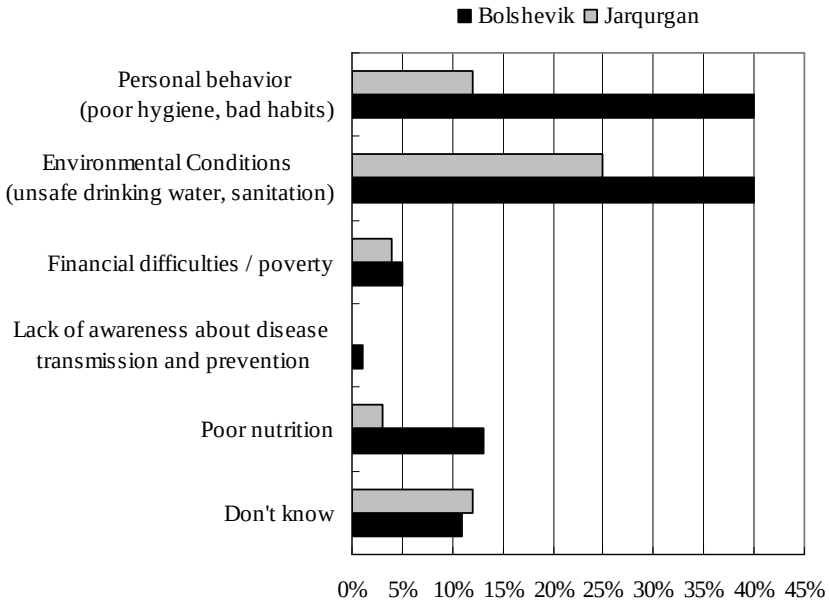

Figure 12.3.4 Understanding of Causes of Diseases

Since the activities were implemented intensively in a short period, some misconceptions remained after the activities in Bolshevik village. For example, the percentage of respondents thinking typhoid could be transmitted through the air was slightly larger than in Jarkurgan, while the percentage of correct answers were much larger in Bolshevik than Jarkurgan.

As a whole, the respondents in Bolshevik answered more correctly to the questions on causes and typical symptoms of selected diseases. Evidently, their understanding of methods of preventing these diseases was thought drastically improved. Bolshevik respondents showed a higher awareness of washing hands and other personal hygiene.

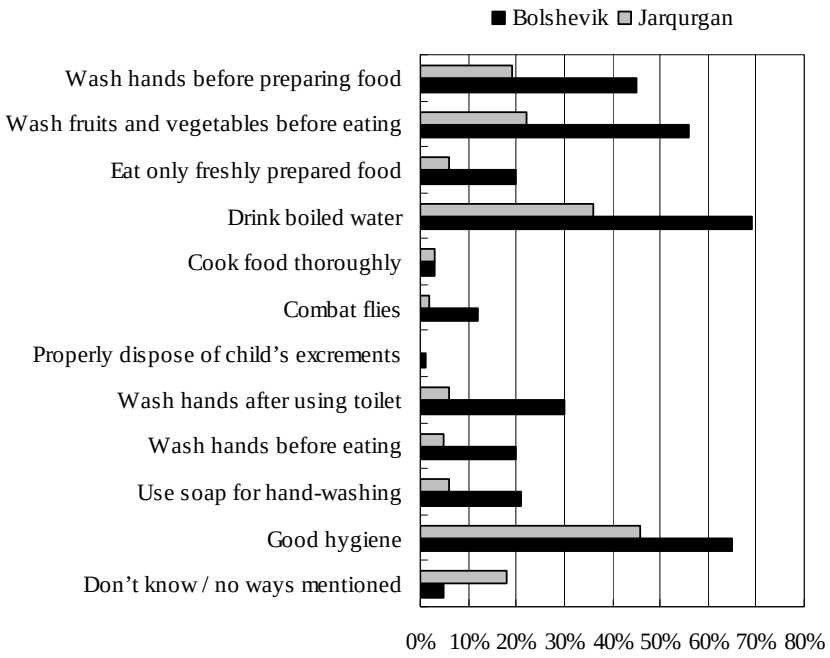

Figure 12.3.5 Perception of Preventing Method of Diseases

(4) Drinking water and hygiene

67% of Bolshevik respondents stated their main source of drinking water was borehole/hand pump either collected directly at the pump or at a public tap. 30% of respondents answered that they were drinking surface water as of September 2008. Few respondents had a source of drinking water within their premises, though the majority had one within 50m from their residents.

In practice, clean drinking water in the villages is boiled water. More than 90% understood this in Bolshevik, while less 80% in Jarkurgan. In addition, their correct answers as to how dangerous it was to drink water from canal were more than 90% in Bolshevik and less than 60% in Jarkurgan.

80% to 90% of Bolshevik respondents answered they boiled the water, and this ratio was almost the same as the estimation reported by UNICEF. In Jarkurgan, however, the ratio was some 60%.

(5) Conclusion

Due to problems of the original baseline survey at Bolshevik in June, the data of similar neighboring 'control' village was used instead. Namely, the above mentioned findings are estimations as to the impact of the activities, rather than direct samples of their effects. Nonetheless, the estimated impact in the control village suggested the effectiveness of timely short-intensive activities. The evident impact is;

- Knowledge that diarrhea, hepatitis, typhoid and dysentery were transmitted through untreated drinking water;

- Understanding the relationship between personal hygienic behavior and the above mentioned water-borne diseases;

- Knowledge of the symptoms of Dysentery Hepatitis and Typhoid Fever; however; some misconceptions regarding typhoid still remain.

- Knowledge of concrete steps that beneficiaries could take to reduce their risk of contracting water-borne diseases;

- Understanding that no matter of its origin, only boiled water could truly be considered to be clean.

12.3.5 CONCLUSION AND RECOMMENDATIONS

Generally changing people's practices and attitudes is a long process, which usually comes about as a result of long lasting intervention. However, shorter-term educational campaigns certainly lay the foundation for more durable change. The impact of the activities in Bolshevik village suggested a synergy effect of people's raised awareness and physical conditions where they can practice them.

It is strongly recommended to include some activities to raise people's awareness when a physical rehabilitation of the water supply system is implemented. Correct understanding of sanitation and hygiene would be a basis of people's proper practice, and physically improved conditions of drinking water would be a support of their practice. People's attitudes, brought by raised awareness and good practice, would be indispensable for sustainable operation and maintenance by the community.

There exist many needs of improvement in the living conditions in the rural villages. An intervention can be designed raising awareness of safe drinking water as well as any aspect(s) of housing, sanitary equipment, nutrition and others.

CHAPTER 13 CONCLUSION AND RECOMMENDATION

13.1 CONCLUSION

(1) It is revealed that there exist a total of 103 water supply systems (excluding systems owned by Vodokanal) in the Study Area. Out of these, 61 systems are receiving water from the Vakhsh Conduits and 41 systems are independent from the Vakhsh Conduits.

(2) A total of 47 systems is currently operating including the systems working incompletely. 30 systems are connected to the Vakhsh conduits and 17 systems are free from the Conduits.

(3) Population of the Study Area is about 812 thousand persons (2007) and about 15% of the population is receiving water from the water supply systems.

(4) A rehabilitation and expansion plan for the Vakhsh Conduits was formulated on the 132km length of the Conduits distributed in the Study Area. Major contents of the plan are as follows:

- A total of 15 water treatment systems is planned applying a decentralized system.
- A new conduit is planned in the section between Sarband and the point about 0.5km southwest from Uzun. Therefore, the Conduits become a double pipeline in this section.
- Water supply systems distributed in the Kolkhozobod Rayon and in the area to Kumsangir from Kolkhozobod are planned to collect water from the Kumsangir Canal, separating from the Vakhsh Conduits.
- Pipes are replaced with the same diameter of pipes in the following sections:
  - between the Sarband Sedimentation Pond and the Bokhtar Head Pump Station
  - between the junction to Bokhtar and the Uzun Pumping Station
- Pipes are replaced with the larger diameter of pipes in the following sections:
  - between the point about 0.5km southwest from Uzun and the Sattarov Water Supply System
  - A part of the section to Bokhtar

(5) Most of the rural water supply systems were constructed more than 30 years ago and are aged. No expansion was made after the construction. Therefore, expansion of the system is required to supply water to the expanded area due to increasing of the population. The total of 16 systems (in 19 villages) were selected as priority systems. A rehabilitation and expansion plan was prepared for these 16 systems.

(6) Approximate implementation cost for the rehabilitation and expansion plans are:

- The Vakhsh conduits : About 441 million Tajikistan Somoni (US$ 130 million)
- Rural Water Supply Systems : About 104 million Tajikistan Somoni (US$ 30.6 million)

(7) Economic Internal Rate of Return (EIRR) of the rehabilitation and expansion plan of the Vakhsh Conduits is 16.2% in case that reduction of fetching water cost is considered as a benefit and 86.1% in case that reduction of water transportation cost is considered as a benefit. In this case, the implementation of the plan is considered feasible. On the one hand, Financial Internal Rate of Return (FIRR) suggests the implementation of the plan is not feasible because the amount of initial investment is quite large. However, if it is possible to increase the water tariff 20% every year, the implementation of the plan becomes feasible. Therefore, it is recommended to raise funds with long term and low interest.

(8) EIRR of the rehabilitation and expansion plan of the rural water supply systems can not be obtained because construction costs and operation and maintenance cost largely exceed the benefit in both cases when reduction of fetching water cost is considered as a benefit and when reduction of water transportation cost is considered as a benefit. However it becomes feasible if construction coast and operation and maintenance costs can be reduced to 1/6 in case that reduction of fetching water cost is considered as a benefit. In case that reduction of water transportation cost is considered as the benefit, it is feasible if the cost can be reduced up to half (1/2). As for FIRR of the plan, it becomes a plus if it is possible to increase the water tariff 45% every year. Considering this situation, it is recommended the government of Tajikistan prepare a fund for the Implementation of the plan. Furthermore, a subsidy from the Tajikistan government is indispensable to operate and maintain the water supply system.

(9) The Study Team proposed the following issues for the proper operation and maintenance of the water supply system.

- to agree to ownership of the water supply system, and the role among the stakeholders for improved operation and maintenance system
- to form Water User Associations (WUAs)
- to establish and collect water tariffs
- to develop a operation and maintenance manual and to provide training for WUAs

In order to verify the feasibility and applicability of the strategy mentioned above in operation and maintenance of the water supply systems, a pilot project was carried out. As a result, it was agreed among the stakeholders that the water supply system should be owned by the Kolkhoz and the role of the stakeholders. On the basis of the agreement, WUA was properly established. A water tariff was collected in December 2008 based on the agreement on the rate of the water tariff and its payment and collection system.

(10) In the implementation of the pilot project, through a consultative meeting with stakeholders to define ownership of the supply system as well as tasks and duties in the system management,

all stakeholders duly recognized the significance on their shared responsibilities in the system management and committed themselves for improved operation and maintenance.

(11) It is reviewed that utilization of existing technical and financial capacity of state entities for system management, operation and maintenance is efficient and effective.

(12) It becomes rather obvious that community's capability to pay for water is extremely low to satisfy the operation and maintenance cost except direct cost for daily operation (i.e. expense for electricity). Therefore, financial backup of Kolkhoz and other state entities as the system owner to cover costs for major maintenance and replacement is necessary to sustain the supply scheme. However, introduction of a water fee, although small, enhanced a sense of community ownership in a symbolic manner as well as participation in operation and maintenance of the supply system.

(13) Creation of WUA also facilitates community participation in system operation and maintenance, with provision of training for their capacity building. Wherever it is possible, it is advocated to register WUA as a public association in accordance with relevant laws, so as their responsibilities and organizational regulations are rather defined with preparation of their bylaws. It also facilitates partnership and sharing responsibility with Kolkhoz and other supply entities in operation and maintenance of the supply system. Community leadership in the pilot project were raised through provision of "Technical Training", "Hygiene and Sanitation Training", and "Organizational Development Training". It is expected that these will be a relevant governmental organization monitor and follow-up community participation and partnership with Kolkhoz.

(14) As a part of the pilot project, public health education was carried out for the community people. As the result, effectiveness of the activities were confirmed. The evident results are;

- Knowledge that diarrhea, hepatitis, typhoid and dysentery were transmitted through untreated drinking water;
- Understanding the relationship between personal hygienic behavior and the above mentioned water-borne diseases;
- Knowledge of the symptoms of Dysentery Hepatitis and Typhoid Fever; however; some misconceptions regarding typhoid still remain.
- Knowledge of concrete steps that beneficiaries could take to reduce their risk of contracting water-borne diseases;
- Understanding that no matter of its origin, only boiled water could truly be considered to be clean.

Generally changing people's practices and attitudes is a long process, which usually comes about as a result of long lasting interventions. However, the result of the activities in

Bolshevik village suggested that a shorter-term educational campaign certainly laid foundations for more durable change.

In fact, people's awareness was gained that diseases could be caused by not washing hands, drinking not boiled water, not keeping and using drinking water in adequate manner, or not constructing adequate toilet equipment. It has been reported based on the relevant studies that people in rural areas of Tajikistan is aware of problems of bad sanitary conditions such as unsafe drinking water, sanitary equipment, while their awareness is not so high regarding personal hygiene, namely, usage of soap, washing young children and others). In this context, the result of activities in Bolshevik is worthy of note.

Rehabilitation of water supply system in Bolshevik improved the access of safe drinking water in the village. Good drinking water is now available through taps in the village. Consequently, people can use water with much fewer burdens than before. This is a condition where they can more likely practice washing hands and bodies to keep clean what they have understand as important sanitation. At the same time, it can be expected importance of indispensable water can be more understood as their hygiene is more sustainably practiced. A sense of values of safe drinking water can be basis of good usage of rehabilitated taps in the village and maintain them adequately. Raised awareness and physical improvement can be requirement and outcome of each other.

In this context, it is strongly recommended to include some activities to raise people's awareness when a physical rehabilitation of water supply system is implemented. Correct understandings of sanitation and hygiene would be a basis of people's good practice, and physically improved conditions of drinking water would be a support of their practice. People's attitude, brought by raised awareness and good practice, would be indispensable for a sustainable operation and maintenance by the community.

(15) As a result of the Initial Environmental Evaluation (IEE), all the items evacuated as “B” in the Preliminary Study, was evaluated as “C”. Thus, the proposed project in the Study was considered as category “C”. Therefore, Environmental Impact Assessment (EIA) is not required for the implementation of the Priority Project. However, it is indispensable to continue the environmental and social monitoring in order to mitigate the occurrence of any adverse impact.

13.2 RECOMMENDATION

(1) Rehabilitation and Expansion of the Vakhsh Conduits

Only around 44% of the population in the Study Area, Bokhtar, Vakhsh, Dzhilikul, Kolkhozobod and Kumsangir Rayons, are receiving water from the water supply systems due to deterioration, and insufficient existing water supply systems. Populations without a water supply service are obliged to use irrigation water as domestic water. This causes water borne diseases every year.

This scheme is supposed to enable to supply the population with drinking water which meets the

forthcoming drinking water quality standards of Tajikistan through yard taps. These projected water supply facilities will be more convenient than fetching water from existing irrigation canals. Consequently, the realization of the Plan will hopefully contribute to poverty reduction, public health, rural development, etc.

(2) Rehabilitation and Expansion of the Rural Water Supply Systems

Groundwater is the main water source of the water supply systems in Shakhritus, Kabodiyon, Nosiri-Khisrav and Pyandzh Rayons where the Vakhsh Conduits is not available. Only 17 systems are operating, therefore, about 77% of the population is left without water supply services. Even though systems are functioning, no extension was made to the expanded area in the villages. Population in such an area has no water supply services. Due to this, most of the population in such areas depends on irrigation canal and rivers. Water borne diseases are reported in the area every year.

There is a rehabilitation and expansion plan of rural water supply systems for 19 villages in the Study. Implementation of the plan will contribute to poverty reduction, public health, rural development, etc. the same as the implementation of the rehabilitation plan for the Vakhsh Conduits. Therefore, it is recommended prepare proper fund and implement the plan.

(3) Operation and maintenance of the rural water supply system

The feasibility and applicability of the strategy for rural water supply systems proposed by the Study Team was confirmed through the pilot project. From now on, assistance and monitoring by MMWR, RWSA and Jamoat are recommended to clarify the ownership of the water supply system, to agree on the role of the relevant organizations, to form the WUA and to collect water tariffs in rehabilitation and expansion of the rural water supply systems.

(4) Public Health Education

There exist many needs of improvement in the living conditions in the rural villages. Safety of drinking water is hardly kept when water is kept inadequately in the poor conditions of cooking space. Although accessibility of water is sharply gained, hygiene can not be maintained when houses have little space of washing hands and bodies. Especially in Bolshevik village, some families have long used canal water as their washing places, not setting or using washing space in their premises. In such circumstances, improved access of drinking water can give a limited impact on peoples living condition in the village. Conditions of houses, sanitary facilities, washing places and others maybe redact the effect of improved water supply. For these reasons, an intervention can be designed raising awareness of safe drinking water as well as any aspect(s) of housing, sanitary equipment, nutrition and others to motivate improvement of living conditions in rural villages.

(5) Continuation of monitoring of the pilot project and accessing of a foreign expert

Monitoring of the pilot project was carried out from September to December 2008 just after the completion of the rehabilitation of the existing rural water supply system. The rural water supply system was properly operated and maintained under the assistance and monitoring by the Study team. Since the field survey of the Study in Tajikistan will be completed in February 2009, monitoring by the

Study Team cannot be continued. However, the rural water supply system shall be properly operated and maintained after the completion of the Study. It is supposed that realization of the strategy proposed in the Study will lead to improvement of the water supply environment in the Study Area. Therefore, it is recommended to continue the monitoring of the pilot project in order to follow the realization of the strategy.

1) Monitoring items for operation and maintenance

- Frequency of the meeting of WUA and reporting on activities and accounting
- Modality on payment and collection of water tariff, collection rate of water tariff and balance of the operation and maintenance of the water supply system
- Malfunction and its repairing
- Water consumption

2) Monitoring items for public health

- Proportion of those who understood that boiling of water prevents water diseases.
- Proportion of households that are actually boiling water.
- Proportion of those who understood that behavior lacking in health will cause diseases.