ANNEX H

REPLACEMENT AND EXTENSION PROGRAM FOR DISTRIBUTION PIPES

1. Replacement and Extension Program for Distribution Pipes

In order to achieve the proposed Master Plan, upgrading of the distribution networks is recommended. For this purpose, pipe replacement and extension program was prepared as shown below, based on the water leakage survey and the proposed water supply Master Plan.

(1) Proposed length for pipe replacement and extension

		Balti	Soroca	Riscani	Falesti
[1]	Existing pipes	266.1 km	69.3 km	27.0 km	31.4 km
[2]	Proposed length for replacement	138.9 km	41.6 km	2.5 km	4.7 km
[3]	Proposed total pipe length	266.1 km	69.3 km	62.5 km	59.1 km
[4]	Proposed length for extension	0 km	0 km	35.5 km	27.7 km

(Note)

[2] Proposed length for replacement was estimated as per Annex in the following pages, considering degree of deterioration by pipe materials and years of construction.

[3] Proposed total length of each pipeline network was estimated, considering present population served and future population served. Consequently, no additional pipelines are required for Balti and Soroca, whereas some extension is required for Riscani and Falesti. Total lengths of pipelines of Riscani and Falesti were calculated based on the forecasted population served by assuming 3m per person of distribution pipes.

[4] Proposed length for extension: [3] – [1]

(2) Cost estimated for the replacement and extension

(thousand US$)

		Balti	Soroca	Riscani	Falesti
[1]	Estimated cost for replacement	7,299.3	887.8	72.6	118.3
[2]	Estimated cost for extension	0	0	505.7	394.6
[3]	Total	7,299.3	887.8	578.3	512.9

(Note)

Cost estimation were made in US Dollar as 2001 price, based on all in pipeline construction cost and its 10% design cost, details are given in the following Annex.

(3) Implementation schedule

Implementation schedule is tentatively proposed as the Schedule of construction and investment in the next page.

Table H.1 Schedule of Construction and Investment for Distribution Networks

BALTI

(USD)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Budget preparation		━━											
Designing & Tendering			━━	━━									
Pipe replacement					━━	━━	━━	━━	━━►	(138.9km)			
Annual Investment	0	0	332,000	331,000	1,327,000	1,327,000	1,327,000	1,327,000	1,328,000	0	0	0	0
Accumulated Investment	0	0	332,000	663,000	1,990,000	3,317,000	4,644,000	5,971,000	7,299,000	7,299,000	7,299,000	7,299,000	7,299,000

SOROCA

(USD)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Budget preparation			━━										
Designing & Tendering				━━									
Pipe replacement					━━	━━	━━►	(41.6km)					
Annual Investment	0	0	0	80,700	269,000	269,000	269,100	0	0	0	0	0	0
Accumulated Investment	0	0	0	80,700	349,700	618,700	887,800	887,800	887,800	887,800	887,800	887,800	887,800

RISCANI

(USD)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Budget preparation	━━				━━		━━			━━			
Designing & Tendering		━━				━━		━━			━━		
Pipe extension			━━►	(11.9km)			━━►	(10.4km)				━━►	(13.2km)
Pipe replacement									━━►	(2.5km)			
Annual Investment	0	15,400	154,100	0	0	13,500	134,700	6,600	66,000	0	17,100	170,900	0
Accumulated Investment	0	15,400	169,500	169,500	169,500	183,000	317,700	324,300	390,300	390,300	407,400	578,300	578,300

FALESTI

(USD)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Budget preparation	━━				━━			━━		━━			
Designing & Tendering		━━				━━			━━		━━		
Pipe extension			━━►	(9.1km)			━━►	(9.2km)				━━►	(9.4km)
Pipe replacement										━━►	(4.7km)		
Annual Investment	0	11,800	117,800	0	0	12,000	119,600	0	10,800	107,500	12,200	121,800	0
Accumulated Investment	0	11,800	129,600	129,600	129,600	141,600	261,200	261,200	272,000	379,500	391,700	513,500	513,500

1) Pipe replacement schedule was tentatively made based on proposed pipe replacement program and cost estimation.
2) Pipe extension schedule was made in conformity with the forecast on population served in the Study area.
3) Pipe length was tentatively made on assumption that three meters (3m) per person of distribution pipe is required, that gives approx. 62.5km for Riscani and approx. 59.1km for Falesti, meaning additional 35.5km and 27.7km is required respectively.
4) Ratio of lengths of new pipes by diameters was assumed for calculation purpose, they are, 50mm: 50%, 100mm: 30% and 150mm: 20%.
5) Design fee was tentatively set as 10% of construction cost.
6) Cost estimation was made in US Dollar based on 2001 price. It doesn't include price escalation.

Table H.2 Cost Estimation for Pipe Replacement (1/3)

BALTI

Length of Steel Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
50 mm		6,870	490	660	1,060
65 mm				170	100
80 mm		80		220	270
100 mm		1,200	720	680	2,760
150 mm		2,170	1,680	650	1,700
200 mm	1,670	5,650	280	1,170	1,540
250 mm	520	3,870	1,120	1,980	830
300 mm		3,870	490	1,580	4,480
350 mm		3,580	1,120		
400 mm		5,490	3,050	1,800	410
500 mm		6,790	5,390	4,530	1,920
600 mm			30	880	2,080
800 mm			2,340	4,650	
900 mm			1,720		
1,000 mm			1,510	24,700	
Total	2,190	39,570	19,940	43,670	17,150

Replace Length

Replacement Cost for Steel Pipe (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
50 mm		41.9	3.0	4.0	6.5
65 mm				1.5	0.9
80 mm		0.9		2.5	3.1
100 mm		18.5	11.1	10.5	42.5
150 mm		57.3	44.4	17.2	44.9
200 mm	64.8	219.2	10.9	45.4	59.8
250 mm	27.1	202.0	58.5	103.4	43.3
300 mm		257.7	32.6	105.2	298.4
350 mm		482.0	150.8		
400 mm		855.8	475.4	280.6	63.9
500 mm		1,480.9	1,175.6	988.0	418.8
600 mm			8.6	250.8	592.8
800 mm			943.5	1,874.9	
900 mm			827.1		
1,000 mm			881.5	14,419.9	
Total	91.9	3,616.3	4,622.9	18,103.7	1,574.7

Replace Cost

Length of Cast Iron Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
50 mm	850	12,730	4,290	20	
65 mm				80	
80 mm		390			
100 mm	3,660	15,110	5,690	1,990	560
150 mm	3,740	15,470	7,940	4,840	
200 mm	2,250	4,460	7,570	2,740	520
250 mm	1,820	950	1,150	1,140	
300 mm	300	2,670	5,880	4,450	
350 mm		2,500			
400 mm		3,380	2,430	2,190	
500 mm		250	2,180	2,670	
600 mm			280	2,130	420
Total	12,620	57,910	37,410	22,250	1,500

Replace Length

Replacement Cost for Cast Iron Pipe (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
50 mm	5.2	77.7	26.2	0.1	
65 mm				0.7	
80 mm		4.4			
100 mm	56.4	232.7	87.6	30.6	8.6
150 mm	98.7	408.4	209.6	127.8	
200 mm	87.3	173.0	293.7	106.3	20.2
250 mm	95.0	49.6	60.0	59.5	
300 mm	20.0	177.8	391.6	296.4	
350 mm		336.6			
400 mm		526.9	378.8	341.4	
500 mm		54.5	475.5	582.3	
600 mm			79.8	607.1	119.7
Total	362.6	2,041.7	2,002.8	2,152.2	148.5

Replace Cost

Length of Asbestos Cement Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
100 mm	330				
100 mm		2,930			
150 mm		810	160		
250 mm		940			
Total	330	4,680	160		

Replace Length

Replacement Cost for Asbestos Cement Pipe (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
100 mm	5.1				
100 mm		45.1			
150 mm		21.4	4.2		
250 mm		49.1			
Total	5.1	115.6	4.2		

Replace Cost

Length of Reinforced Concrete Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
800 mm				4,600	
Total				4,600	

Replacement Cost for Reinforced Concrete (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
800 mm				1,854.7	
Total				1,854.7	

Length of Polyethylene Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
65 mm				40	
100 mm				80	700
150 mm				350	
200 mm				150	750
Total				620	1,450

Replace Length

Replacement Cost for Polyethylene Pipe (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
65 mm				0.3	
100 mm				1.2	10.8
150 mm				9.2	
200 mm				5.8	29.1
Total				16.6	39.9

Replace Cost

Length for replacement (m)
Balti 138,890

Replacement cost (thousand US$)
Balti 6,635.8

Table H.2 Cost Estimation for Pipe Replacement (2/3)

SOROCA

Length of Steel Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
32-50-80			25,306		
100 mm			6,114		
200 mm			1,619		
300 mm			7,008		
400 mm			9,164		
Total			49,211		
	Replace Length				

Replacement Cost for Steel Pipe (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
32-50-80			154.4		
100 mm			94.2		
200 mm			62.8		
300 mm			466.7		
400 mm			1,428.5		
Total			2,206.6		
	Replace Cost				

Length of Cast Iron Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
50 mm			755		
100 mm			2,818		
150 mm			3,989		
200 mm			6,936		
300 mm			1,994		
500 mm			953		
Total			17,445		
	Replace Length				

Replacement Cost for Cast Iron Pipe (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
50 mm			4.6		
100 mm			43.4		
150 mm			105.3		
200 mm			269.1		
300 mm			132.8		
500 mm			207.8		
Total			763.1		
	Replace Cost				

Length of Asbestos Cement Pipe (m)

Diameter	'50s	'60s	'70s	'80s	'90s
100-350		NA			
400 mm				2,600	
Total				2,600	
	Replace Length				

Replacement Cost for Asbestos Cement Pipe (thousand US$)

Diameter	'50s	'60s	'70s	'80s	'90s
100-350		NA			
400 mm				405.3	
Total				405.3	
	Replace Cost				

Length for replacement (m)
Soroca 41,582

Replacement cost (thousand US$)
Soroca 807.1

RISCANI

Length of Steel Pipe (m)

Diameter	
100 mm	9,300
Total	9,300

Replacement Cost for Steel Pipe (thousand US$)

Diameter	
100 mm	143.2
Total	143.2

Length of Cast Iron Pipe (m)

Diameter	
150 mm	12,700
250 mm	1,000
300 mm	1,500
Total	15,200

Replacement Cost for Cast Iron Pipe (thousand US$)

Diameter	
150 mm	335.3
250 mm	52.2
300 mm	99.9
Total	487.4

Length of Asbestos Cement Pipe (m)

Diameter	
150 mm	2,500
Total	2,500
	Length

Replacement Cost for Asbestos Cement Pipe (thousand US$)

Diameter	
150 mm	66.0
Total	66.0
	Cost

Length for replacement (m)
Riscani 2,500

Replacement cost (thousand US$)
Riscani 66.0

Information on year of construction is not available

Table H.2 Cost Estimation for Pipe Replacement (3/3)

FALESTI

Length of Steel Pipe (m)

Diameter	1950s	1960s	1970s	1980s	1990s
100 mm				8,400	
150 mm				12,700	
200 mm				4,000	
Total				25,100	

Replacement Cost for Steel Pipe (thousand US$)

Diameter	1950s	1960s	1970s	1980s	1990s
100 mm				129.4	
150 mm				335.3	
200 mm				155.2	
Total				619.8	

Length of Cast Iron Pipe (m)

Diameter	1950s	1960s	1970s	1980s	1990s
100 mm				500	
250 mm				1,100	
Total				1,600	

Replacement Cost for Cast Iron Pipe (thousand US$)

Diameter	1950s	1960s	1970s	1980s	1990s
100 mm				7.7	
250 mm				57.4	
Total				65.1	

Length of Asbestos Cement Pipe (m)

Diameter	1950s	1960s	1970s	1980s	1990s
100 mm				1,500	
150 mm				3,200	
Total				4,700	
	Replace Length				

Replacement Cost for Asbestos Cement Pipe (thousand US$)

Diameter	1950s	1960s	1970s	1980s	1990s
100 mm				23.1	
150 mm				84.5	
Total				107.6	
	Replace Cost				

Length of Polyethylene Pipe (m)

Diameter	1950s	1960s	1970s	1980s	1990s
150 mm					
Total					

Replacement Cost for Polyethylene Pipe (thousand US$)

Diameter	1950s	1960s	1970s	1980s	1990s
150 mm					
Total					

Length for replacement (m)
Falesti 4,700

Replacement cost (thousand US$)
Falesti 107.6

ALL IN DISTRIBUTION PIPELINE COST

Material	Diameter (mm)	Price (US$/m)
Polyethylene	50	6.1
Polyethylene	65	8.6
Polyethylene	80	11.4
Polyethylene	100	15.4
Polyethylene	150	26.4
Polyethylene	200	38.8
Polyethylene	250	52.2
Polyethylene	300	66.6
Ductile Iron	350	134.6
Ductile Iron	400	155.9
Ductile Iron	450	140.1
Ductile Iron	500	218.1
Ductile Iron	600	285.0
Ductile Iron	700	336.3
Ductile Iron	800	403.2
Ductile Iron	900	480.9
Ductile Iron	1,000	583.8
Ductile Iron	1,100	674.7
Ductile Iron	1,200	792.0
Ductile Iron	1,350	954.9
Ductile Iron	1,500	1,156.2

(Notes)

1) All in costs were calculated from an estimation of the material, plant and labour costs including for pipeline materials and fittings, excavation, laying, backfilling and for reinstatement of road surface.
2) Pipe material has been assumed to be polyethylene for Dia. 300 mm or less, and ductile iron for Dia 350 mm or more.
3) Prices were estimated in US Dollar as 2001 price, which doesn't includes price escalation

ANNEX I

ENVIRONMENT

1. Environmental Impact Assessment Requirements and Procedures in Moldova

This section describes the Environmental Impact Assessment Requirements and Procedures in Moldova.

1.1 Criteria of EIA Requirement

The developer/performer of the project should clarify if the planned activity is a subject of EIA. For this purpose the list of activities (32 objects and activities) which are required in EIA are stipulated in the law (Law on Ecological Expertise and Environmental Impact Assessment). The list of activities obligatory for EIA is shown in Table I.1.

Concerning water supply projects, the following criteria are applied for judging the necessity of the EIA procedures.

- water supply systems with capacity 1,000 m^3/d or larger for groundwater intakes
- water supply systems with capacity 10,000 m^3/d or larger for surface water intakes

If negative impacts to the environment are expected, the EIA procedures are required by the judgment of the Ministry of Environment and Territorial Development.

1.2 EIA Procedures

The main EIA procedures are shown in Figure I.1. If the planned activity is a subject of EIA, the developer should form and finance the work of so called EIA Team (experts in required fields). The EIA Team should conduct full EIA study and prepare two types of documents:

- EIA documentation
- EIA statement

The developer should summarize and present in understandable way the EIA findings.

The EIA statement is submitted to the appropriate ministries and state agencies as well as to the local public administration. Within 5 days after the receipt of the EIA statement, the local administration should announce its availability in mass media, and conduct public discussion, which is named "public ecological expertise". The access to the EIA statement is open for 30 days. After 14 days of the end of the public discussions, the comments and suggestions should be submitted to the developer and to the State Ecological Expertise (SEE) office in the Ministry of Environment and Territorial Development. The other ministries and state agencies submit their comments to the developer and SEE office within 50 days after the receipt of the EIA statement.

The EIA Team and the developer should revise EIA findings or augment its content if necessary and present the revised EIA documentation and EIA statement to the SEE office.

When the EIA materials are approved by the SEE, the developer can start further to the detail design stage. Finally, the EIA results should be incorporated in the design documentation as a chapter on "environmental protection". The design documents are reviewed again by the SEE.

EIA links with other legislation and EIA methodology

During the EIA study the EIA Team should concern all national legal provisions and standards. The list of relevant laws, standards and construction rules/normative depends on the planned activity. Specific scientific methods and forecasting models should be applied.

Unfortunately, the specific EIA methodology and methods applicable for the EIA studies are not developed yet. As a first example, the ACVAPROIECT Institute has developed a paper "Conceptual Approach for the EIA Relevant to the Water Supply and Sewerage Development" as a part of project named "Correction of Complex Scheme for Water Supply and Sewerage Development in the Republic of Moldova till 2015".

The analysis of the national EIA procedures and approaches has been carried out in the project "Prut Basin Water Management Project Moldova" financed by the TACIS. The paper presented only wastewater issues to be concerned in the EIA. The international approaches are presented as well as national ones. The national EIA framework and the EIA steps were analyzed in contrast to the international ones, and specific recommendations for possible improvements have been made.

Brief comparison is presented in the following table. The left column apply the general stages of the EIA internationally adopted, and the right one is the present the stages which are formally required by the Moldovan legislation.

International Approaches for EIA	Moldvan Legal Provision
Screening	No formal requirements. National legislation stipulates the list of 32 objects and activities, on which EIA is obligatory. The Ministry of Environment and Territorial Development might require EIA for the projects not listed in the law.
Scope	No formal stage. Practically, this step followed at the stage of preparation of TOR for the EIA Team.
Assessment	The list of topics to be concerned during EIA study is presented. There are no methodology and methods developed for EIA.
Report	The structure of the EIA documentation and EIA statement is prescribed in general way.
Review	EIA documentation and EIA statement should be revised by public opinion, ministries and state agencies.
Decision-making	Not a part of EIA law.
Monitoring	Ecological Expertise can monitor the EIA results and check if they are incorporated in the design documentation.
Public participation	Required at the stage when the EIA statement is prepared (EIA law) or earier as a part of general planning process (planning law).

Table I.1 List of Activities with Requirement of EIA

No.	Objects and Activities
1	Thermal power plant, installed heating boiler-houses with the capacity of 300 MW and more.
2	Mechanical engineering and machinery-construction factories with foundries which productivity 10,000 tons and more per year.
3	Metallurgic factories with the productivity of 500,000 tons and more per year.
4	Cement and Slate productions, including those using asbestos in manufactural processes, namely asbestos-concrete plants.
5	Chemical and non-chemical productions, secondary processing of paper and cellulose.
6	Pharmaceutral and ether-oil production.
7	Construction of Highways, speedways, railways of long distance, airports with the length of runway of 2,100 meters and more.
8	Complex hydrological constructions (Ports, Big dams and Water reservoirs).
9	Main Oil- and Gas-providing pipelines of high-pressure.
10	Oil storage terminal.
11	Sugar and oil-fat manufacture and plants.
12	Meat-processing and dairy products factories and plants.
13	Tinned-food factories and plants with the capacity of 100 MCC (Million of Conditional cans) and more per year, big warehouses and points of preliminary processing of the agricultural
14	Agricultural-industrial, cattle-breeding complexes: for cattle, pigs, sheep and poultry
15	Water intakes for manufacture, urban and rural settlements with the capacity: groundwater – 1000 m^3/day and more, surface water –10,000 m^3/day and more.
16	The wastewater treatment plants of the industrial and domestic wastewater with the capacity of 10,000 m^3/day and more.
17	Industrial area and vineyards with the surface of 500 ha and more.
18	Irrigation and drainage systems for the sectors with the surface of 1,000 ha and more (for Irrigation) and 100 ha and more (for Drainage).
19	Greenhouse facilities with the surface of the closed ground of 24 ha and more.
20	Garbage processing and garbage combustion facility.
21	Installations and fields for processing, burying and neutralization of the industrial waste, including the toxic, narcotic and radioactive materials.
22	Any type of construction activity in the riverbeds, in river-protected river lines and water
23	Open excavationsa) of limestone with the volume of 100,000 tons per year and more;b) of sand, gravel, clay and gypsum with the volume of 100,000 tons per year and more.
24	The determination and processing of the oil and gas fields.
25	Closed excavations of limestone.
26	Military fields and bases.
27	Wine and beer producing plants, manufacture for producing champagne wines and other types of alcoholic drinks, with the capacity of 1,000,000 litters per year and more.
28	Power Line with the tension of 330 kV and more.
29	Radio-electronic and Electro-technical manufacture with a workshop of 2,000 m^2 and more.
30	Leather processing manufacture, including for the primary processing of the row material.
31	Wood-processing and furniture manufacture with a workshop of 4,000 m^2 and more.
32	Textile, sewing and shoes manufacture with dye workshop and processing plants of polymer or synthetic row material.

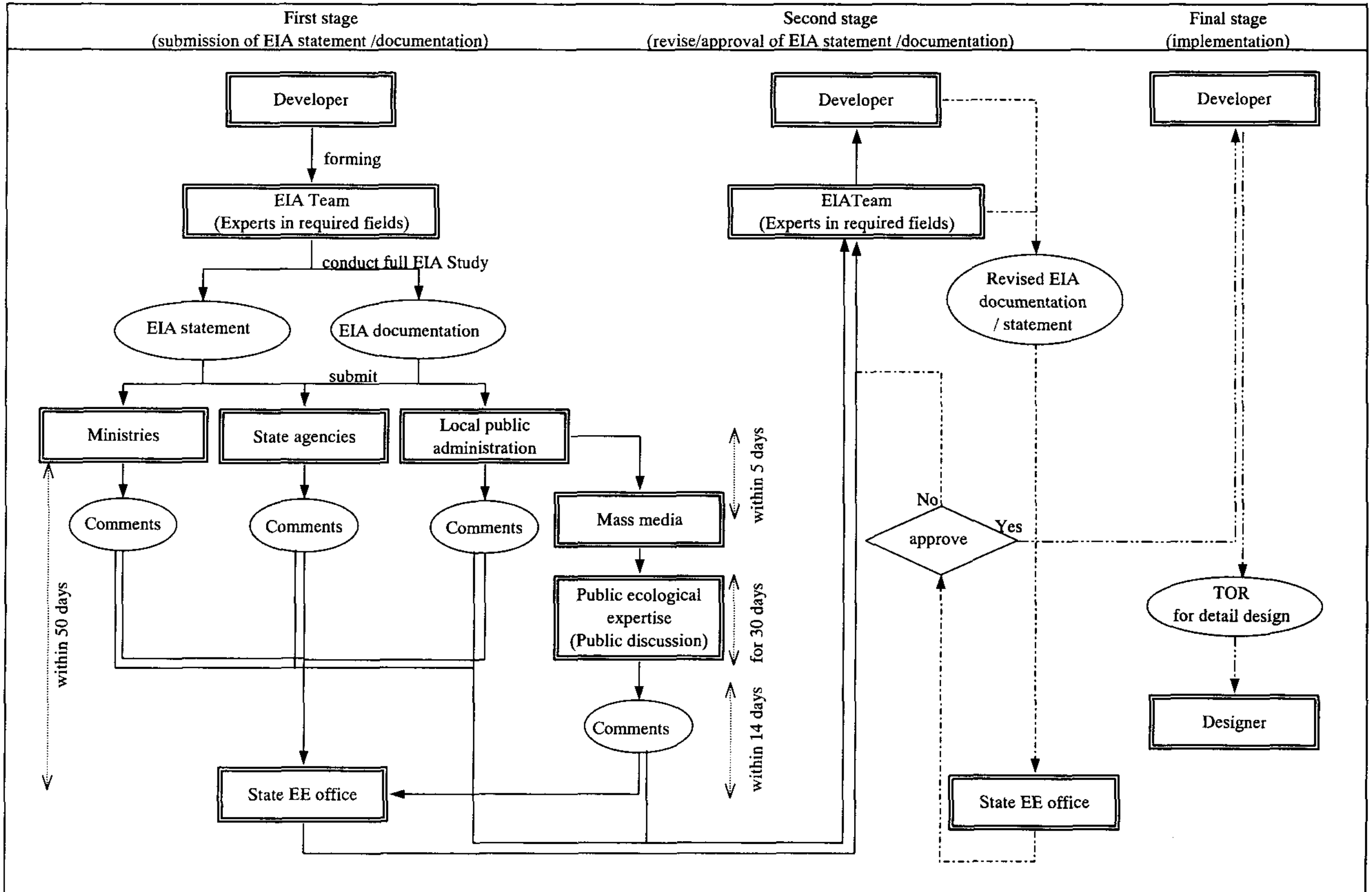


Figure I.1 Flowchart of EIA Procedures

2. Initial Environmental Examination

2.1 Introduction

Generally, the IEE (Initial Environmental Examination) study is carried out as one of important components of a development master plan, in which due consideration should be given to any negative impacts on natural, physical, ecological and socio-economic environments.

There is no procedure of IEE for development projects in the Republic of Moldova, and the execution of EIA (Environmental Impact Assessment) is determined by type and scale of development projects. Although the conduct of the IEE is not required in Moldova, it will provide useful basis to conduct EIA in the next stage, i.e. a feasibility study.

Generally speaking, a construction of new water supply facilities and new operation works are certain to cause some impacts on the environment. Most of the impacts are considered to be positive, but some might be negative, and monitoring and special mitigation measures may be required.

The environmental information required at this stage has been collected and analyzed for the Initial Environmental Examination.

The following are the major contents to be presented in the subsequent sections:

- Review of the content of the preliminary environmental considerations conducted by the JICA Preparatory Study Team on the basis of newly collected information. It includes revision of the Project Description and Site Description.
- Final arrangements of Screening and Scoping for careful judgments on whether the project implementation will affect environment or not, and on the fields of environmental priorities to be considered.
- Overall evaluation of IEE to evaluate whether Environmental Impact Assessment is necessary for the project and, if so, to define its contents

In order to implement above-mentioned tasks, the JICA requirements as prescribed in the Environmental Guidelines for Infrastructure Projects (IX. Water Supply) have been referred.

2.2 Project Description and Site Description

According to the JICA requirements, the Project Description should include the contents and features of the project, such as its background, objectives, location, executing agency, beneficiaries, scale, structure, construction method, operation and maintenance, etc.

Site Description includes the present conditions of the natural and social environment and pollution in and around the project area.

Tables I.2 and I.3 present required information as Project Description and Site Description, respectively.

Components of construction of new facilities and new operations included in the Master Plan are summarized below.

Construction of new facilities:

- Transmission pipe line from Balti to Riscani (D=400 mm, 35 km)
- Transmission pipe line from Balti to Falesti (D=400 mm, 32 km)
- Distribution reservoirs in Saroca (V=4,200m^3, Land acquisition = 3,150m^2)
- Distribution reservoirs in Falesti (V=4,200 m^3, Land acquisition = 3,150m^2)
- Distribution reservoirs in Riscani (V=1,400 m^3, Land acquisition = 1,050m^2)
- Drying bed for sludge treatment

New operation works:

- Treatment works (sludge treatment)
- Transmission works (from Balti to Riscani, and from Balti to Falesti)

2.3 Screening

The screening matrix prepared in the project preparatory phase has been revised according to the project components and the environmental information collected. Table I.4 presents summary of screening items applied for all potential environmental impacts that may be caused by the project implementation not only in the project area, but also in the surrounding areas that may directly or indirectly affected during the construction and after the commissioning of project facilities.

2.4 Identification of Potential Environmental Impacts

This section presents some technical and operational details relevant to the type of proposed improvements, and a list of potential impacts that has been prepared for each category of new facility construction and new operation work.

(1) Transmission Pipe Line

Details of Construction Works

New transmission pipe lines are to be installed in road side along the road from Balti to Riscani and from Balti to Falesti. Outline of construction works is itemized as below.

-	Land acquisition:	No requirement	
-	Pipe diameter:	400 mm	
-	Total length :	32 km as Balti-Riscani / 35 km as Balti-Falesti	
-	Excavation:	width 1000 mm, depth 2000 mm	
-	Work schedule:	length of construction lot:	100 - 200 m
		time of construction:	4 days to 8 days / lot
		total period:	160 days as Balti-Riscani
			150 days as Balti-Falesti
-	Construction machinery:	Power shovel	

Potential Environmental Impacts

From above construction works, the following potential environmental impacts are expected.

1) Construction works of transmission facilities may damage historical/cultural relics.

2) Construction works may cause interference of wildlife, natural objects under protection and rare species of plant.

3) Construction works may interfere traffic at the construction site.

4) Construction wastes may be illegally dumped around the construction sites.

5) Construction works (machinery) may disturb soil and agricultural vegetation at the surrounding areas, may require temporal land acquisition or crops' yield compensation.

6) Construction works and machinery may affect air quality, and cause noise and vibration.

7) Construction works and machinery may damage the roads (particularly unpaved) and increase the risk of traffic accidents.

(2) Distribution Reservoirs

Details of Construction Works

New distribution reservoirs are to be constructed in Soroca, Falesti and Riscani. In Balti, reservoirs construction is to be completed for those of which construction works have been suspended.

Therefore, no new distribution reservoir will be constructed. Outline of new construction works is itemized below.

-	Land acquisition:	3,150 m^2 for Soroca, 3,150 m^2 for Falesti and 1,050 m^2 for Rescani.
-	Capacity:	4,200 m^3 for Soroca, 4,200 m^3 for Falesti, and 1,400 m^3 for Riscani
-	Size of reservoir :	Soroca: width 16 m, length 33 m, depth 4 m, 2 reservoirs
		Falesti: width 16 m, length 33 m, depth 4 m, 2 reservoirs
		Riscani: width 10 m, length 17.5 m, depth 4 m, 2 reservoirs
-	Work period:	200 days for Soroca
		200 days for Falesti
		120 days for Riscani
-	Construction machinery:	Power shovel.

Potential Environmental Impacts

Expected environmental impacts are summarized below.

1) Land acquisition may cause resettlement and require landowner compensation.

2) Construction works of reservoirs may damage historical/cultural sites, natural objects under protection and rare species of plant.

3) Construction works may cause inconvenience in the living condition.

4) Construction works may cause traffic congestion near the site.

5) Construction works and reservoir facilities may change landscape and visual characteristics at the site.

6) Construction works affect air quality, and cause noise and vibration.

7) Construction wastes may be illegally dumped around the construction site.

(3) Drying Bed

Details of Construction Works

Drying bed for sludge treatment is to be constructed in the existing treatment plant site. Outline of construction works is itemized as below.

-	Land acquisition:	No requirement
-	Size of bed:	width 30 m, length 100 m, depth 1.5 m, 2 beds
-	Work schedule:	total 3 months
-	Construction machinery:	Power shovel

Potential Environmental Impacts

Potential environmental impacts to the environment are listed below. Impacts to the natural surroundings are limited during construction phase as new drying bed facilities are constructed in the premise of the existing water treatment plant.

1) Construction works may cause traffic congestion near the site.

2) Construction works affect air quality, and cause noise and vibration.

3) Construction wastes may be illegally dumped around the construction site.

(4) New Operation Works

Details of Operation Works (sludge treatment and treated water transmission)

Basically, operation works for intake, raw water transmission and treatment were established as the Soroca-Balti water supply system. During operation works for 5 years or more, no complaints and no obstacle to environment were occurred.

Intake and raw water transmission works will include only changing of pumps and related electricity/control equipment. The pumps capacities will be about 100,000 m^3/day at each pumping stage, little higher as existing one. Modernization of pumping equipment will allow better operation and performance of pumping schedule as well as energy saving. It is positive aspects.

However, in the existing treatment plant, the sludge from sedimentation tank is discharged to the Nistru River without treatment. As new improvement, drying bed of the sludge treatment facilities is proposed for mitigation of impact to the Nistru River. Consequently, operation works of drying bed will be newly added. The dried sludge should be properly managed, re-used or dumped as well.

Also, transmission of the treated water from Balti to Riscani and from Balti to Falesti is categorized as new operation works. However, no pump operation is required for the above transmission.

According to the requirements of national sanitary authorities, new disinfecting facilities should be built near the distribution reservoirs. However, construction of disinfecting units is not included in the Master Plan. It should be dealt with in the frame of water distribution plans for each town.

Potential Environmental Impacts

The potential environmental impacts by the operation works of drying bed and the treated water transmission pipes are listed below.

Drying bed:

1) Operation works may cause water pollution in the Nistru River by discharge of supernatant liquor.

Transmission pipes:

No potential environmental impact is expected by the operation of transmission pipes. The attention should be paid to the proper maintenance of the pipes with periodical inspection.

2.5 Scoping

The scoping procedure, as defined by JICA, is an element of overall environmental examination for the aid projects and should help in identification of potential environmental impacts, their significance, and in defining the study items of EIA based on the findings. The checklist for scoping has been prepared taken into consideration:

- Application conditions - (i) period for scoping covers both the construction and operation periods; (ii) spatial extent of scoping which includes new items to be added to the existing water supply systems; (iii) types of environmental impacts having negative effects to the existing environment.
- Evaluation methods of important fields and items – (i) item is rated according to the categories as A (serious impact is expected), B (some impact is expected), C (extent of impact is unknown but further examination is required because it might become clear as the study progress), and D (no impact is foreseeable).

Expected potential environmental impacts associated with the above-described new facilities construction and new operation works are categorized using an impact matrix table as shown in Table I.5.

2.6 Overall Evaluation and Conclusion

Overall evaluation of results of the Initial Environmental Examination (IEA) are summarized in Table I.6. Conclusions of the Initial Environmental Examination are as follows:

1. EIA is necessary as the project may have some impacts to the existing environment.
2. EIA is required by the Moldavan regulations for the water supply systems with capacities exceeding 10,000 m^3/day.
3. Specific items for EIA of more importance are: (i) construction wastes; (ii) fauna and flora; (iii) air pollution; (iv) water pollution; (v) noise and vibration.

4. EIA items of (i) economic activities; (ii) traffic are important as well.

5. EIA items of (i) resettlement; (ii) cultural property; (iii) topography and geology; (iv) landscapes depend on selection of precise sites for new construction, but full-scale assessment will not be required.

6. EIA items of (i) water rights and (ii) public health conditions should be preliminarily clarified with national environmental and health authorities before the final decision on EIA will be made.

7. EIA items of (i) groundwater and (ii) soil contamination will depend on technical options to be proposed.

Table I.2 Project Description

Item	Description
Project Name	The Study on the Water Supply Systems for the Northern Region of the Republic of Moldova
Background	In the city Soroca the centralized water supply system was build from the bank-filtrated water intake located at the bank of the Nistru river. The urban water accumulation facilities and distribution lines were installed. Later, after construction of the regional aqueduct Soroca-Balti, the city has been connected to the new facilities and received drinking water after treatment. The source is Nistru river surface water. In the city Balti, the second important town in the country, the water supply system has been constructed on the base of local deep groundwater boreholes which cannot provide sufficient amount of water, and the quality of water is not satisfactory. After construction of the regional water supply pipeline (Soroca-Balti) from the Nistru river, the city received surface water after treatment and disinfections. The capacity of the system was designed on the basis of overestimated water demand in accordance with the former USSR standards and progressive development of industry. Because of the low water reservoir capacity, the water supply system is very sensitive to the any operational failure or problems with pumping both from the boreholes and Nistru river. In towns Riscani and Falesti the urban water supply systems were build. The sources of drinking water are deep boreholes, and the water is provided without treatment and its quality is not in conformity with the national and international drinking water quality standards. The worst situation is in the town Falesti. Rural settlements, located around the towns and along the pipeline Soroca-Balti are not connected to the system. Some of them have small local supply systems, but majority of population use water from shallow wells, which are seriously polluted by nitrates, pesticides and other health related contaminants. The other urban localities in the northern region such as Singerei, Drocia and Floresti have water supply conditions similar to that in Falesti and Riscani. During the years of the transition period and economic crisis, the urban water supply systems in all towns were deteriorated structurally and operationally. The distribution networks are old, physically disturbed and water losses are evident. Dramatic rising of pumping costs, unstable electricity supply, low payment rates of consumers, inadequate water metering, in-efficient works of pumping equipment, decreasing of water demands, over-designed capacities and other factors lead to the difficulties in operation of water supply systems and low level of services performed. As a result, the population both in urban and rural localities are affected by poor drinking water quality and inadequate amounts of water or unstable water provision schedule. Health risk is evident and should be urgently minimized.
Objectives	The principal objective is to improve water supply status in the northern region of the Republic of Moldova.
Location	The areas primarily consisting of cites/towns of Balti, Soroca, Falesti and Riscani, locations of water supply facilities and inter-city pipelines.
Executing Agency	The Republican Water Resource Management Concern "APELE MOLDOVEI" under the Ministry of Agriculture and Food Industry.
Beneficiaries	Approximately 244,000 people, living in the towns Soroca, Balti, Falesti and Riscani plus local water consumed industry. In addition it is about 123,000 of people (living in the urban and rural settlements in the Northern Region of Moldova) will have benefits and opportunities to improve drinking water service in future.

Item	Description
Project Components	
Type of Project	New constructions in combination with improvement/rehabilitation of existing facilities
Major Property	Drinking water
Water Source and Water Quality	Water source: surface water from the Nistru river. Raw water should be treated and disinfected before the supply to consumers. Modernization of water intake pumping and support equipment.
Conveyance Facilities	Modernization of transmission pumping and support equipment. Construction of new water supply pipelines from Balti to Riscani and from Balti to Falesti with the total length at about 67 km.
Purification Plant	Rehabilitation of treatment facilities to ensure proper coagulation/flocculation, sedimentation, sand filtration, and disinfection, with a total treatment capacity of approx. 91 000 m^3/day. Construction of new sludge drying beds.
Reservoir Facilities	Completion of construction of distribution reservoirs in Balti (2 x 10,000 m^3, 2 x 6,000 m^3) Construction of new distribution reservoirs in Soroca (2 x 2,100 m^3) Construction of new distribution reservoirs in Falesti (2 x 2,100 m^3) Construction of new distribution reservoirs in Riscani (2 x 700 m^3)
Appurtenant Facilities	Not applicable at this stage, but can be proposed later.
Other	Not applicable

Table I.3 Site Description

Item		Description
Project Name		The Study on the Water Supply Systems for the Northern Region of the Republic of Moldova
Social Environment	Inhabitants: (residents/ indigenous people/their views on the project, etc.)	About 163,000, 46,000, 19,000, and 16,000 inhabitants are living in Balti, Soroca, Falesti, and Riscani, respectively. The Moldovan population is predominant (45 - 65%), the major minorities groups are Ukrainians and Russians (15 - 40%). Residents in the region hope for safe and stable drinking water supply, but have concern on high water service prices.
	Public facilities (wells, reservoirs, water supply/ electricity, etc.)	There are centralized water supply facilities in the urban areas. Cities Soroca and Balti can switch water sources from surface to the bank-filtrated (Soroca) and deep artesian (Balti). The water supply for Riscani and Falesti is based only on the groundwater boreholes. The quality of groundwater in the city/towns Balti, Riscani and Falesti is poor (including high content of fluoride) and raises health problems for population. Due to the poor management of water supply system, the water supply status in all the citeis/towns is unsatisfactory. Presently the reservoir capacities are enough in Soroca, Riscani and Falesti. The city Balti has very little accumulation capacities of tanks. Pumping equipment is generally old, operates with failure, and no any energy saving options implemented. Transmission pipe (Soroca-Balti) seems to be in satisfactory conditions. Distribution network within the cities/towns are old and damaged, water losses are evident. Water treatment is available only in the Soroca-Balti pipeline system, but the facilities need to be repaired and sludge should be properly managed. The electricity is available in all the cities/towns, it depends on the capacity of local water supply companies to pay the electricity charges. The number of people connected to the water supply system is varies from 25% in Riscani to over 90% in Balti and Soroca. The rest of people in towns and almost all rural people rely on the hand-dug shallow wells with extremely poor water quality in chemical and bacteriological parameters.
	Public health and sanitation (illness/ infectious diseases, hospitals, sanitary habits)	Among the people using the water supplied through the groundwater aquifer based systems, water-borne diseases such as fluorosis are observed. Infectious diseases are registered but not as epidemic events. Water sources such as shallow wells used by the majority of population in the northern area of Moldova are contaminated due to the insufficiency of sewerage, animal husbandry in the living space, poor management of domestic and livestock manure and solid wastes. All these together are resulting in the low sanitation and occurrence of a wide variety of water-born diseases. Sewerage facilities are built in all towns, but not operated or maintained under proper technical conditions. As a result the pollution of surrounding areas and surface water are evident, especially in the city Soroca. Medical infrastructure (hospitals, polyclinics, surgeons, ambulance service) is developed in all urban areas, and in the cities/towns the medical staff is available.
Natural Environment	Topography and geology (steep slopes, soft ground, wetland/faults, etc.)	The northern region is situated at the Miocene geological formation (clay, limestone, sands, sandstone), which is uniformly distributed. A few regional and local geological breaks exist. The grade of seismic activity is 6 - 7 in the Richter scale. The relief around the city Soroca is comprehensive and formed by river terraces, valleys and deep canyons. The lowest elevation point is around 45 m and the highest 240 m above the sea level. The ravines slopes are very steep.

Item		Description
		Water intake and lift pumping stations for the Soroca-Balti pipeline are located at the steep slope to the Nistru river. The relief around the town Falesti is formed by hills and small river valleys, ravines and landslides. The small wet plain areas are limited in the south and east sides in the town. The town is located around the hill with maximum elevation of 150 - 160 m. Riscani town is situated on the both banks of a small river. The town lies on the number of hills and slopes. The elevation is in the range of 120 - 184 m above the see level. The relief around the city Balti is formed by hills and small river valleys, ravines and landslides areas on the both banks of Reut river. A large wetland area exists in the middle of the city.
	Groundwater/ lakes/ rivers/ climate (water quality, quantity, precipitation, etc.)	The eastern zone of the study area (city Soroca, water intake for Soroca-Balti pipeline) lies on the bank of Nistru river. The city/town of Balti and Riscani are associated with the Nistru watershed as well. The town Falesti is located within the Prut river catchment. Both rivers are important national and international rivers. Water quality in both rivers is generally satisfactory because of decreasing of industrial pollution, but affected by agricultural nutrients and bacteriological contamination. The city Balti is situated at the bank of Raut tributary to the Nistru. The land's internal small rivers and lakes are extremely polluted and their use is limited. Groundwater is available from deep aquifers but its quality depends on the locality. The poorest groundwater is linked with the Prut river basin. The average salt content varies between 930 and 1,400 mg/l (maximum at 3,000 mg/l), hardness at 2.6 - 10 m.equivalent/l, fluoride 2 - 9 mg/l or higher, and iodine 4 - 7 mg/l. Shallow groundwater is characterized by salt content in the limits of 300-1,300 mg/l, and by hardness as 10 - 14 m.equivalent/l, iodine 1 - 7 mg/l, fluoride 0.5 - 1.5 mg/l, and high content of nitrates, nitrites and microbiological parameters. Typical depths of the shallow wells are 3 - 10 m. The climate is moderate. The annual precipitation 450 - 550 mm. The annual average air temperature is 8 - 9 °C. The average temperature in July is about 20 °C, and in January – 4 °C. The temperature of the topsoil in July is estimated at 25 - 26 °C, and in January at minus 5 °C.
	Valuable fauna and flora / their habitats: (national parks / habitats of rare species, etc.)	The forests cover about 5 - 10% of the territory of the Study Area. The types of natural forests are of grab-trees and oak-trees. Forests are designated for soil protection, recreation, and water protection. In Soroca region the forests are predominantly natural and have high values. Within Falesti region only small artificial plantations of various tree species are seen around the town. The forests around town Riscani are natural, but artificial plantations have been extended to the former forestlands. The forest areas are relatively small and sporadically distributed. There are no natural forests within the Balti region as all forests are artificially planted. Within the valleys of small rivers, a few places with meadow vegetation can be found. Various types of meadow vegetation are identified in the surrounding territories of the Balti city as floodplain meadow, grass vegetation wetlands, second terraces meadow of cereals and sedge vegetation and typical meadow. The natural steppe vegetation is absent in the Study Area as the lands are cultivated intensively. Only very small sporadic places with some species of typical steppe vegetation are reported. The wildlife in the region is limited and presented by the species associated with forests and steppe zones. The most important wildlife area is surroundings of the city Soroca, which provides a variety of natural habitats and maintains a high biodiversity level. The Balti area is less populated with wild lives.

Item		Description
		The rare and protected species can be potentially found in the natural habitats near the city of Soroca (plants – 11 species, mammals – 1, birds – 10, reptiles – 4, fishes – 5, insects – 14) and at the other towns (birds – 1, reptiles – 5, insects – 8). A few exotic trees are growing in the municipal parks. The natural locations covered by medical plants and herbs can be found around Soroca, and to the less extent in the Falesti, Riscani and Balti regions. Number of natural protected areas, monuments, habitats and scenic landscapes can be found in the neighborhood of the city Soroca.
Pollution	Complaints: (pollution of the uppermost concern, etc.)	The major pollution concerns in the Soroca region is municipal wastewater as transmission sewer line to the wastewater treatment plant (located at the Ukrainian territory) is passing the Nistru river. The pipe is old, disturbed and wastewater leakages lead to the international environmental conflicts. The important pollution problems in the Falesti region are wastewater leakages at the wetland area, pollution of groundwater and shallow wells, recovering of abandoned waste landfill. In Riscani the principal concerns are associated with the contamination of drinking water wells and illegal dumping of wastes. In Balti region the important pollution concerns are air pollution from stationary and mobile sources, toxic wastes management at the enterprises, sanitation, pollution of Reut river.
	Measures taken: (institutional measures, compensation, etc.)	The number of mitigation measures are usually undertaken by local environmental and public authorities. The efforts have little success, as financial ability is very low and not adequate to implement required mitigation measures at full extent.
Other particular importance	Tourism and recreation	Soroca city, together with the neighboring villages, is forming a nationally important medical, recreational and tourist region. The tourist activities are less developed in the other city/towns of the Study Area.
	Soils	The losses of fertility and degradation of soil resources are the major national environmental concern in the rural areas.

Table I.4 Screening Summary

N	Environmental Item	Description	Evaluation	Remarks (reason)
	Social Environment			
1	Resettlement	Resettlement due to land occupancy (transfer of the rights of residence and land ownership)	Y	Potentially expected for the sites of new reservoir tanks in Falesti and Riscani, should be clarified during selection of the construction sites.
2	Economic Activities	Loss of production base and change of economic structure	Y	Temporal losses of agricultural yields or negative effects to the road protection corridor (trees and vegetation) are expected for the construction areas of the transmission pipelines Balti-Falesti and Balti-Riscani, should be clarified during selection of construction corridors.
3	Traffic and Public Facilities	Impacts on school, hospitals and present traffic conditions, such as a traffic jams and accidents	Y	Potentially construction vehicles and machinery can affect traffic at the local roads.
4	Split of Communities	Separation of regional communities by hindrance of regional traffic	N	
5	Cultural Property	Loss or decrease of the value of cultural assets, such as templates, shrines and archeological assets	?	Should be clarified at the architecture departments and Academy of Science.
6	Water Rights and Rights of Common	Obstruction of fishing rights, water rights, and rights of common	?	Not expected as there are no new water intakes are proposed, but should be clarified at environmental fish and water management authorities, as it is expected that system will work at full capacity (100 000 m^3/day) and required new permissions for water abstraction and revision of fish protection measures.
7	Public Health Condition	Worsening of health and sanitary condition due to the generation of garbage and pathogenic insects	?	Not expected, but special attention should be paid to the water losses at the distribution network and wastewater originated after full operation of the towns systems. The capacities and technical conditions of sewer and treatment facilities should be evaluated.
8	Waste	Generation of construction waste, surplus soils, sludge and domestic wastes	Y	Expected during all construction works and operation of new sludge drying bed.

N	Environmental Item	Description	Evaluation	Remarks (reason)
9	Hazards (Risk)	Increase of risk of cave-in, ground failure and accidents	N	Expected only in case of non-adequate operation of transmission pipelines, network leakage and operation of disinfecting units (if constructed).
	Natural Environment			
10	Topography and Geology	Change of valuable topography and geology due to excavation and earthfill	Y	Potentially expected for the sites of new reservoir tanks in Falesti and Riscani, should be clarified during selection of the construction sites.
11	Soil Erosion	Topsoil erosion by rainfall water after land reclamation and deforestation	N	Not expected at this moment
12	Groundwater	Exhaustion of groundwater caused by over-draft, and water pollution by leachate	?	Not expected at this moment, but possible pollution should be clarified during designing of sludge drying bed.
13	Hydrological Situation	Changes of river discharge and riverbed condition due to filling work and drainage inflow	N	
14	Coastal Zone	Coastal erosion and change of coastal vegetation due to the changes of habitat conditions	N	
15	Fauna and Flora	Obstruction of breeding and extinction of species due to the changes of habitat conditions	Y	Potentially expected for the construction sites and areas of pumps rehabilitation works.
16	Meteorology	Change of micro-climate, such as temperature, wind, etc., due to large-scale reclamation and construction	N	
17	Landscape	Change of topography and vegetation due to reclamation. Deterioration of aesthetic harmony by structures.	?	Should be clarified during selection of the construction sites for new reservoir tanks in Falesti and Riscani,

N	Environmental Item	Description	Evaluation	Remarks (reason)
	Pollution			
18	Air Pollution	Pollution caused by exhaust gas or toxic gas from vehicles and factories	Y	Expected for short period during construction phase.
19	Water Pollution	River and groundwater pollution caused by inflow of drainage and sludge from water treatment plant	Y	Expected for new sludge drying bed.
20	Soil Contamination	Contamination caused by discharge or diffusion of waste water drainage or toxic materials	?	Not expected at this moment, but possible pollution should be clarified during designing of sludge drying bed.
21	Noise and Vibration	Noise and vibration generated by vehicles and operation of water treatment plant	Y	Expected mainly during construction works.
22	Land Subsidence	Land deformation and land subsidence caused by the lowering of water table	N	
23	Offensive Odor	Generation of offensive odor and exhausted gas	N	
	Overall Evaluation: Either IEE or EIA is necessary for the Project Implementation ?		Y	IEE is necessary for the Master Plan and EIA is necessary at the Feasibility Study as the project: (i) potentially may have environmental impacts and (ii) falls to the category of obligatory required EIA according to the national legislation.

Table I.5 Result of Initial Environmental Examination (Potential Environmental Impacts)

		Items	Construction			Operation		Remarks
			Transmission pipe line	Reservoir tank	Drying bed	Transmission pipe line	Drying bed	
Social Environmental Factors	1	Resettlement		C				Land acquisition may cause resettlement. The exact sites for new reservoir tanks in Falesti and Riscani are unknown yet and should be clarified during final selection of the construction sites.
	2	Economic Activities	B	C				Temporal losses of agricultural yields or negative effects to the road protection corridor (trees and vegetation) are expected for the construction areas of the transmission pipelines. The scale and extent of the impacts should be clarified.
	3	Traffic and Public Facilities	B	B	C			Construction vehicles and machinery potentially may affect traffic at the local roads.
	4	Division of Communities						Not expected at this stage.
	5	Historical or cultural site	C	C				The exact project sites for new reservoir tanks and transmission pipeline are unknown yet. Location of archeological sites should be clarified at the architecture departments and Academy of Science.
	6	Water Rights and Rights of Common				C		Not expected at this stage as there are no new water intakes are proposed. However, the impacts should be clarified in the fishing rights and the river water management.
	7	Public Health Condition				C		Not expected at this stage. The capacities and technical conditions of the wastewater treatment facilities should be evaluated.
	8	Waste	B	B	B		B	Impacts which are relevant to the construction period temporal and small-scale. Operation of new sludge drying bed may cause long-term impacts of dried sludge if not managed properly.
	9	Risk of disaster						Not expected at this stage.
Natural Environmental Factors	10	Topography and Geology		C				The exact sites for new reservoir tanks in Falesti and Riscani are unknown yet and should be clarified during final selection of the construction sites.
	11	Soil Erosion						Not expected at this stage.
	12	Groundwater		C				Not expected at this stage, but possible pollution caused by drainage water leaches should be clarified during designing of sludge drying bed.
	13	Hydrological Situation						Not expected at this stage.
	14	Coastal Zone						Not expected at this stage.
	15	Fauna and Flora	B	C				Potentially expected for the construction sites and areas for transmission pipelines and reservoir tanks. The impacts are temporal and small-scale.
	16	Meteorology						Not expected at this stage.
	17	Landscape		C				The exact sites for new reservoir tanks in Falesti and Riscani are unknown yet and should be clarified during final selection of the construction sites.
Pollution Factors	18	Air Pollution	B	B	B			Expected impacts are small-scale and for short period during construction phase.
	19	Water Pollution					B	Expected for discharge of supernatant liquor from the drying bed.
	20	Soil Contamination			C			Not expected at this stage, but possible pollution should be clarified during designing of sludge drying bed.
	21	Noise and Vibration	B	B	B			Expected impacts are small-scale and for short period during construction phase.
	22	Land Subsidence						Not expected at this stage.
	23	Offensive Odor						Not expected at this stage.

Note: A: Serious negative impact is expected.
B: Some negative impact is expected.
C: Extent of impact is unknown and examination is needed.

Table I.6 Overall Evaluation [1]

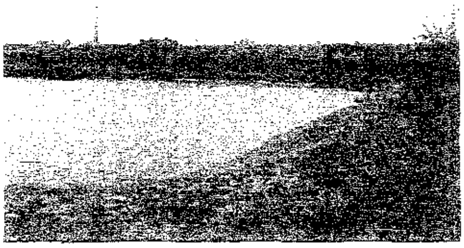
N	Item	Evaluation	Study Plan	Remarks
1	Resettlement	C	Quick examination of potential impacts after selection of alternatives for the reservoir sites. Detailed plan will depend on the options proposed.	
2	Economic Activities	B and C	Field inspection of transmission pipeline corridor after formulation of more precise alternatives of pipeline route. Vegetation pattern (agricultural, road protection zone) and engineering structures may be affected by the construction. Clarification of potential scale of damages expected and assessment of site specific compensation/mitigation measures.	
3	Traffic and Public Facilities	B and C	Assessment of existing traffic conditions and formulation of project relation scenarios. Impact scale identification and development of preventive actions.	
4	Split of Communities	D		
5	Cultural Property	C	After pre-selection of transmission pipelines corridors and reservoir tanks locations the request for relocation of archeological sites may be necessary. It is normal procedures not only for EIA but for all designing documentation as well.	
6	Water Rights and Rights of Common	C	The detailed plan will depend on the formal requirements of fish authorities. Preliminary discussion will be necessary. If identification of effects to the fish rights is obligatory, the field investigation of aquatic population (bio-assessment) should be implemented and potential impacts should be studied as well as compensation/mitigation measures.	
7	Public Health Condition	C	Attention should be paid to the identification of water leaking areas within the towns. The capacities and technical conditions of sewer and treatment facilities should be evaluated. Preliminary discussion with health authorities will be helpful.	
8	Waste	B	Estimation of waste generation rate and evaluation of their hazard properties. Formulation of mitigation measures.	
9	Hazards (Risk)	D		
10	Topography and Geology	C	Quick examination of potential impacts after determination of alternatives for reservoir sites. Detailed plan will depend on the options proposed.	
11	Soil Erosion	D		

[1] A - Serious impact is expected; B - Some impact is expected; C - Extent of impact is unknown and examination is needed. Impacts may become clear as study progress; D - No impact is expected. IEE/EIA is not necessary.

N	Item	Evaluation	Study Plan	Remarks
12	Groundwater	D and C	Quick examination of potential impacts after formulation of technical options for sludge drying bed. Assessment of groundwater table and vulnerability of aquifer affected. Detailed plan will depend on options proposed.	
13	Hydrological Situation	D		
14	Coastal Zone	D		
15	Fauna and Flora	B	Site specific assessment of natural habitats located closely to the construction sites. Identification of protected species to be affected. Assessment of vulnerable seasons (reproduction, breeding, and migration). Proposals for impact reduction measures.	
16	Meteorology	D		
17	Landscape	C	Quick examination of potential impacts after determination of alternatives for reservoir sites. Detailed plan will depend on the options proposed.	
18	Air Pollution	B	Estimation of air pollutant emission from construction vehicles and evaluation of air quality by prediction models.	
19	Water Pollution	B	Estimation of pollutant discharges, assessment of toxicity and other effects of drying bed supernatant liquor. Probably a number of toxicity experiments will be required.	
20	Soil Contamination	D and C	Quick examination of potential impacts after selection of technical options for sludge drying bed. Detailed plan will depends on options proposed.	
21	Noise and Vibration	B	Assessment of noise and vibration by using models (if available) or previous experience or professional judgements. Impact scale and magnitude identification. Development of mitigation measures.	
22	Land Subsidence	D		
23	Offensive Odor	D		

3. Photograph of the Project Sites

Wastewater discharge ponds and water purification plant



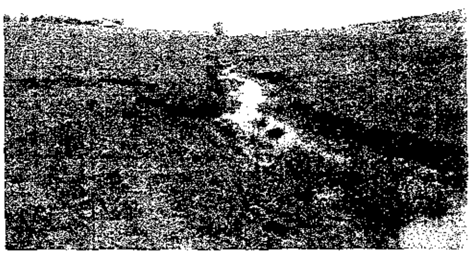

Wastewater discharge point (2 ponds) from water treatment plant (WTP)
Distant building is the water purification plant on the left picture.

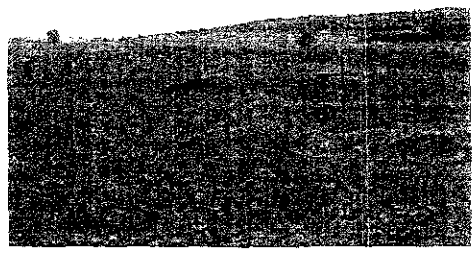

Overflow water from the ponds is drained into the Melochun Valley as shown *in the right picture.*

Transmission pipe from the WTP to Balti


Transmission pipe from the WTP to Balti is installed along the road. Manhole and valve is shown above.

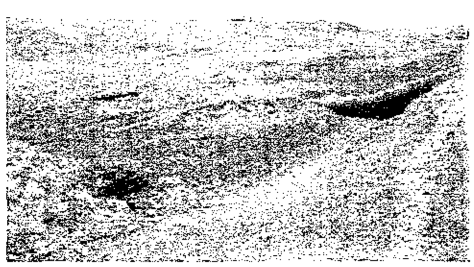
Washout valves are installed at the low points such as the place above. Water is discharged there when pipe maintenance is carried out.





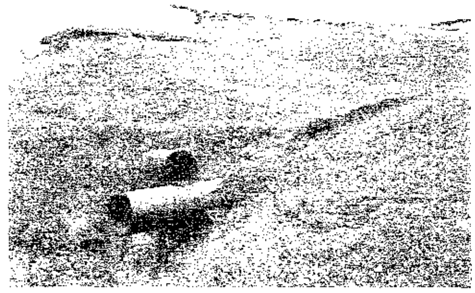
Ditto

Pipe is exposed at some points as shown above.



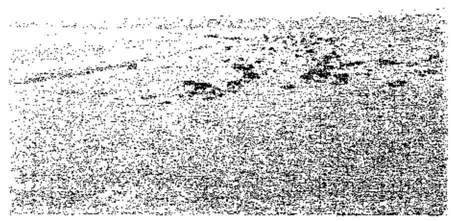
Ditto

Ditto

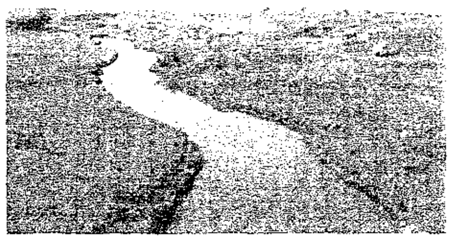


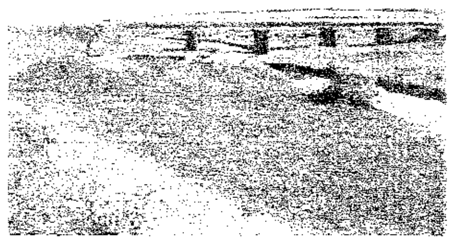
Discharge pipe from washout manhole

Solid waste disposal site above pipeline



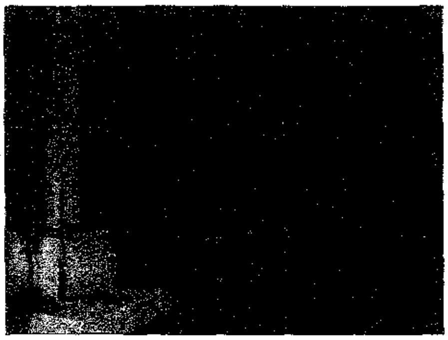
Washout valve is installed at the low points such as the place above.



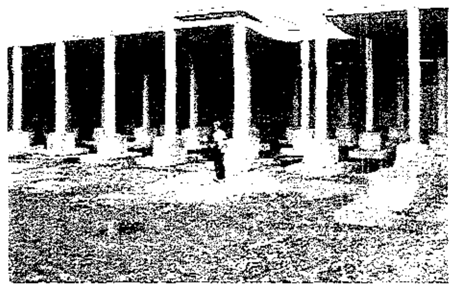


Washout valves are installed at the low points such as the place above.

Uncompleted reservoir in Balti

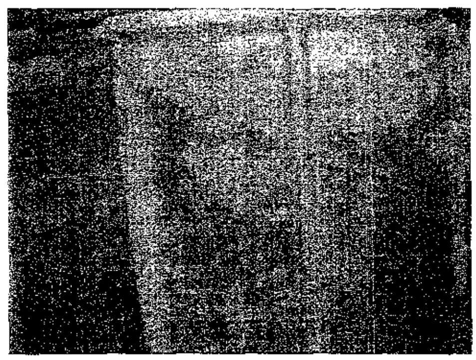


Inside of 1st reservoir

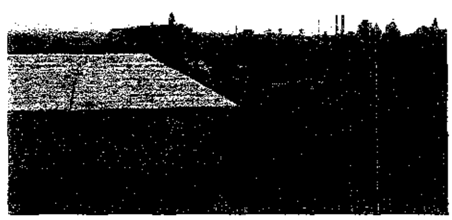


Inside of 2nd reservoir

Connections between panels are not completed.



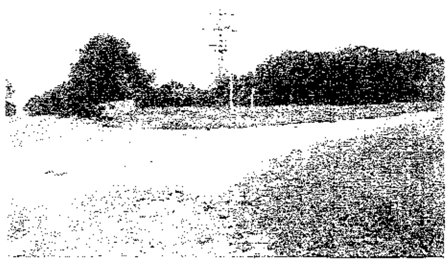
Reinforcement bars of ceiling panels are exposed.



Distance view of the uncompleted reservoir in Balti

Route of the planned transmission pipe from Balti to Riscani

Planned transmission pipe route around reservoir in Balti



Planned transmission pipe is passing around forest.

Planned transmission pipe is passing agriculture farm.

Planned transmission pipe is passing around cliff.

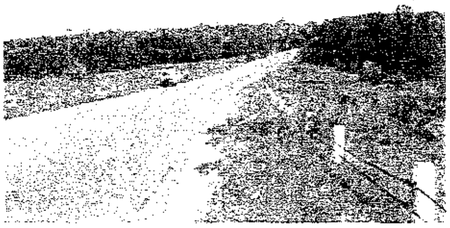
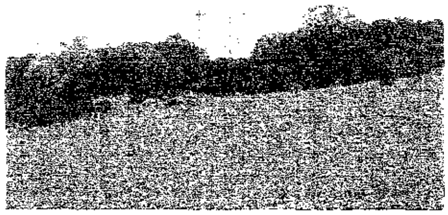

Planned Transmion pssion pipe is passing around apple farm.


Planned transmission pipe is passing around farm pig houses and gas station.


Planned transmission pipe is passing around wetland.


Existing reservoir and location of planned reservoir site

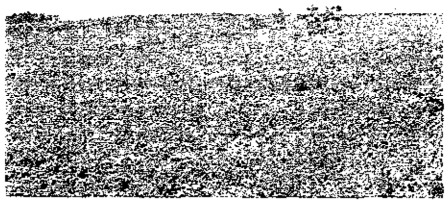
Route of planned transmission pipe from Balti to Falesti

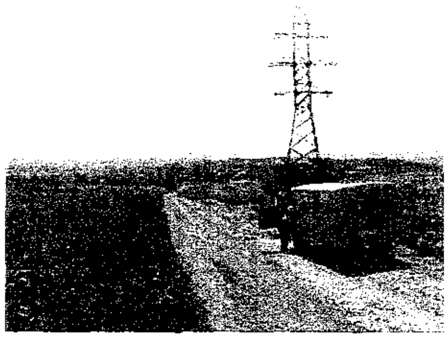
Planned transmission pipe is passing around forest.


Transmission pipe is passing under railway.

Spring is gushed and creek is stated where the washed out valve will be installed.



Planne transmission pipe is passing through farm land to the planned reservoir in Falesti


Planned Transmission pipe is passing along the road from the planed reservoir to the existing reservoir

ANNEX J

ON-GOING WATER SUPPLY PROJECTS IN MOLDOVA

Major water supply projects in Moldova being carried out or completed during the past few years are outlined below.

1. Water Supply of Localities in the South of Moldova - Project Financed by Turkish Credit

Project goals

The project is aimed at constructing water supply systems in three towns of the autonomous territory Gagauz-Eri: Comrat, Ciadyr-Lunga and Vulcanesti.

Financing

The credit amounts to 35 million US dollars. Stage one provided construction works in the amount of 17.7 million US dollars, 15 million financed by Turkey and 2.7 million by the Republic of Moldova.

Conditions of financing

The credit was offered via the TURKEXIMBANK, the interest rate being 8 % plus banking service expenses. Grace period is two years, and full reimbursement period 7 years. Reimbursement of interest sums started after six months since the construction was started.

Project implementation period

The first stage was planned to be implemented during the period from November 1998 to the end of year 2000. But due to the financial problems experienced by the Republic of Moldova, the first stage has not been finalized yet, and by 1 October 2001 the cost of unfinished construction works amounts to 1.5 million US dollars (debt of Moldova).

Designer

All the design and tender organization and supervision works were performed by the ACVAPROIECT Design Institute.

Client

By the decision of Gagauz-Eri Autonomous Republic, the Government of Moldova created the enterprise "SUDACON" that had to take over the constructed facilities, and performed the functions of technical supervision and signed invoices.

Guarantees

The Government of Moldova issued a guarantee for this credit.

Present situation

The already finalized portion of works that amounts to 16.2 million US dollars includes deep groundwater intake, transmission and disinfection systems for the town of Comrat and two adjacent villages. The overall system capacity is 5,000 m^3/day, the total length of distribution networks of Comrat being 10 km. A water intake has been constructed for the town of Ciadyr- Lunga that together with the existing intake provides 6,200 m^3 of water per day. Also constructed are the pipelines between the pumping stations I, II and II, two new reservoirs of 2,000 m^3 each, and the pumping station III. Two existing reservoirs were reconstructed, and the distribution network has been revitalized.

Still suspended are the construction of water treatment facility for Ciadyr-Lunga and the entire water supply system for the town Vulcanesti.

2. Reconstruction of Water Supply System of Chisinau by EBRD Credit

Project goals

The project is aimed at reconstruction of internal distribution networks of the Chisinau city. While the total length of the distribution network is around 1,200 km, only 100 km were proposed for rehabilitation on stage one.

Financing

The overall amount of financial resources needed for the reconstruction was estimated at 60 million US dollars, out of which 12 million were allocated for the first stage. Costs are covered half by the EBRD - 6 million, and half by the Chisinau municipality together with Apa Canal Chisinau - 6 million US dollars.

Conditions of financing

Financing is done by equal contributions from EBRD and Moldova.

Project period

Implementation period for stage one is expected to be from the beginning of year 2000 till December 2001.

Designers

Project preparation was done by international companies. Main network design works were done by the ACVAPROIECT Design Institute.

Client

The Client's interests were represented by the municipality and Apa Canal Chisinau. But control of construction works was entrusted to the Danish engineering consultant RAMBOLL that won a tender for the consulting service financed by the Danish Government (Environment Protection Agency).

Guarantees

The Government of Moldova issued a guarantee for this credit.

Current situation

The progress rate is now around 75 %. All the construction works of the stage one are to be finalized by the end of 2001.

3. Collaboration Between Denmark and Moldova - Environment Protection - DANCEE Program

Project goals

The collaboration agreement provides financing of water supply reconstruction projects in small localities. The entire project is planned for 10 years. The first pilot projects for 2001 - 2002 are in the field of water supply. One of them (rehabilitation of water supply system of the town Edinet) provides replacement of pumping equipment of the existing system in order to decrease operation costs, and thus the costs of water delivered to consumers. The two remaining projects are expected to be construction of water supply systems in rural areas.

Financing

The total costs of implementing this program are estimated at around 10 million US dollars, but the annual allocations are determined depending on the projects selected. The Danish side assumes only the financing of material components (i.e. costs of pipes, equipment and their delivery), and local contributions should cover the costs of construction and mounting without material components.

Conditions of financing

Water supply projects are elaborated for the priority localities selected. Bills of quantities are compiled and tenders are organized among Danish manufacturers. The costs are not disclosed to the Moldavian side. Tenders for construction and mounting are organized among Moldavian construction enterprises. Payment of construction works is done by the common efforts of local water users, state budget of all levels, and the environmental fund of Moldova.

Project implementation period

The entire project is expected to last for 10 years. The stage one started in May 2001 and will last until the end of 2002.

Designer

Selection of projects is done based on information offered by the ACVAPROIECT Design Institute to the Ministry of Environment and Territorial Development and a Danish company COWI. Working designs are made by ACVAPROIECT Design Institute under the control of Danish consulting company RAMBOLL.

Client

Official Client of the project is the mayoralty of each particular village. But a part of Client's functions is undertaken by RAMBOLL.

Guarantees

There are no guarantees for this project, but the Danish side does not effect delivery of materials until the Client accumulates a specified amount of money for the construction works on special account. The contract has been signed by the Ministry of Environment and Territorial Development.

Current situation

Presently the construction of water supply system for the Borceag village is being finalized. Technical documentation and a tender for the delivery of equipment for the second project, water supply for the town Edinet, are being prepared. Already prepared are the tender documents for the delivery of materials for the third water supply project, the village Chircaesti, and design documents are also being finalized.

4. Swiss Investment Fund

Project name

Study and Technical Assistance in the Water Supply Sector

Project goals

Provision of technical assistance to rural localities for temporary solution of water supply problems ; limited amount of water without quality requirements.

Project period

2000 - 2005

Designer and project organization

Promoted by ACVAPROIECT Institute. But due to the temporary character of measures and lack of water quality requirements, the project is not supported by the Institute.

Client

Official Clients are the mayoralties of beneficiary villages.

Conditions of financing

All the activities are expected to be financed on the grant basis.

Current situation

Elaboration of master plans for the town of Nisporeni in Ungeheni county and the village of Cotul Rorii in Lapusuna county. The possibility of providing spring water to the villages of Zberoaia and Balauresti in Ungheni county is being considered.

ANNEX K

WASTEWATER MANAGEMENT IN THE STUDY AREA

1. General Provisions in Moldova

1.1 Types of Sewerage Systems

According to the legislation in force, the localities of the Republic of Moldova are to be provided with sanitation systems of either of the following types:

1) Full sewage collection: wastewater and storm water are collected together and treated in one treatment plant.

2) Separated - complete or incomplete: wastewater and storm water are collected separately and treated in respective treatment plants (complete), or wastewater only is treated (incomplete).

3) Semi-separated: wastewater and storm water are collected separately and transported to one treatment plant where all of wastewater and a part of storm water separated in the overflow chamber are treated.

4) Combined: any combination of above systems.

Selection of sewerage types depends on requirements to treatment of surface run-off, on climatic conditions, local relief and other factors.

Industrial wastewaters are allowed to enter the public sewer networks in conformity with the Rules for Acceptance of Industrial Effluents into the Public Sanitation Networks. The rules specify the maximum admissible concentrations (MAC) of pollutants in the mix of domestic and industrial wastewaters when entering the biological cycle of wastewater treatment facility.

In the cases of impossibility to assure concentrations of pollutants below MAC values (for example, MAC of suspended solids is 500mg/l), industrial effluents must be pre-treated in locally provided facilities before discharging into the public sewers.

Most sewerage facilities in the countries of former Soviet Union are of separated type. Most of them are of the separated - incomplete type that allows to direct domestic wastewater, i.e. most polluted from the sanitary point of view, to wastewater treatment facilities before discharging into watercourses. Storm water is discharged via separate collectors into watercourses without any treatment.

1.2 Major Methods of Wastewater Treatment in the Republic of Moldova

Treatment of wastewaters in the Republic of Moldova as a rule is mechanical + biological. In 70 % of cases, the designs provide additional treatment of already treated effluents in biological ponds if design capacity of wastewater treatment facilities is below 12,000 m^3/day, or with aerobic biological filters if design capacity of facilities is higher.

When constructing sewage treatment facilities in rural localities with capacity up to 25 m^3/day, a standard set of components is provided: septic tank, dosing camber, sand-gravel underground filters, and chlorination chamber. Circulation of wastewater within the facilities is gravitational. The effluent from the septic tank is supplied through the dosing chamber and perforated pipes onto the sand-gravel filter of the layer thickness at 1 - 1.5 m. The filtration effluents are collected from the beneath by special drainage system and chlorinated before discharge.

When wastewater treatment facilities of capacities between 25 and 700 m^3/day are to be constructed, they usually include sand separation tanks with horizontal or radial water circulation, double-decked sedimentation tanks with diameter 6 - 12 m for mechanical treatment with retention time of 1.5 h.

Biological treatment is provided in biofilters, aeration ponds or aeration tanks with mechanical or pneumatic aeration via notched pipes or filtration plates.

Most of latest wastewater treatment facilities of above capacities are factory-made according to common designs.

As a rule, they incorporate an integrated aeration-sedimentation tank with prolonged aeration cycle and internal re-circulation of activated sludge.

As a rule, the facilities are also provided with sand and sludge deposit sites and final treatment ponds with capacities up to 1.5 to 3 days retention time with disinfection system. The design concentration of suspended solids and BOD in the influents to such facilities is up to 300 mg/l, while their effluent concentrations should not exceed 5 mg/l.

Wastewater treatment facilities of large cities are constructed according to the same principles: mechanical treatment (building with mechanical gratings, rakes and crushers, sand separation chambers of radial or tangential type, radial or double-decked sedimentation tanks), biological treatment on corridor-type aeration tanks with pneumatic aeration, secondary sedimentation tanks and activated sludge re-circulation systems. Disinfection is done by chlorine, after that the treated wastewater is discharged into watercourses or reservoirs. Large wastewater treatment facilities have their own laboratories that perform quality tests for influents and effluents on the daily basis.

1.3 Quality Norms for Discharged Effluents

Effluent quality requirements are provided in the "Rules for the protection of surface waters against pollution", so, the MACs of pollutants in discharged water are approved on annual basis for each of particular wastewater treatment plants (WWTPs).

1.4 Effluent Discharge Sites

Requirements to effluent discharge sites are also provided in the «Rules for the protection of surface waters against pollution». Discharge of treatment plant effluents has to be made downstream from locality boarders and all locations of water use and water intakes, taking into consideration the possibilities of reverse flow in the rivers in cases of strong winds. The discharge points on watercourses or water accumulations without stream or with weak streams should be determined taking into account sanitary, meteorological and hydrological factors in order to prevent negative impacts on the conditions of water use by the population.

2. Wastewater Management in the Study Area

2.1 City of Balti

The main sources of wastewater discharges are: population, public institutions, and industrial enterprises. 65 % of the total number of residences is connected to the centralized sewerage system. The most of the industrial wastewaters comes from the food industry. The fur factory, that used to discharge its effluents into the centralized sewerage system after the primary treatment in its own facilities, does not operate presently.

The wastewater treatment plant with design capacity of 60,000 m^3/day was constructed in 1970. Its actual operating capacity is around 47,000 m^3/day.

The wastewater discharges are collected and transported to the treatment plant by the gravitational and pressure sewers. There are four district pumping stations and one main pumping station.

The wastewater is pumped from the main pumping station to the intake chamber of the WWTP. After passing the grates, sand separation chambers and primary sedimentation tanks, the influents enter the biological treatment cycle - aeration tanks. After passing the secondary sedimentation tanks, the effluents are chlorinated and discharged into the Raut river.

The sediments are transported to the sludge deposit sites, and drainage from the sludge is discharged by gravity into the Reut river as well.

According to the design documents, sludge fermentation tanks were also constructed, but they are not in operation presently.

2.2 City of Soroca

The sewerage system of Soroca City is of incomplete-separated type. The design capacity of the system is 10,300 m^3/day, and actual operating capacity is 7,000 m^3/day. The system was constructed in 1979. The sources of wastewater are: population, public institutions, and industrial enterprises.

Only 50 % of the total population is connected to the centralised sewerage system. Industrial effluents from the existing canning factory pass the internal wastewater treatment cycle with mud separators before discharging into the sewerage system.

The wastewater discharges are collected and transported by gravitational and pressure sewers with help of two sewage-pumping stations (one district PS and the head PS). The gravitational sewers are made of reinforced concrete and ceramic sections, and pressure sewers are made of steel and cast-iron. The average depreciation of the gravitational sewers is 20 %, and that of the pressure sewers is 80 %.

The wastewater is pumped by the head PS and transported via a pressure pipeline of diameter 400 mm and 7.2 km long to the WWTP located on the opposite bank of Nistru river in the village Tsekinovka Yampol district, the Ukraine.

The WWTP provides full biological treatment. From the inlet chamber the influents are directed to the mechanical treatment facilities - grates, sand separation chambers, sedimentation tanks, then to the biological treatment cycle - aeration tanks and secondary sedimentation tanks. The effluents are chlorinated and discharged into Nistru river. The sediments are transported to sludge deposit sites on the territory of Moldova approved by the State Sanitary-Epidemiological Inspection.

The present sewerage system has serious problems particularly with the WWTP. The sedimentation tanks in the WWTP are much deteriorated. Most of pressure pipes and gravitational pipes in the WWTP have reached the economic life. The pressure sewer on the river bed of Nistru is deteriorated and at an emergency state.

To solve these problems, a project to construct a new WWTP on the territory of Moldova has been prepared. But its implementation has not been realized mainly due to financial difficulties.

2.3 Town of Falesti

The sewerage system of Falesti is of incomplete-separated type. The main sources of wastewater discharges are the population and a machinery factory. About 50 % of the total number of inhabitants is connected to the centralised sewerage system.

Collection of wastewater discharges is made by means of gravitational (with total length 16.7 km) and pressure (with total length 2.6 km) collectors. There are three sewage-pumping stations: two in the town and one at the machinery factory, JSV «Prut-80».

The wastewater discharges from the machinery factory and population are transported to the wastewater treatment plant that was a property of the machinery factory JSV «Prut-80» until July 2001 when the WWTP was transferred to the municipality and is operated by the Municipal Enterprise for Operation of Housing and Communal Facilities.

The WWTP with design capacity of is 10,000 m^3/day was completed in 1994. The wastewater passes mechanical treatment (grates, sand separation chambers, primary sedimentation tanks), followed by treatments in aeration tanks, secondary sedimentation tanks, and finally in biological ponds with subsequent chlorination. The effluents are discharged into the river Small Shovets.

Presently the WWTP operates at only 10 % of the design capacity - around 1,000 m^3/day. The grates do not operate; air blowers are out of operating condition and need replacement. The same refers to the biological ponds. The chlorine contact tank is not used, and chlorine is dosed directly into the discharge pipeline. Sludge compaction tanks also need repair.

The main problems experienced by the WWTP are: over-sized design capacity, bad technical state of equipment, deterioration of reinforced concrete structures, and corrosion of metallic parts.

2.4 Town of Riscani

The main source of wastewater at present is the population, the rate of coverage by the sewerage system is around 65 % of the people connected to the centralised water supply system. Other sources are public institutions and industrial enterprises. The industrial sector is represented by the dairy-cheese factory that is operating at 10 % of design capacity and agricultural enterprises located within the town limits.

The wastewater discharges are collected by a network of gravity collectors with a total length around 13 km. There are two pumping stations. The district pumping station pumps the sewage from a more depressed part of the town to the main pumping station via a 200 mm pressure collector, that is 400 m long. The main pumping station pumps the sewage to the WWTP via two pipelines with d=300mm, each 800 m long.

The WWTP constructed in 1978 was designed to treat 2,400 m^3/day of effluents, but actual operating capacity is around 1,200 m^3/day.

Full biological treatment is provided in the WWTP with aeration tanks and consecutive final treatment in biological ponds with pneumatic aeration and superior water flora. Sediments are treated in double-decked sedimentation and fermentation tanks. Sludge is drained on special sludge deposit sites. The effluents are chlorinated before discharging into a brook which is a tributary of Copaceanca river. The wastewater generated in the dairy-cheese factory passes a local treatment cycle before discharged into the centralised sewerage system.

3. Necessary Improvements in Wastewater Management in the Study Area

In the current study, a master plan of the water supply system for the cities/towns of Balti, Soroca, Falesti, and Riscani has been proposed. Implementation of the water supply master plan will increase the amount of water supply in each of the 4 cities/towns. Increase of water supply amount requires strengthening of sewerage system for the protection of sanitary conditions and the water environment. It is recommended for the 4 cities/towns to improve their sewerage systems as described below.

3.1 City of Balti

In the city of Balti, 65 % (or 106,000 persons) of the total population is connected to the sewerage system. In the year 2015, the population served with water supply is projected to be 168,000 persons as described in Chapter 3 of the Main Report. The existing sewer network should be expanded to cover additional 62,000 residents. The capacity of the existing sewage treatment plant (60,000 m^3/d) constructed in 1970 is sufficient to treat the wastewater to be generated in 2015. However, improvement of sludge treatment facilities seems to be necessary including the fermentation tanks that are not operating now.

3.2 City of Soroca

In the city of Soroca, 50 % (or 23,000 persons) of the total population is connected to the sewerage system. In the year 2015, the population served with water supply is projected to be about 46,000 persons. The existing sewer network should be expanded to cover additional 23,000 residents. The existing sewage treatment plant located on the Ukrainian side of Nistru River and the pressure sewer crossing the river bed are at critical states. The currently suspended project to construct a new sewage treatment plant on the Moldovan side should be implemented as soon as possible.

3.3 Town of Falesti

In the town of Falesti, 50 % (or 9,500 persons) of the total population is connected to the sewerage system. In the year 2015, the population served with water supply is projected to be about 19,000 persons. The existing sewer network should be expanded to cover additional 9,500 residents. The capacity of the existing sewage treatment plant (10,000 m^3/d) constructed in 1994 is more than sufficient to treat the wastewater to be generated in 2015. However, a considerable degree of improvement of the plant is necessary as some of the existing facility components including grates, air blowers, biological ponds, and chlorine contact tank are not operating properly. Also, deteriorated concrete structures, sludge compaction tanks, and other corroded metallic parts should be repaired or replaced.

3.4 Town of Riscani

In the town of Riscani, the present sewerage system covers 65 % of the people connected to the water supply system, i.e., only 17.4 % (or 2,900 persons) of the total population. In the year 2015, the population served with water supply is projected to be about 16,000 persons. The existing sewer network should be expanded to cover additional 13,100 residents. The capacity of the existing sewage treatment plant (2,400 m^3/d) constructed in 1978 is not sufficient to treat the wastewater to be generated in 2015. The present capacity needs to be expanded by about 50 %.

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