Depending on the sludge quality and soil properties, basically the following disposal routes are available:

- Land filling
- Composting followed by final disposal;
- Co-incineration in large industrial combustion plants;
- Land reclamation;
- Agricultural re-use;
- Forestry;
- Mono-incineration;

By adding the disposal costs and the transportation costs the following values for each WWTP would occur for the estimated final disposal costs:

Disposal Route	Drying €/t DS	Transport €/t DS	Laboratory Analyses €/t DS	Entrance Fee €/t DS	Application Costs €/t DS	Total Costs €/t DS
Agriculture	0	9	75	0	40	124
Reforestation	0	11	60	0	40	111
Land Reclamation	0	11	60	0	40	111
Composting	0	4	0	37	0	41
Co-Incineration	200	5	0	0	0	205
Land Filling	0	4	0	37	0	41

Table 1-33: Sludge disposal costs – Bacău WWTP

Disposal Route	Drying €/t DS	Transport €/t DS	Laboratory Analyses €/t DS	Entrance Fee €/t DS	Application Costs €/t DS	Total Costs €/t DS
Agriculture	0	9	75	0	40	124
Reforestation	0	11	60	0	40	111
Land Reclamation	0	11	60	0	40	111
Composting	0	8	0	37	0	45
Co-Incineration	200	4	0	0	0	204
Land Filling	0	8	0	37	0	45

Table 1-34: Sludge disposal costs – Buhuşi WWTP

Disposal Route	Drying €/t DS	Transport €/t DS	Laboratory Analyses €/t DS	Entrance Fee €/t DS	Application Costs €/t DS	Total Costs €/t DS
Agriculture	0	21	75	0	40	136
Reforestation	0	9	60	0	40	109
Land Reclamation	0	9	60	0	40	109
Composting	0	11	0	37	0	48
Co-Incineration	200	7	0	0	0	207
Land Filling	0	11	0	37	0	48

Table 1-35: Sludge disposal costs – Moineşti WWTPs

Disposal Route	Drying €/t DS	Transport €/t DS	Laboratory Analyses €/t DS	Entrance Fee €/t DS	Application Costs €/t DS	Total Costs €/t DS
Agriculture	0	24	75	0	40	139
Reforestation	0	9	60	0	40	109
Land Reclamation	0	9	60	0	40	109
Composting	0	13	0	37	0	50
Co-Incineration	200	8	0	0	0	208
Land Filling	0	13	0	37	0	50

Table 1-36: Sludge disposal costs – Dărmăneşti WWTP

Disposal Route	Drying €/t DS	Transport €/t DS	Laboratory Analyses €/t DS	Entrance Fee €/t DS	Application Costs €/t DS	Total Costs €/t DS
Agriculture	0	24	75	0	40	139
Reforestation	0	9	60	0	40	109
Land Reclamation	0	9	60	0	40	109
Composting	0	12	0	37	0	50
Co-Incineration	200	9	0	0	0	209
Land Filling	0	12	0	37	0	50

Table 1-37: Sludge disposal costs – Târgu Ocna WWTP

Disposal Route	Drying €/t DS	Transport €/t DS	Laboratory Analyses €/t DS	Entrance Fee €/t DS	Application Costs €/t DS	Total Costs €/t DS
Land Filling	0	13	0	37	0	50

Table 1-38: Sludge disposal costs – Caraboaia WTP

Disposal Route	Drying €/t DS	Transport €/t DS	Laboratory Analyses €/t DS	Entrance Fee €/t DS	Application Costs €/t DS	Total Costs €/t DS
Land Filling	0	5	0	37	0	42

Table 1-39: Sludge disposal costs – Barați WTP

The current sludge disposal practice is summarized in the following table.

WWTP	Current Sludge Treatment	Final Disposal	Current Production (t DS/a)
Bacău City	anaerobic digestion mech. Dewatering	sludge lagoon	15,858
Buhuşi	Imhoff tanks drying beds	drying beds	390
Moineşti	Imhoff tanks drying beds	drying beds	507
Comăneşti	aerobic stabilization drying beds	drying beds	105
Dărmăneşti	unknown	unknown	unknown
Slanic Maldova	drying beds	drying beds	2
Târgu Ocna	Imhoff tanks drying beds	non-compliant landfill	4
Oneşti	Imhoff tanks	sludge lagoon	692
Căiuți	not functioning	none	none
Faraoani	drying beds	unknown	<< 1
Răcăciuni	unknown	non-compliant landfill	0.05
Podu Turcului	not functioning	none	none

Table 1-40: Existing WWTPs in Bacau County with Urban Sludge

The strategy can be divided into short, middle and long-term activities and for each time horizon there are different disposal routes which can be implemented according to the status of the strategy activities. As also described above, there are several possible disposal routes in the County.

Short-term Disposal Path: - *2011 to 2014*

- Solid Waste Landfill (81 - 99 % of sludge)
- Composting plus final disposal guaranteed by contractor (1 - 9 % of sludge)

Middle-term Disposal Paths: - *2015 to 2020*

- Solid Waste Landfill - provisionally selected disposal route (69 - 78 % of sludge)
- Composting plus final disposal guaranteed by contractor (22 - 31 % of sludge)
- Co-Incineration (dependent on successful negotiations)
- Bio-Gas Production with subsequent land filling (dependent on successful negotiations)

Long-term Disposal Paths: - *2021 and thereafter*

- Solid Waste Landfill
- **Co-Incineration** – provisionally selected disposal route (50 % of sludge)
- Bio-Gas Production with subsequent land filling (dependent on successful negotiations)
- Agriculture
- **Reforestation** – provisionally selected disposal route (25 % of sludge)
- **Land Reclamation** – provisionally selected disposal route (25 % of sludge)

Specifically, the short-term urban sludge disposal will be:

Bacău WWTP:

- The sludge will go to the central County Chimiei Street landfill and to the composting plant.

Buhuşi WWTP:

- The sludge will go to the central county Chimiei Street landfill.

Moineşti North WWTP:

- The sludge will go to the central county Chimiei Street landfill.

Târgu Ocna WWTP:

- The sludge will go to the central county Chimiei Street landfill.

At this point in time, however, it is not at all possible to state which of the disposal paths in the long-term best meets the ***objectives*** set down by the County, the Romanian Ministry of Environment and Forests and the EU. This will only be possible after several years of operation of the CF facilities to be built, the implementation of the recommended harmonization of the legal and administrative

regulations dealing with wastewater and sludge management in Romania (given below), and further intensive investigations and negotiations.

1.5 Drinking Water Systems

1.5.1 Water Supply Zone Bacau

With its population of 197,013 inhabitants, the Water Supply Zone Bacau is the largest Water Supply Zone in Bacau county and situated in the middle of Bacau county. This Water Supply Zone comprises beside the municipality several localities:

WSZ	City/commune	Locality	WS-network existing
BACAU	BACAU	BACAU	YES
	MARGINENI	MARGINENI	YES
		BARATI	YES
		PADURENI	YES
		TREBES	YES
		VALEA BUDULUI	YES
	MAGURA	CRIHAN	**NO**
		DEALU MARE	**NO**
		MAGURA	YES
	HEMEIUS	LILIECI	YES
		HEMEIUS	YES
	LETEA VECHE	LETEA VECHE	YES

Table 1-41: Overview of existing water distribution network in Water Supply Zone Bacau – breakdown by locality

The Water Supply Zone Bacau is fed by the following water sources : Water Treatment Plant Caraboaia at storage lake Poiana Uzului, Margineni wellfields, Gheraiesti wellfields and Hemeius wellfields.

Chlorinated water from the treatment plant is pumped by a DN 800 to RSV Barati. On the way to Bacau this water is rechlorinated at Chlorination Station Stejaru .

A fraction of water from Wellfield Margineni which is chlorinated at the wellfield is as well pumped into RSV Barati. Another fraction is distributed directly into the network. From RSV Barati water is distributed into the network by gravity. Water from well field Gheraiesti is stored at RSV Gheraiesti and pumped into the network. Chlorination takes places at the pumping station Gheraiesti.

There are three locations where RSVs are built. The total storage capacity sums up to 60,000 m³ .

RSV	Barati	Margineni	Gheraiesti
Volumes [m³]	10,000	10,000	10,000
	5,000	-	10,000
	5,000	-	5,000

	-	-	5,000
Sum:	**20,000 m^3**	**10,000 m^3**	**30,000 m^3**

Table 1-42: Details about Reservoirs in WSZ Bacau

The water quantity is sufficient for the system including all connected localities and even leaves additional capacity for the supply of more people. In future a separate water main as well as a separate WTP Barati is planned to supply Bacau WSZ. This is realized by an ongoing ISPA Project. It is also planned to catch the water at the foot of the barrage and let it go via hydropower into the new WTP at Barati. This Hydropower is actually under construction at Chlorination Station Stejaru and has a capacity of 600 – 800 l/s.

Following water quality problems are existing :

- High values of Manganese and Iron by groundwater as already mentioned in the MP.
- The turbidity at the outlet of the WTP Caraboaia is high and also exceeds several time the guideline value of 1 NTU (guideline).

During this FS the Connection Rate of WSZ Bacau was evaluated to 90 % existing. Due to budget constraints following investment measures have been chosen :

1. Necessary Rehabilitation of WTP Caraboaia which is a common part of several communes and cities. The investment was incorporated in WSZ Bacau during MP :

New treatment technology, including pre-treatment (pre-oxidation) and powder activated carbon treatment, construction of a new mixing chamber and demolition of the old mixing chamber. Rehabilitation of backwash filters, backwash water pumps and pipe gallery and new sludge treatment units / dewatering line.

1.5.2 Water Supply Zone Onesti

From MP stage it was clear that no CF investment will be spent for Onesti for Water Supply. Furthermore during this FS Onesti decided not to join into the Project. So Onesti will not be considered in this FS.

1.5.3 Water Supply Zone Comanesti-Moinesti

As described in subchapter 1.2 in WSZ Comanesti-Moinesti only the northern part including the City of Moinesti and locality Gazarie are part of the project. This northern part of Water Supply Zone Comanesti-Moinesti has a population of 23,902 inhabitants and is supplied by WTP Caraboaia. The WSZ Comanesti-Moinesti comprises beside the City of Moinesti locality Gazarie. City of Comanesti is supplied

by WTP Ciobanus and operated by another operator. Comanesti did not join into the IDA and so it is not considered in this FS.

There are four locations where RSVs are built. The total storage capacity sums up to 8,540 m³ .

	Micleasca	**Cristea**	**Pini**	**PS Vasiesti**	**Hangani**
Reservoirs [m³]:	300	100	2,500	240	500
	300	100	2,500		
		240 (out of service)	1,000		
			1,000		
Sum [m³]:	**600**	**200**	**7,000**	**240**	**500**

Table 1-43: Details about Reservoirs in WSZ Comanesti-Moinesti

The water quantity is sufficient for the system including all connected localities and even leaves additional capacity for the supply of more people. Judging from the few available data, the water quality is sufficient. The water quality analysis is made by the National Health Agency " Autoritatea de Sanatate Publica a Judetului Bacau".

The Cohesion Fund measures focus on increasing the connection rate.

1. Network extensions

In the city of Moinesti streets will be connected to the existing water supply system. The connection rate will increase from 84% to 90%. Furthermore the pumping station Vermesti will be used for supply of the city, PS Vasiesti including RSV Hangani will be decommissioned.

1.5.4 Water Supply Zone Buhusi

The Water Supply Zone Buhusi has a population of 19,644 inhabitants and is supplied by ground water. The WSZ Buhusi comprises only the City of Buhusi.

There are two RSVs and the total storage capacity sums up to 2,500 m³ .

RSV	**RSV 1**	**RSV 2**
Volumes [m³]	1,000	1,500
Sum [m³]:	**2,500**	

Table 1-44: Details about Reservoirs in WSZ Buhusi

The water quantity is sufficient for the system and even leaves additional capacity for the supply of more people. Judging from the few available data, the water quality is also sufficient.

The Cohesion Fund measures focus on increasing the connection rate.

1. Network extensions

In the city of Buhusi one long street will be connected to the existing water supply system. The connection rate will increase from 85% to 90%.

1.5.5 Water Supply Zone Darmanesti

Due to budget constraints no CF measures will be spent for Darmanesti water supply system.

1.5.6 Water Supply Zone Targu Ocna

Due to budget constraints no CF measures will be spent for Targu Ocna water supply system.

1.5.7 Summary of CF-Investments Water Supply Zones

Physical indicators Water Supply	Unit	2010 - 2014
Rehabilitation Water Treatment Plant, including SCADA	pc	1
Network extension (below DN 150)	m	9,811
New house connections	m	615

Table 1-45: Details about Water Supply Cohesion Fund investments in County of Bacau

1.5.8 Evolution of water losses

In the following table the evolution of water losses considered in this project is summarised. The reduction of water losses takes a water loss reduction programme into consideration which is the result of a water loss reduction programme by the effort of ROC.

Evolution of water losses								
YEAR	2008	2009	2010	2011	2012	2013	2014	2015
WSZ Bacau	55%	54%	52%	50%	50%	48%	46%	46%
WSZ Moinesti	51%	51%	51%	50%	48%	46%	44%	44%
WSZ Buhusi	50%	50%	50%	49%	47%	46%	45%	45%
WSZ Darmanesti	51%	50%	49%	48%	47%	47%	47%	45%
WSZ Targu Ocna	57%	57%	55%	55%	53%	53%	50%	48%

Table 1-46: Evolution of water losses

1.6 Results of Cost Benefit Analyses

The Benefit/Cost Ratio is 2.67, the ERR 18.9˚%, and the NPV calculated at a discount rate of 5.5˚% is EURO 201.4˚million. The project shows satisfactory economic indicators with economic benefits significantly exceeding economic cost.

1.7 Results of Institutional Analyses

The beneficiary of the project is Compania Regionala de Apa Bacau SA which is the Regional Operating Company (ROC) from Bacau County.

The key institutional elements according to the strategy from the Sectoral Operational Programme (SOP) (the Intercommunity Development Association (IDA), the Regional Operating Company (ROC)) are implemented at the level of Bacau County the Delegation Contract was signed on 29.11.2010.

1.8 Results of Environmental Impact Assessment

The Environmental Impact Assessment is still ongoing.

1.9 Results of Procurement

The 6 defined work contract packages include 4 yellow book (YB) packages and 2 red book (RB) packages, the estimated values including contingencies are from 3.9 till 39 million Euro. all RB packages include "yellow in red" parts.

The following table shows an overview about the proposed procurement packages.

Contract Nr.	Title	Sum incl. Conting.	Start works	End Works
1	WWTP Bacau	14,149,547 €	Dec-2010	Dec-2012
2	WW-Network Buhusi and Moinesti	12,061,053 €	Apr-2011	Dec-2013
3	WS-Networks Buhusi and Moinesti, Rehabilitation WS AC parts in Bacau ('Other Funds'), WW networks in Bacau, Darmanesti and Targu Ocna	39,082,199 €	Apr-2011	Dec-2013
4	Rehabilitation WTP Caraboaia	3,880,385 €	May-2011	Dec-2012
5	WWTPs Moinesti and Buhusi	16,650,384 €	May-2011	Dec-2013
6	New WWTP Darmanesti and Rehabilitation WWTP Targu Ocna	9,712,236 €	May-2011	Dec-2013
7	Service Contracts Bacau	7,624,004 €	Dec-2010	Dec-2013

Table 1-47: Overview of proposed procurement packages

2 of the 6 packages are recommended for CF Priority I, they are:

- WC1: WWTP Bacau - YB
- WC2: WW-Networks Buhusi and Moinesti - RB

The estimated values including contingencies of these 2 packages is 26.2 million Euro (constant) or 29.4 million Euro (current).

1.10 Summary of Investment Costs

The following table shows a summary of the planned investment costs (eligible part, exclusive contingencies, design, supervision and other overhead):

COUNTY: Bacau

Cohesion Fund Priority Projects
Total Investment costs per cost category for all agglomerations

All costs in Thousand EURO Cost base year 2009

N°	Item	Total County CF	Percentage of CF	Bacau	Comanesti-Moinesti	Buhusi	Darmanesti	Targu Ocna
1	**Water Supply**							
1.1	Water Abstraction	0						
1.2	Water Treatment Plant	3,591	4%	3,591				
1.3	Water Main	0						
1.4	Pumping Station, Reservoirs	0						
1.5	Distribution Network	1,644	2%	3,787	648	997		
	SUM WS	5,236	6%	3,591	648	997	0	0
2	**Wastewater**							
2.1	WWTP	37,494	44%	13,095	7,960	7,450	5,027	3,962
2.2	Main Collector	0						
2.3	Pumping Stations	1,720	2%	266	176	442	532	342
2.4	Wastewater Network (incl pressure lines)	40,144	47%	9,839	5,285	5,260	13,073	6,687
	SUM WW	79,358	94%	23,162	13,421	13,152	18,632	10,991
	Total CF	84,594		**26,754**	**14,093**	**14,148**	**18,632**	**10,991**

WWPS Magura is financed by other funds

OTHER FUNDS	3,825

WS rehabilitataion and WWPS Magura

WS rehabilitation in Bacau is financed by other funds

Table 1-48: Summary of Investments

1.11 Compliance Dates

The following table gives an overview to compliance deadlines:

Deadline for Compliance	2013	2015	2018
Number of **wastewater** agglomerations	7 *		50
Number of **water supply** zones		5	

Table 1-49: Summary of compliance dates

* 5 of 7 Agglomerations are part of this CF Project; Onesti and Comanesti are not part of the project.

Note: Number of agglomerations is according masterplan result and comprises agglomerations above 2000 p.e., number of water supply zones is also according masterplan result.

1.12 Effect of the Project

The following table gives an overview to some effects of the project:

Agglo-meration	Population of the agglomeration [1000*capita]			Load of the wastewater agglomeration [1000*p.e.]			Connection rate to the sewerage system [%]			Treatment capacity of the WWTP [1000*p.e.]	
Name	Current situation (2008)	After completion of the project (2015)	2018	Current situation (2008)	After completion of the project (2015)	2018	Current situation (2008)	After completion of the project (2015)	2018 (effect of ROC efforts	After completion of the project (2013)	2018
Bacau	197	195	194	228	241	215	73	90	100	241	241
Comanesti-Moinesti	24	24	23	20	25	25	67	90	100	26	26
Buhusi	20	20	19	17	24	24	54	90	100	35	35
Darmanesti	12	11	11	0	17	17	0	90	100	22	22
Targu Ocna	12	12	12	6	12	12	54	90	100	16	16

Table 1-50: Summary of projects effects

1.13 Summary of Wastewater Flows and Loads

The following table summarize the wastewater flows and loads before and after project completion per agglomeration.

1.13.1 Agglomeration Bacau

Hydraulic flows		
	Current situation	**After project completion (Design Values)**
Average dry weather incl. infiltration [m³/d]	51,971	73,965
Maximum dry weather (in case of seasonal peaks) [m³/h]	No data	3,720
Maximum admissible flow (rain **weather)** [m³/h]	No data	5,899

Table 1-51: WW Hydraulic Flows – Agglomeration Bacau

Pollution loads (kg/d))		
	Current situation	**After project completion (Design Values)**
BOD5	17,628	14,436
Including from Industries	*No data*	*2,400*
COD	5,763	28,872
Including from Industries	*No data*	*4,800*
MS	9,892	16,842
Including from Industries	*No data*	*2,800*
Nt	1,772	2,647
Including from Industries	*No data*	*440*
P	188	481
Including from Industries	*No data*	*80*

Table 1-52: WW Pollution Loads – Agglomeration Bacau

Based on a specific BOD5 of 60 g/p.e./day the plant has a size of 241,000 p.e.. Consequently, the following discharge effluent parameters as set out in the Urban Wastewater Treatment Directive 91/271/EEC, implemented in the Romanian standard NTPA 001 – 011, apply to the WWTP Bacau.

Parameter	Plant Size	Effluent Concentration	Minimum percentage of reduction
	p.e.	mg/l	%
BOD_5	--	25.0	
COD	--	125.0	
SS	> 10,000	35.0	90
Total N (1)	> 100,000 or sensitive areas	10.0	70 - 80
P	> 100,000 or sensitive areas	1.0	80

Table 1-53: WWTP Bacau, Effluent Standards

Treatment of residues		
	Daily volume (m³)	***Polluting load (kg BOD/d)***
Grease	2.67	Grease from aerated grit and grease chamber will be pumped into anaerobic digestion. No additional pollution load for the treatment process.
Sand	2	The pollution load coming from sand, separated in the grit chamber is insignificant and has no effect on the WWTP
Residues from sewer cleaning	4.61	The load is insignificant and included in Design Load
Sludge collected from septic tanks	66	481

Treatment of residues		
	Daily volume (m³)	***Polluting load (kg BOD/d)***
expected to be treated in the WWTP		

Table 1-54: WWTP Residues – Agglomeration Bacau

Discharges from combined system	
	Current situation
Average frequency of the discharges (/ year)	No data
Corresponding maximum concentration (mg/l): ▪ BOD5 ▪ COD ▪ MS	No Data

Table 1-55: Existing Discharge from Combined System – Agglomeration Bacau

Rehabilitation of sewage	**Average 2010-2015**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Daily infiltration avoided (m³/d)	- 766	-916	-1,196	-869	-704	-535	-374
Corresponding efficiency ratio (€/m³/d)	- 23	-12	-16	-38	-32	-25	-17
Savings generated in OPEX (€/year)	- 8,529	-4,452	-5,956	-13,950	-11,530	-8,965	-6,319
Technology envisaged	Open trenches	Open trenches	Open trenches	Open trenches	Open trenches	Open trenches	Open trenches

Table 1-56: Rehabilitation of sewage – Agglomeration Bacau

The wastewater system of Bacau city is a combined system.

For the assessment of overflow discharges, the Consultant applied the "Storm Water Management Model 5.0, U.S. Environmental Protection Agency".which is a dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity from primarily urban areas.

The runoff component of SWMM operates on a collection of subcatchment areas that receive precipitation and generate runoff. The routing portion of SWMM transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators.

For the modeling time-variant, synthetic model rainfalls (Euler II) based on peak rainfall statistics acc. to STAS 9470/73 were developed.

Bacau is located in rainfall zone No. 2. The relevant rainfall duration (average concentration time on subcatchments + max. flow time in sewer system) was determined to be 240 minutes. In accordance with the importance class of Bacau agglomeration the threshold rain for the assessment of local floodings was selected as follows:

Return frequency:	1/2 - 1/3	years
Rainfall intensity:	230 - 255	l/s/ha
Rainfall duration:	240	min

The simplified network model included the following components:

Total Catchment Area:	2,261	ha
Impervious Area:	727	ha
% Impervious:	32	%
Total No. of Catchment Areas:	528	--
Total No. of Pipes:	2,256	--
Total network Length:	174.3	km

The future sewer network will include 11 combined sewer overflows. The main overflows from the combined network are:

- CD Serbanesti: CD Serbanesti is upstream of PS Serbanesti on the left river bank of Bistrita River.
- CD Izvoare: CD Izvoare is located at Izvoare street on the right river bank of Bistrita River.
- CD WWTP: CD WWTP is located downstream of the stormwater tanks at Bacau WWTP.
- CD Industry: CD industry is located close to an industrial site (eastern projection of Narciselor street).

The rest of the overflows consist of emergency overflows at wastewater pumping stations.

The results of the modeling are presented in the following tables for the before project / after project situation.

AGGLOMERATION BACAU - ASSESSMENT OF OVERFLOW DISCHARGES - BEFORE IMPLEMENTATION							
Overflow	Q_{ww}	Max. admissible Q_{Rain}	Max. Capacity Q_{ww} + Q_{Rain}	f = 1/1 years i = 195 l/s/ha t = 240 min	f = 1/2 years i = 230 l/s/ha t = 240 min	f = 1/3 years i = 255 l/s/ha t = 240 min	f = 1/5 years i = 265 l/s/ha t = 240 min
				Discharge at Overflow	Discharge at Overflow	Discharge at Overflow	Discharge at Overflow
-	l/s	l/s	l/s	l/s	l/s	l/s	l/s
CD_Serbanesti	30	195	225	732	948	1,141	1,445
CD_Izvoare	514	3,442	3,957	2,747	3,864	4,489	5,461
CD_Stormwater_Tank	2	58	60	4,109	4,179	4,379	4,588
CD_Industry	180	211	391	3,103	3,289	3,452	3,829
CD_Ciprian_Porembescu	5	45	50	20	26	31	37
CD_Rozelor	2	81	83	70	85	103	131
CD_Magura	8	17	25	115	125	125	129
CD_Arcade	20	86	106	41	57	67	81
CD_Gheraiesti	1	27	28	17	38	41	51
CD_Triumfului	1	44	63	79	97	116	137
CD_Muncii	1	26	27	86	101	115	133

Table 1-57: Agglomeration Bacau Assesment of Overflow Discharges before implementation

AGGLOMERATION BACAU - ASSESSMENT OF OVERFLOW DISCHARGES - AFTER IMPLEMENTATION							
Overflow	Q_{ww}	Max. admissible Q_{Rain}	Max. Capacity Q_{ww} + Q_{Rain}	f = 1/1 years i = 195 l/s/ha t = 240 min	f = 1/2 years i = 230 l/s/ha t = 240 min	f = 1/3 years i = 255 l/s/ha t = 240 min	f = 1/5 years i = 265 l/s/ha t = 240 min
				Discharge at Overflow	Discharge at Overflow	Discharge at Overflow	Discharge at Overflow
-	l/s	l/s	l/s	l/s	l/s	l/s	l/s
CD_Serbanesti	50	176	225	598	802	953	1,188
CD_Izvoare	603	3,353	3,957	2,773	3,841	4,510	5,476
CD_Stormwater_Tank	2	58	60	4,043	4,200	4,327	4,548
CD_Industry	212	178	391	3,079	3,306	3,557	3,699
CD_Ciprian_Porembescu	19	31	50	18	21	26	32
CD_Rozelor	2	81	83	68	83	104	130
CD_Magura	12	13	25	115	125	126	128
CD_Arcade	20	86	106	41	57	68	81
CD_Gheraiesti	1	27	28	10	19	36	44
CD_Triumfului	1	62	63	79	97	116	137
CD_Muncii	2	25	27	86	100	113	129

Table 1-58: Agglomeration Bacau Assesment of Overflow Discharges after implementation

Increase of discharge After / Before Project	f = 1/1 years i = 195 l/s/ha t = 240 min	f = 1/2 years i = 230 l/s/ha t = 240 min	f = 1/3 years i = 255 l/s/ha t = 240 min	f = 1/5 years i = 265 l/s/ha t = 240 min
CD_Serbanesti	-18%	-15%	-16%	-18%
CD_Izvoare	1%	-1%	0%	0%
CD_Stormwater_Tank	-2%	0%	-1%	-1%
CD_Industry	-1%	1%	3%	-3%
CD_Ciprian_Porembescu	-10%	-16%	-16%	-13%
CD_Rozelor	-3%	-3%	1%	-1%
CD_Magura	0%	0%	1%	-1%
CD_Arcade	0%	0%	0%	0%
CD_Gheraiesti	-42%	-49%	-13%	-14%
CD_Triumfului	0%	0%	0%	0%
CD_Muncii	0%	-2%	-2%	-3%

Table 1-59: Agglomeration Bacau Increase of discharge After / Before Project

The increase of overflow discharge After / Before project with less than 10 % is insignificant. Furthermore no jump in spill-over frequency (i.e. decrease of frequency from 1/2 to 1/1 years) can be observed.

1.13.2 Agglomeration Comanesti-Moinesti

Hydraulic flows		
	Current situation	**After project completion (Design Values)**
Average dry weather incl. infiltration [m³/d]	5,517	7,470
Maximum dry weather (in case of seasonal peaks) [m³/h]	No data	474
Maximum admissible flow (rain **weather)** [m³/h]	No data	823

Table 1-60: WW Hydraulic Flows – Agglomeration Comanesti-Moinesti

Pollution loads (kg/d))		
	Current situation	**After project completion (Design Values)**
BOD5	1,340	1,531
Including from Industries	*No data*	*180*
COD	899	3,061
Including from Industries	*No data*	*361*
MS	373	1,786
Including from Industries	*No data*	*210*
Nt	92	281
Including from Industries	*No data*	*33*
P	No data	105
Including from Industries	*No data*	*60*

Table 1-61: WW Pollution Loads WWTP Moinesti North

Due to pollution loads, the WWTP Moinesti North has a size of 25,500 p.e. based on a BOD_5 of 60 g/p.e./d. Consequently the following effluent standards apply, which were used for the design of the plant.

Parameter	**Plant Size**	**Effluent Concentration**	**Minimum percentage of reduction**
	p.e.	**mg/l**	**%**
BOD_5	--	25	
COD	--	125	
SS	> 10,000	35	90
P	10,000 – 100,000	2	80
Total N [1]	10,000 – 100,000	15	70 - 80

[1] Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH4-N), nitrate (NO3-N)-nitrogen and nitrite (NO2)-nitrogen

Table 1-62: Effluent Standards – WWTP Moinesti North

Pollution loads (kg/d))		
	Current situation	**After project completion (Design Values)**
BOD5	No data	373
Including from Industries	*No data*	*49*
COD	No data	745
Including from Industries	*No data*	*97*
MS	No data	435
Including from Industries	*No data*	*57*
Nt	No data	68
Including from Industries	*No data*	*9*
P	No data	27
Including from Industries	*No data*	*16*

Table 1-63: WW Pollution Loads WWTP Moinesti South

Due to pollution loads, the WWTP Moinesti South has a size of 6,200 p.e. based on a BOD_5 of 60 g/p.e./d. Consequently the following effluent standards apply, which were used for the design of the plant.

Parameter	Plant Size	Effluent Concentration	Minimum percentage of reduction
	p.e.	mg/l	%
BOD_5	--	25	
COD	--	125	
SS	> 10,000	35	90
P	10,000 – 100,000	2	80
Total N [1]	10,000 – 100,000	15	70 - 80

[1] Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH4-N), nitrate (NO3-N)-nitrogen and nitrite (NO2)-nitrogen

Table 1-64: Effluent Standards – WWTP Moinesti South

Treatment of residues		
	Daily volume (m³)	***Polluting load (kg BOD/d)***
Grease	0.5	Grease from aerated grit and grease chamber will be pumped into gravity sludge thickeners of containers. No additional pollution load for the treatment process.
Sand	0.3	The pollution load coming from sand, separated in the grit chamber is insignificant and has no effect on the WWTP's
Residues from sewer cleaning	0.61	The load is insignificant and included in Design Load
Sludge collected from septic tanks expected to be treated in the WWTP	8.77	64

Table 1-65: WWTP Residues – Agglomeration Moinesti

Discharges from combined system	
	Current situation
Average frequency of the discharges (/ year)	
Corresponding maximum concentration (mg/l): ▪ BOD5 ▪ COD ▪ MS	No Data

Table 1-66: Existing Discharge from Combined System – Agglomeration Comanesti-Moinesti

Rehabilitation of sewage	Average 2010-2015	2010	2011	2012	2013	2014	2015
Daily infiltration avoided (m^3/d)	110	18	49	87	134	180	193
Corresponding efficiency ratio (€/m^3/d)	9	0	0	8	12	16	17
Savings generated in OPEX (€/year)	3,240	47	131	2,759	4,291	5,870	6,344
Technology envisaged	Open trenches	Open trenches	Open trenches	Open trenches	Open trenches	Open trenches	Open trenches

Table 1-67: Rehabilitation of sewage – Agglomeration Comanesti-Moinesti

1.13.3 Agglomeration Buhusi

Hydraulic flows		
	Current situation	**After project completion (Design Values)**
Average dry weather incl. infiltration [m^3/d]	No data	7,238
Maximum dry weather (in case of seasonal peaks) [m^3/h]	No data	464
Maximum admissible flow (rain **weather)** [m^3/h]	No data	828

Table 1-68: WW Hydraulic Flows – Agglomeration Buhusi

Pollution loads (kg/d))		
	Current situation	**After project completion (Design Values)**
BOD5	No data	2,089
Including from Industries	*No data*	*378*
COD	No data	4,179
Including from Industries	*No data*	*755*
MS	No data	2,438
Including from Industries	*No data*	*441*
Nt	No data	383
Including from Industries	*No data*	*69*
P	No data	70
Including from Industries	*No data*	*13*

Table 1-69: WW Pollution Loads – Agglomeration Buhusi

Due to pollution loads, the WWTP Buhusi has a size of 34,800 p.e. based on a BOD_5 of 60 g/p.e./d. Consequently the following effluent standards apply, which were used for the design of the plant.

Parameter	Plant Size	Effluent Concentration	Minimum percentage of reduction
	p.e.	mg/l	%
BOD_5	--	25	
COD	--	125	
SS	> 10,000	35	90
P	10,000 – 100,000	2	80
Total N (1)	10,000 – 100,000	15	70 - 80

(1) Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH4-N), nitrate (NO3-N)-nitrogen and nitrite (NO2)-nitrogen

Table 1-70: Effluent Standards – Agglomeration Buhusi

Treatment of residues		
	Daily volume (m^3)	***Polluting load (kg BOD/d)***
Grease	0.39	Grease from aerated grit and grease chamber will be pumped into gravity sludge thickeners of containers. No additional pollution load for the treatment process.
Sand	0.3	The pollution load coming from sand, separated in the grit chamber is insignificant and has no effect on the WWTP
Residues from sewer cleaning	0.67	The load is insignificant and included in Design Load
Sludge collected from septic tanks expected to be treated in the WWTP	9.54	70

Table 1-71: WWTP Residues – Agglomeration Buhusi

Discharges from combined system	
	Current situation
Average frequency of the discharges (/ year)	
Corresponding maximum concentration (mg/l): ▪ BOD5 ▪ COD ▪ MS	No Data

Table 1-72: Existing Discharge from Combined System – Agglomeration Buhusi

The wastewater network network of Buhusi is a combined system.

For the modeling time-variant, synthetic model rainfalls (Euler II) based on peak rainfall statistics acc. to STAS 9470/73 were developed.

Buhusi is located in rainfall zone No. 2. The relevant rainfall duration (average concentration time on subcatchments + max. flow time in sewer system) was determined to be 120 minutes. In accordance with the importance class of Buhusi agglomeration the threshold rain for the assessment of local floodings was selected as follows:

Return frequency:	1/2 - 1/3	years
Rainfall intensity:	230 - 255	l/s/ha
Rainfall duration:	120	min

The simplified network model included the following components:

Before Project:

Combined System:

Total Catchment Area:	187	ha
Impervious Area:	48	ha
% Impervious Area:	26	%

Separate System:

Total Catchment Area:	0	ha
Total Before Project	187	ha

After Project:

Combined System:

Total Catchment Area:	187	ha
Impervious Area:	48	ha
% Impervious Area:	26	%

Separate System:

Total Catchment Area:	575	ha
Total After Project	762	ha

The future sewer network will include 1 combined sewer overflow 400 – 500 m upstream of the WWTP.

The results of the modeling are presented in the following tables for the before project / after project situation.

AGGLOMERATION BUHUSI - ASSESSMENT OF OVERFLOW DISCHARGES - BEFORE IMPLEMENTATION							
Overflow	Q_{WW}	Max. admissible Q_{Rain}	Max. Capacity $Q_{WW} + Q_{Rain}$	f = 1/1 years i = 195 l/s/ha t = 120 min	f = 1/2 years i = 230 l/s/ha t = 120 min	f = 1/3 years i = 255 l/s/ha t = 120 min	f = 1/5 years i = 265 l/s/ha t = 120 min
				Discharge at Overflow	Discharge at Overflow	Discharge at Overflow	Discharge at Overflow
-	l/s	l/s	l/s	l/s	l/s	l/s	l/s
CD1	24	4,376	4,400	1,358	1,565	1,738	1,923

Table 1-73: Agglomeration Buhusi Assesment of Overflow Discharges before implementation

AGGLOMERATION BUHUSI - ASSESSMENT OF OVERFLOW DISCHARGES - AFTER IMPLEMENTATION							
Overflow	Q_{WW}	Max. admissible Q_{Rain}	Max. Capacity $Q_{WW} + Q_{Rain}$	f = 1/1 years i = 195 l/s/ha t = 120 min	f = 1/2 years i = 230 l/s/ha t = 120 min	f = 1/3 years i = 255 l/s/ha t = 120 min	f = 1/5 years i = 265 l/s/ha t = 120 min
				Discharge at Overflow	Discharge at Overflow	Discharge at Overflow	Discharge at Overflow
-	l/s	l/s	l/s	l/s	l/s	l/s	l/s
CD1	54	4,346	4,400	1,552	1,690	1,738	1,779

Table 1-74: Agglomeration Buhusi Assesment of Overflow Discharges after implementation

Increase of discharge After / Before				14%	8%	0%	-8%

Table 1-75: Agglomeration Buhusi Increase of discharge After / Before Project

The increase of overflow discharge After / Before project with less than 10 % is insignificant. Furthermore no jump in spill-over frequency (i.e. decrease of frequency from 1/2 to 1/1 years) can be observed.

1.13.4 Agglomeration Darmanesti

Hydraulic flows		
	Current situation	**After project completion (Design Values)**
Average dry weather incl. infiltration [m³/d]	No data	4,410
Maximum dry weather (in case of seasonal peaks) [m³/h]	No data	266
Maximum admissible flow (rain **weather)** [m³/h]	No data	471

Table 1-76: WW Hydraulic Flows – Agglomeration Darmanesti

Pollution loads (kg/d))		
	Current situation	**After project completion (Design Values)**
BOD5	No data	1,292
Including from Industries	*No data*	*430*
COD	No data	2,584
Including from Industries	*No data*	*859*
MS	No data	1,507
Including from Industries	*No data*	*501*
Nt	No data	237
Including from Industries	*No data*	*79*
P	No data	43
Including from Industries	*No data*	*9*

Table 1-77: WW Pollution Loads – Agglomeration Darmanesti

Due to pollution loads, the WWTP Darmanesti has a size of 21,500 p.e. based on a BOD_5 of 60 g/p.e./d. Consequently the following effluent standards apply, which were used for the design of the plant.

Parameter	Plant Size	Effluent Concentration	Minimum percentage of reduction
	p.e.	**mg/l**	**%**
BOD_5	--	25	
COD	--	125	
SS	> 10,000	35	90
P	10,000 – 100,000	2	80
Total N [(1)]	10,000 – 100,000	15	70 - 80

[(1)] Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH4-N), nitrate (NO3-N)-nitrogen and nitrite (NO2)-nitrogen

Table 1-78: Effluent Standards – Agglomeration Darmanesti

Treatment of residues		
	Daily volume (m³)	***Polluting load (kg BOD/d)***
Grease	0.24	Grease from aerated grit and grease chamber will be pumped into gravity sludge thickeners of containers. No additional pollution load for the treatment process.
Sand	0.2	The pollution load coming from sand, separated in the grit chamber is insignificant and has no effect on the WWTP..
Residues from sewer cleaning	0.41	The load is insignificant and included in Design Load
Sludge collected from septic tanks expected to be treated in the WWTP	5.9	43

Table 1-79: WWTP Residues – Agglomeration Darmanesti

Discharges from combined system	
	Current situation
Average frequency of the discharges (/ year)	
Corresponding maximum concentration (mg/l): ▪ BOD5 ▪ COD ▪ MS	No Data

Table 1-80: Existing Discharge from Combined System – Agglomeration Darmanesti

1.13.5 Agglomeration Targu Ocna

Hydraulic flows		
	Current situation	**After project completion (Design Values)**
Average dry weather incl. infiltration [m³/d]	1,183	3,304
Maximum dry weather (in case of seasonal peaks) [m³/h]	No data	220
Maximum admissible flow (rain **weather)** [m³/h]	No data	395

Table 1-81: WW Hydraulic Flows – Agglomeration Targu Ocna

Pollution loads (kg/d))		
	Current situation	**After project completion (Design Values)**
BOD5	611	956
Including from Industries	*No data*	*98*
COD	384	1,911
Including from Industries	*No data*	*197*
MS	528	1,115
Including from Industries	*No data*	115
Nt	75	175
Including from Industries	*No data*	*18*
P	No data	32
Including from Industries	*No data*	*3*

Table 1-82: WW Pollution Loads – Agglomeration Targu Ocna

Due to pollution loads, the WWTP Targu Ocna has a size of 16,000 p.e. based on a BOD_5 of 60 g/p.e./d. Consequently the following effluent standards apply, which were used for the design of the plant.

Parameter	Plant Size	Effluent Concentration	Minimum percentage of reduction
	p.e.	mg/l	%
BOD_5	--	25	
COD	--	125	
SS	> 10,000	35	90
P	10,000 – 100,000	2	80
Total N [1]	10,000 – 100,000	15	70 - 80

[1] Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH4-N), nitrate (NO3-N)-nitrogen and nitrite (NO2)-nitrogen

Table 1-83: Effluent Standards – Agglomeration Targu Ocna

Treatment of residues		
	Daily volume (m³)	***Polluting load (kg BOD/d)***
Grease	0.18	Grease from aerated grit and grease chamber will be pumped into gravity sludge thickeners of containers. No additional pollution load for the treatment process.
Sand	0.1	The pollution load coming from sand, separated in the grit chamber is insignificant and has no effect on the WWTP..
Residues from sewer cleaning	0.31	The load is insignificant and included in Design Load
Sludge collected from septic tanks expected to be treated in the WWTP	4.36	32

125

Table 1-84: WWTP Residues – Agglomeration Targu Ocna

Discharges from combined system	
	Current situation
Average frequency of the discharges (/ year)	
Corresponding maximum concentration (mg/l): ▪ BOD5 ▪ COD ▪ MS	No Data

Table 1-85: Existing Discharge from Combined System – Agglomeration Targu Ocna

CHAPTER 2

REFERENCE TO TECHNICAL ASSISTANCE

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2 REFERENCE TO TECHNICAL ASSISTANCE

2.1 General Framework

This report represents the second stage of the Technical Assistance for project preparation in the drinking water and wastewater sectors, ISPA Measure No.: 2005 RO 16 P PA 001-02, which comprises:

1. Preparation of Master Plan for water and wastewater sectors in five counties;
2. Preparation of Technical Feasibility Studies, Cost Benefit Analyses, EIA, Institutional Analyses and EU application for co-financing in the counties assigned;
3. Tendering for Works and Services;

At a previous stage of this TA, the Master Plan at county level, time horizon 2007- 2037, for water supply and wastewater components, was completed and approved by the Romanian Authorities concerned. Consequently, a List of Prioritised Investments Measures has been prepared and approved, based on findings of Master Plan and Sectoral Operational Programme (SOP) Environment.

The SOP has been approved (EU) and accounts in its content for the provisions agreed between Romania and EU for Chapter 22 – Environment. The SOP represents the basis for the selection of projects to be supported under this Technical Assistance measure.

One of the specific objectives which is subject to this project is the improvement of quality and access to the water and wastewater by providing water and wastewater services in the majority of urban areas by 2015 and set efficient regional structure for water/wastewater service management.

TA has coordinate this project with the other ongoing projects such as: SAMTID, ISPA, MUDP as well as the FOPIP II programme dedicated to institutional strengthening, which is developed in parallel with this project.

During this Feasibility Study development the Consultant collaborates with the following programmes:

- PHARE 2005/017/553.04.03/08.01/EUROPEAID/123067/D/SER/RO– Extension of existing integrated waste management system
- Institutional strengthening FOPIP II

Technical Assistance (TA) will assist the implementation and monitoring of the programme. The **consortium ILF Consulting Engineers / Hydro-Ingenieure / ILF Consulting Engineers SRL Romania** was contracted to provide Technical Assistance for Project Preparation in the Wastewater and Drinking Water Sector, Romania. The TA will support the Final Beneficiaries to:

- ensure compliance with national and EU legislation within the agreed transition period;
- ensure the optimal utilization of the EU funds;
- develop local capacities for future project development;
- define a long-term phased investment programme.

The specific objectives of this Technical Assistance measure are:

- to prepare the regional projects to the point where they can be proposed for EU co-financing
- to ensure an efficient public procurement and implementation plan
- to prepare the tender documents in a way allowing project implementation
- to provide on-the-job-training for the future final beneficiaries staff
- to provide assistance in setting up the Project Implementation Units (PIUs)

2.2 Stakeholders

The following key stakeholders and beneficiaries are involved in the project:

The **CFCU** is the Contracting Authority for this ISPA Measure in the environmental sector, responsible for the overall financial and administrative management

The **Ministry of Environment and Forests (MEF, former MESD/MoE)** is the beneficiary of this ISPA Measure; it is also responsible for the programming of EU co-financed measures, as well as for the coordination of project preparation under this TA

The **Ministry of Economic and Public Finance (MEPF)** is the National ISPA Co-ordinator and monitors the implementation of the ISPA Programme and now, after Romania's accession to the EU, it shall also act as Cohesion Funds coordinator

The **Ministry of Interior and Administrative Reform (MIAR)** is responsible for the overall monitoring of the municipal services in Romania and for the development of strategies and policies to improve the quality of these services.

The **National Regulatory Authority for Public Municipal Services (ANRSC)** is responsible for setting up the legislation and the national policy for the public utilities in Romania. It is the regulatory body which approves prices and tariffs for water supply and sewerage utilities in line with the Government Decision No. 32/2002.

The **Local Environmental Protection Agencies** (of each county) are responsible for environmental monitoring activities. They are entitled to issue the environmental permits and they are responsible for the identification and selection of priority projects and planning works in the field of environmental protection.

Intermediate Bodies are public bodies designated by the MESD for SOP Environment which, by delegation from the Managing Authority, implement operations within the SOP Environment; Environmental Protection Agencies. The IBs play an important role in specific project programming and appraisal activities.

The **National Administration Apele Romane "Romanian Waters"** is responsible for the implementation of the water management policy.

The **EC DG REGIO** is the General Directorate within the European Commission which controls compliance of the implementation process with the provisions of the Financing Memorandum.

The **EIB, EBRD, KfW and other IFIs** are co-financers of approved ISPA measures; they might furthermore secure a co-financing of measures supported by the European Union through Cohesion Funds.

The **Local Councils** are responsible for administering the public domain of the urban agglomerations including their water and wastewater infrastructure.

The **AoM/IDA Association of Municipalities and County Administrations**, so-called Inter-community Development Associations are beneficiaries that represent the public competence related to the management of the water and wastewater services, which was transferred to the AoM/IDA by the local councils. The AoM/IDA delegates the management of these services to ROCs and controls their performance.

The **ROCs, the Regional (Water Utility) Operation Companies**, are beneficiaries responsible for the development, construction and operation of drinking water supply, wastewater collection and water treatment facilities.

2.3 Project Objectives

The overall objective of the project is to improve the infrastructure in the water and wastewater sectors of Bacau County, not only for the benefit of inhabitants and a better environment but also to meet the obligations regarding the environmental aquis within the transition periods agreed between Romania and UE.

The specific objectives of the project are:

- improvement of drinking water quality in order to meet EU standards (98/83/EC);
- increasing the accessibility to water and sewerage services;
- increasing the connection rate to wastewater treatment plants in order to meet the Urban Waste Water Treatment Directive (91/271/CEE);
- ensuring an efficient use of EU funding.

The new investments will have an essential contribution in the pursuit of the following objectives of Article 174 of EC Treaty

- preserving, protecting and improving the quality of the environment;
- protecting human health;
- prudent and rational utilization of natural resources;
- promoting measures at international level to deal with regional or worldwide environmental.

The compliance with the Art.17 of the Directive was achieved by developing the Implementation Programme required for the implementation and enforcement of the directive. The Implementation Programme includes investment costs for each agglomeration, separately for WWTP and sewage networks and is developed taking into consideration the treatment objectives and deadlines.

According to the Priority Investment List, in Bacau County, 7 urban agglomerations have stringent requirements and were selected for investments, 6 of them decided to participate in the CF Funding program. The proposed investments are intended to improve the situation of the selected agglomerations, both in water and wastewater sectors in order to comply with the environmental aquis.

The investments are focused on the following components:

Water Supply: Rehabilitation and extension of water main pipes, rehabilitation of a drinking water treatment plant, re-endowment, rehabilitation of storage facilities, rehabilitation and extension of water distribution networks, including metering.

The investment strategy for water sector in the selected water supply zones is based on the following criteria:

- Extension of the systems up to 90% connection rate
- Extension or new pipes for water distribution network shall be integrated and will follow the extension and/or construction of sewage network
- Applying modern standards, function and reliability to facilities
- Reducing energy consumption by promoting effective and efficient equipment
- Increasing the quality of services in both sectors

Wastewater: rehabilitation and extension of sewage networks, rehabilitation of wastewater pumping station, rehabilitation and construction of wastewater treatment plants.

At the completion of this project the following targets will be achieved:

- The accessibility of public services to the population will reach a connection rate of 90%, in both sectors, to meet full compliance until 2015
- The extension and construction of wastewater treatment plant, including tertiary treatment, to a coverage rate of 100% for all urban area, due term 2015
- Compliance with the Directive 98/83/EC on drinking water quality, due term 2015
- Compliance with the Directive 91/271/CEE

The new infrastructure will clearly demand greater technical capabilities to efficiently operate the system. Only experienced water companies may provide the assurance that investments will be properly managed by using best management practices for water and wastewater sector and guarantee their future operation. Under these circumstances Romania has ensured the legislative framework required for EU funds accession, so that all these allocated funds will be expended for their intended purpose.

In Bacau County the Regional Operating Company which is CRAB SA - Compania Regionala de Apa Bacau SA shall be responsible for the implementation of these major investment projects and also to operate the facilities financed by CF funds.

The legislative operational framework is ensured by the following laws:

- Water Supply and Sewerage Service Law No. 241/2006, amended and completed by EGO 13/2008
- Local Public Administration Law No. 215/2001, republished
- Public Utility Community Services Law No. 51/2006, amended and completed by EGO 13/2008

Taking into consideration the negative effects of wastewater on environment from different classes of agglomeration, the Feasibility Study is carried out on an integrated, unitary and co-ordinated approach, in the condition of a prudential and rational use of water resources. The direct environmental effects are more significant on the short term considering these large urban agglomerations, where important quantities of wastewater are concentrated.

In the context of long term operation, the design of sustainable water/wastewater systems along with a proper maintenance in the future, will significant enhance and maintain the environment quality.

Surface and groundwater shall be considered together, in both qualitative and quantitative terms. The main objective is to achieve "good surface water status" and "good groundwater status", and also to prevent deterioration in the quality of those waters, which are already "good".

The ecological quality is a key means by which, surface waters in particular, will be assessed against "good status" as well as the more traditional assessment of chemical quality. In addition, a sludge management strategy shall be available.

At the completion of this project the following environment objectives will be achieved:

- Improvement of supply security by replacing the structurally defective system elements
- Increasing surface water quality by minimizing the effects of human settlements
- Mitigation of health risk associated with surface and groundwater pollution due to the on-plot waste disposal facilities and discharge of insufficiently or untreated wastewater
- Reducing the risk of wastewater flooding
- Reducing the pollution of Trotus, Tazlau and Siret Rivers from poorly treated wastewater effluent and regeneration of the river's natural environment

Scope of Services

The Scope of Services can be summarized for each of the 3 project phases as follows:

- Phase Ia – Pre-feasibility Phase: Development of a Masterplan for Water and Wastewater Sector covering the complete county
- Phase Ib – Feasibility Phase: Development of the Application for CF funding covering the defined priority measures including development of supporting documents like Feasibility Study, CBA and EIA
- Phase II – Tendering Phase: Development of the Tender Documents covering the defined priority I measures (work tenders) and priority measures (service tenders)

The Work program for the feasibility phase covers the Feasibility Study of priority projects to be included in the Application, Institutional- Financial- and Economic Analyses, EIA, Procurement Strategy, Preparation of the Application and support during appraisal.

General Goal and Approach for Developing the FS

The Feasibility Study shall assist the local beneficiaries of CF funds in bringing the CF applications to the point were they can be proposed for EU co-financing. It will be a vital part of CF applications for the priority agglomerations.

The presented Bacau County Feasibility Study (FS) covers those parts of the measures of the Phase 1 of the Long Term Investment Plan for the County of Bacau as defined in the county Master Plan, that were defined for CF funding. This phase lasts from the present until the year 2015.

The proposed measures aim at maximising environmental benefits and at improving the water and wastewater services standard. Specific improvements are envisaged as regards the:

- Public image of water services and hence the willingness to pay
- Security of service through renewal of worn-out mechanical and electrical equipment
- Operator and public safety
- Plant efficiency

The FS developed the measures proposed in the Master Plan further, goes into a more detailed option analysis and design and concludes with a refined cost calculation as well as a refined cost benefit analysis. It thereby proofs cost efficiency of measures as demanded by the European Union.

The data already gathered for the Master Plan has been revisited and replenished with relevant data for the target areas in order to enable the development of a preliminary design for the proposed measures.

2.4 Other relevant programmes

2.4.1 General

ISPA Measure 2005 RO P PA 001- Technical Assistance for Project Preparation in the Environmental Sector in Romania

- Contract 6: Institutional strengthening of future EU financed projects beneficiaries

With regard to the Contract 6 the component is named from FOPIP II. The estimated implementation period envisaged for this contract is May 2007 – May 2010.

The overall aim of this measure is to develop efficient, financially viable and efficient utility companies to increase sustainability of ISPA co-funded assets and ensure improvement in the quality and cost-effectiveness of the services delivered to the population served by such assets.

Two main components are supported under this measure as follows:

1. Financial and Operational Performance Improvement Programme
2. Financial and institutional pre-screening future ISPA beneficiaries

The TA is running parallel to Component 2: Technical assistance for project preparation in the drinking water sector and waste water sector (5 projects – Iasi County, Neamt County, Bacau County, Buzau County, Prahova County). The presented Feasibility Study is part of this component.

Small and Medium Town Infrastructure Development Program (SAMTID)

Small and Medium Town Infrastructure Development Program (SAMTID) is being developed by the Romanian Authorities, through the Ministry of Administration and Interiors with the aim to support the smaller towns to improve the water and waste water services standards while promoting the application of cost recovery principle. These towns are also encouraged to seek ways to gain the benefits of scale of the larger

operators able to provide better services at an affordable level of tariffs, which ensures full cost recovery and loan reimbursement for water related investments.

Municipal Utilities Development Program (MUDP)

The Municipal Utilities Development Programme (MUDP) I and II, co-financed by the Romanian Government, the European Union under the PHARE programme and the European Bank for Reconstruction and Development (EBRD), supported 16 utility companies providing water/waste water services. Beside the investment component, this programme included significant support for institutional strengthening and restructuring of beneficiary utility companies. The approach pioneered under MUDP as regards the financial and operational performance improvement programme (FOPIP) was also to introduce the concept of benchmarking in order to compare the performance of different utility companies in the same sector. Virtually all of the utility companies which have taken part to MUDP I and II are now in receipt of an ISPA grant or are included in the future ISPA project pipeline. Some of the above mentioned beneficiaries have benefited by MUDP Programme and ISPA grant respectively: Iasi (operator APAVITAL - former RAJAC) – MUDP I and Bacau (operator RAGC) – MUDP II, but only at the municipality level.

2.4.2 Existing technical projects per agglomeration

Regarding water supply and wastewater, important projects in the urban communes and implementation works in many rural communes have been carried out, financed through national and international funds. In order to avoid double financing the existing projects as presented in the following tables are taken into account while designing the measures.

Commune	Water supply		
	Description	**Project**	**Costs**
Bacau Munici- pality	ISPA – Project Bacau Drinking Water and Wastewater Collection and Treatment Improvements located in the County of Bacau in Romania The project includes : New WTP Barati and separate main pipe (61,9 km) from Lake Poiana Uzului including Hydropower station in Stejaru, capacity approx. 650 l/s Rehabilitation of sewerage network and WWTP TA and Supervision during Implementation	ID: No 2002 RO 16 P PE 018 Under Construction	52,056,000 Euro

Table 2-1: Existing projects in Bacau City

Commune	Water supply		
	Description	**Project**	**Costs**
Hemeius	Water supply project for Fantanele, Hemeius and Lilieci since 1997 under construction Design made by : SC GENERAL TECTONIC Ltd BACAU The project includes : 4 groundwater wells, low depth total flow : 9l/s RSV of 100m³ in Fantanele RSV of 300 m³ in Hemeius pipes DN 90 and DN 110 material HDPE 80 1,265 m in Fantanele and 3,385 m in Hemeius (from RSVs to wells) Water supply network in Fantanele 6,000 m Water supply network in Hemeius 3,000 m	ID : 101/2001/Ad.C Financed by Romanian Government HG 577/1997 has started in 1997, should have been finished in 2010	6,236,000 lei

Table 2-2: Existing projects in Commune of Hemeius

Commune/ Villages	Water supply		
	Description	**Project**	**Costs**
Barati, Margineni, Trebes, Valea Budului, Poiana, Luncani, Podis	Extension of water supply and wastewater network The project includes : 2 water pumping stations (Trebes and Luncani), 2 Chlorination Stations (Trebes and Luncani),1 Wastewater Pumping Station Modernization of local roads in Barati, Margineni, Luncani, and Trebes Construction of a social centre	ID : C32204081040002 0/ 06.07.2009 FEADR – Measure 322 – National Program for Rural Development and local funds starting by 26/07/2010	7,971,969 lei (excluding VAT)

Table 2-3: Existing projects in the north western localities of Bacau

Commune	Water supply		
	Description	**Project**	**Costs**
Letea Veche	Extension of water supply and wastewater network Company : SOLEL BONEH INTERNATIONAL The project includes : 1 Chlorination Station 1 Reservoir, 700 m^3 1 Pumping Station	ID : C32204081040002 3/ 01.07.2009 FEADR – Measure 322 – National Program for Rural Development has started 2008, shall be finalized on 30/06/2012	11,259,485 lei

Table 2-4: Existing projects in Commune of Letea Veche

There are no ongoing projects in the other agglomerations.

2.5 Structure of Report

2.5.1 General

The Feasibility Study comprises major parts and the respective annexes as outlined below. The present draft versions are submitted to the MOE and ROC for approval. Afterwards final versions will be produced.

Volume I: Feasibility Study Report

Volume II: Annexes Feasibility Study

Volume III: Drawings

Volume IV: Financial and Economic Assessment – Cost Benefit Analysis (CBA)

Volume V: Environmental Impact Assessment (EIA)

2.5.2 Content of Volume I – Feasibility Study Report

Chapter 1 - Summary	Describes the summary of the findings of the FS.
Chapter 2 - Reference to Technical Assistance	Describes the general framework and project objectives and summarizes the relevant programmes.
Chapter 3 - General Data	In this chapter the project area and the relevant natural features are described briefly as background for the FS.
Chapter 4 - Project Background	This chapter summarizes the relevant results of the Master Plan, recapitulates the objectives and targets of the accession treaty and gives a short summary of the socio-economic and institutional framework.
Chapter 5 - Analysis of Current Situation and Projections	Presents the current situations of water resources and demand, projections, current and possible future pollution of water resources as well as an assessment of existing water supply and wastewater infrastructure.
Chapter 6 - Industrial Wastewater Discharge	In this chapter the existing wastewater treatment of industrial dischargers and its technical suitability are summarized. The effluent standard compliance is analysed and an action plan for sustainable development is advised.

Chapter 7 - Sludge Management	For future sludge management a sustainable strategy is developed in co-ordination with other solid waste projects.
Chapter 8 - Design Parameters	The applied design parameters and assumptions for design of measures and network calculation for both water and wastewater are outlined here.
Chapter 9 - Option Analysis	General options for each agglomeration and necessary specific option analyses are presented and justified with financial and economic assessment.
Chapter 10 - Overall Project Presentation	In this chapter the project components are described, the main investment characteristics and justifications are summarised and the investment strategy is outlined.
Chapter 11 - Results of Financial and Economic Analysis	The financial sustainability as well as the economical efficiency is presented and economic benefits are depicted and if necessary a concept for future system administration is outlined.
Chapter 12 - Results of Institutional Analysis	The existing institutional setup of final beneficiaries is reviewed with regard to EU requirements.
Chapter 13 - Results of Environmental Impact Assessment	The likely effects of the proposed measures on the environment are outlined and the authorities comments and concerns about the measures are summarized.
Chapter 14 - Procurement Strategy and Implementation Plan	The most appropriate conditions of contract and the procurement strategy are outlined and its effectiveness in terms of fastness and efficiency is shown.

2.5.3 Content of Volume II: Annexes Feasibility Study

Annex Nr. and Title	Description of Content	Referring Main chapter(s)
Annex 1 - Documents According Romanian Standard	Urban Certificates and other necessary permits.	10
Annex 2 - Base Data	Data on Population, Economic Development etc.	5, 8, 10
Annex 3 - Water Supply System	Water Quality Analyses, Unit Cost Database, Design Standards, Flow Measurements, Calculations and Option Analysis	5, 8, 9, 10
Annex 4 - Wastewater System	Hydrological Investigations, Unit Cost Data Base, Design Standards, Flow Measurements, Calculations and Option Analysis	5, 8, 9, 10
Annex 6 - Detailed Investment Cost Breakdown	Detailed Investment Cost Breakdown (annex 2 of guide) and Selected Indicators for Investment Costs (annex 3 of guide)	10
Annex 8 - Performance Indicators	Indicator table according annex 1 of guide	10
Annex 9 - Industrial Wastewater Discharge	Data from pollutant agents	6
Annex 10 - Sludge Disposal Strategy	Sludge Data	7
Annex 11 – Institutional Analysis	IA Report	12
Annex 12 - Procurement Strategy and Implementation Plan	Procurement and Implementation Tables	14

CHAPTER 3

GENERAL DATA

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3 GENERAL DATA

3.1 Title of Project

The title of the project is:

"Rehabilitation and Extension of Water and Wastewater Infrastructure in Bacau County, Romania"

This project was developed for the priority agglomerations defined in the Master Plan and shall contribute to the first phase of investments:

The agglomerations concerned are as follows:

- BACAU
- ONESTI
- COMANESTI-MOINESTI (only settlements Moinesti, Gazarie in CF project)
- BUHUSHI
- TARGU OCNA
- DARMANESTI

The city Comanesti being part of the agglomeration Comanesti-Moinesti decided not to attend the present CF project during MP. However, Moinesti and Gazarie as settlements within that agglomeration opted to join the IDA and later on signed the contract with the newly established ROC. Consequently Moinesti and Gazarie were included in the CF project.

The City of Onesti decided during elaboration of this Feasibility Study not to join into the CF project; therefore Onesti is not considered in this Feasibility Study.

Bacau	197,013	237,013
Moinesti-Comanesti (only northern part)	23,902	27,717
Buhusi	19,644	25,937
Darmanesti	11,508	18,668
Targu Ocna	12,118	13,756

Table 3-1: Overview of population and population equivalent in 2008

3.2 Project Area

Bacau County is situated in the North-Eastern part of Romania, in the Moldova region, having a surface of 6,621 km². The county population has approx. 722,000 inhabitants and the main administrative units are: 3 municipalities (Bacau, Onesti, Moinesti), 5

cities/towns (Buhushi, Slanic Moldova, Targu Ocna, Darmanesti and Comanesti) and 85 communes. The capital of the county is Bacau city, with 197,013 inhabitants.

The following figure shows a map of the county including a map indicating the location of the county in Romania and the locations of the 6 priority agglomerations. The figures afterwards include borders of agglomerations and clusters, main roads, rivers, settlement areas and locations of WWTP's.

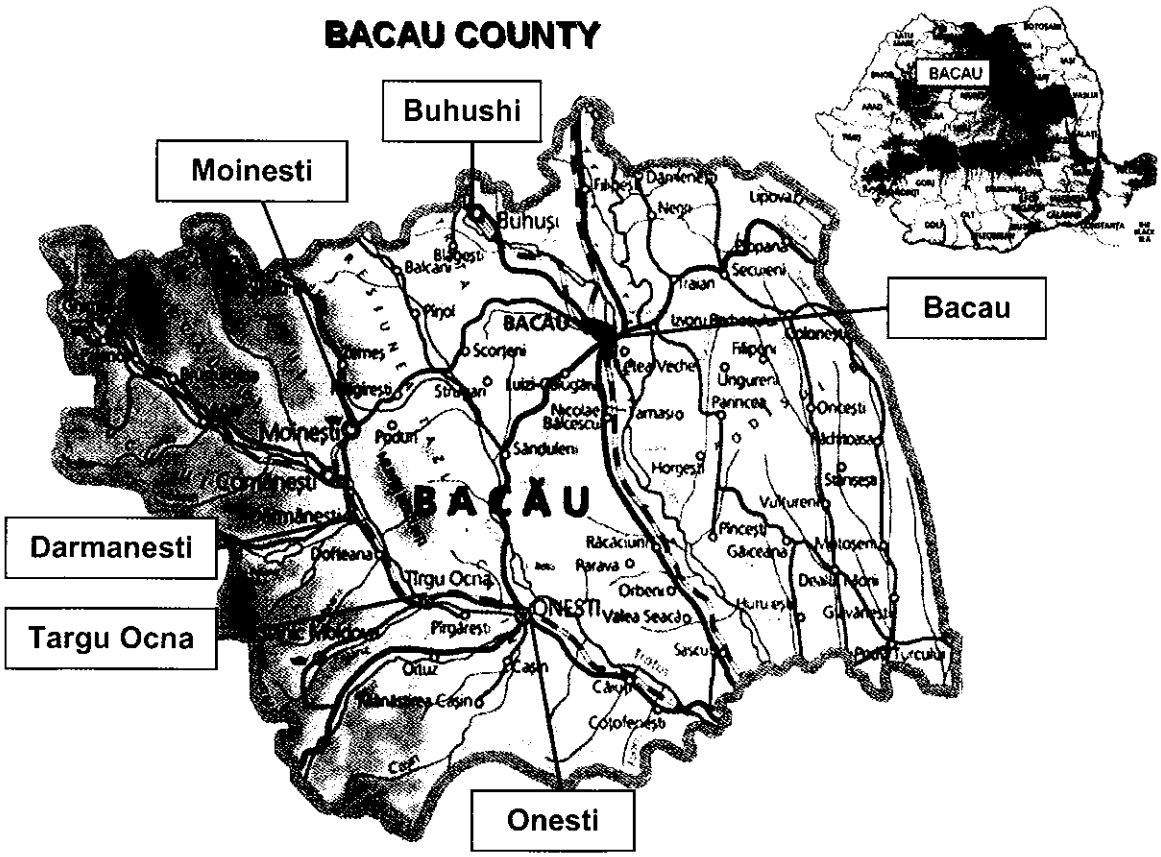

Figure 3-1: Location of PA in Bacau County

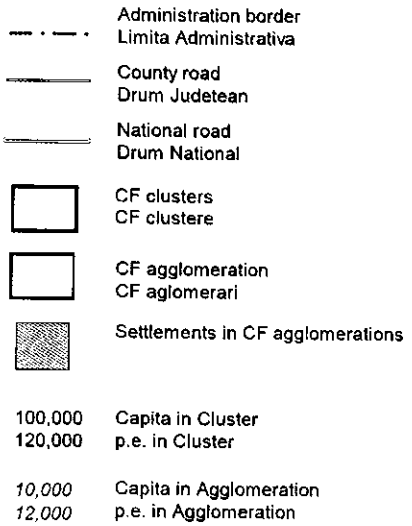

Figure 3-2: Legend to Figures 3-3 till 3-7

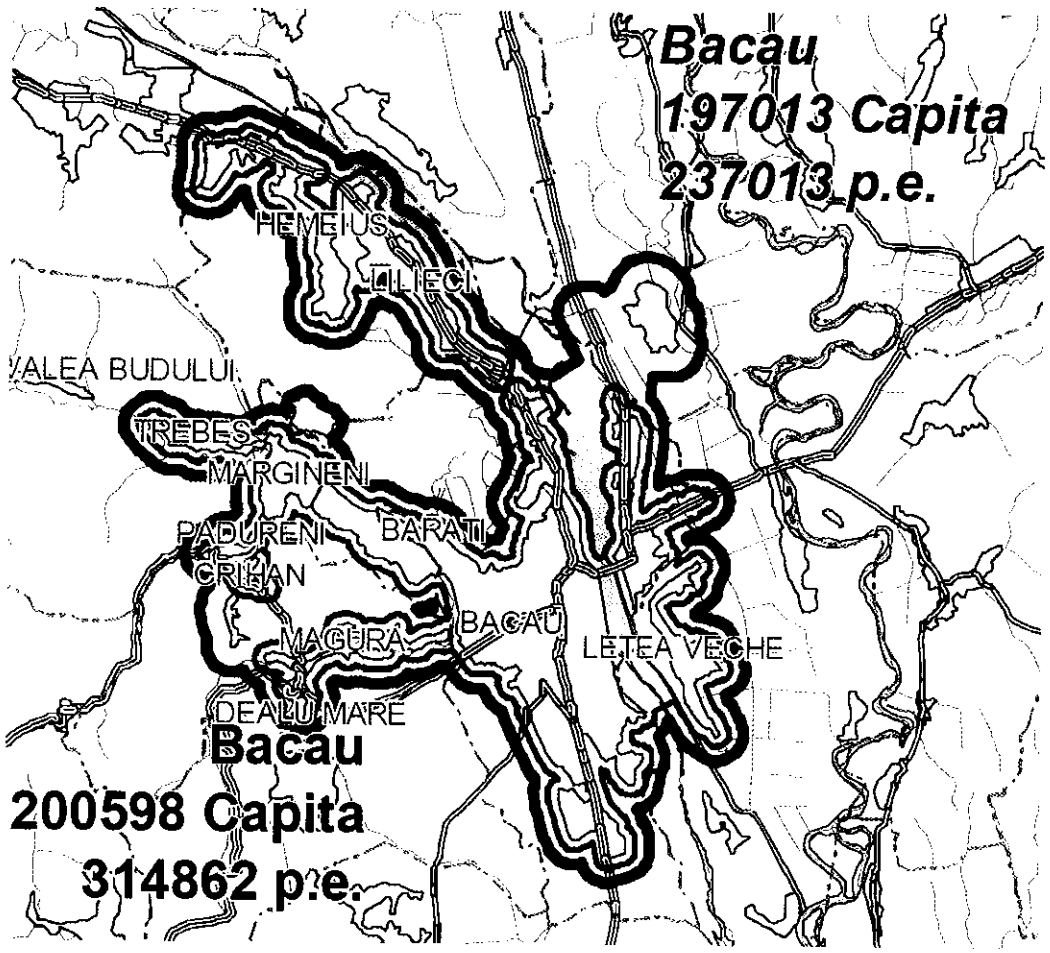

Figure 3-3: Overview of Bacau Agglomeration

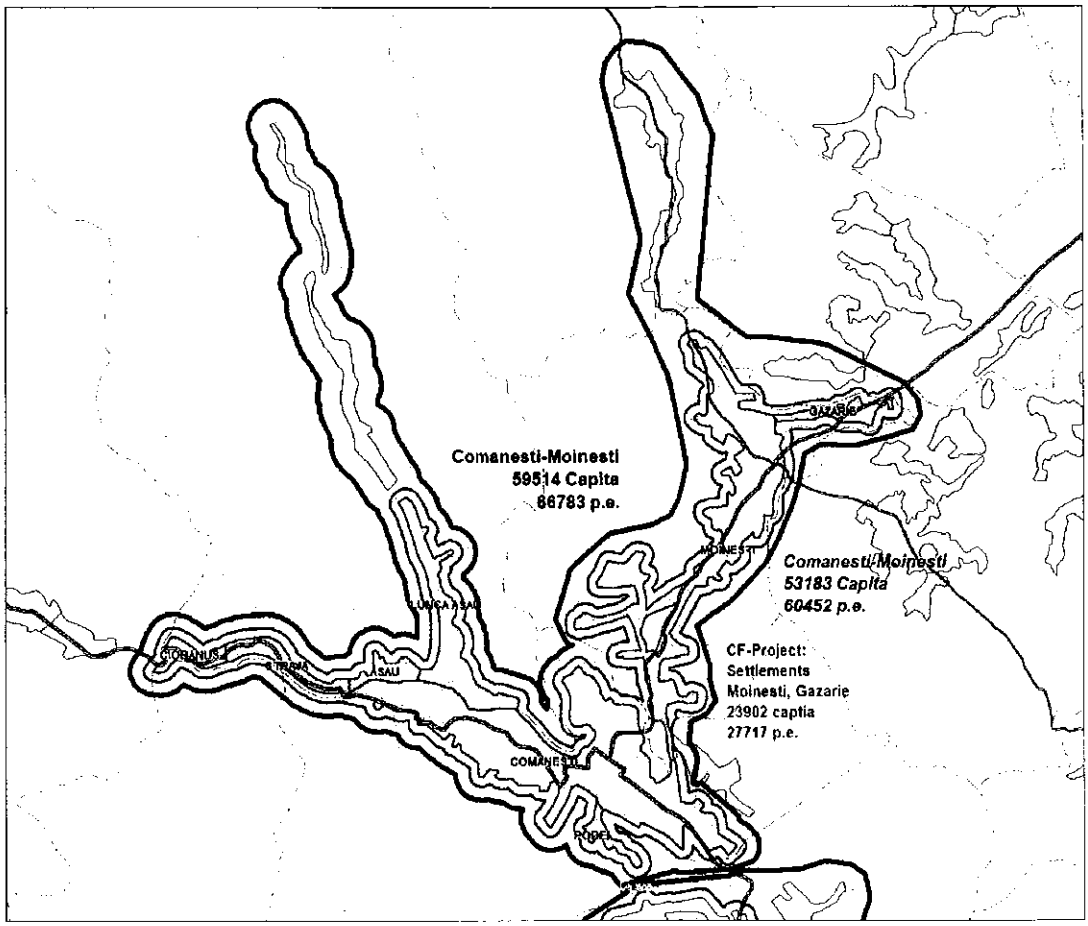

Figure 3-4: Overview of Comanesti-Moinesti Agglomeration

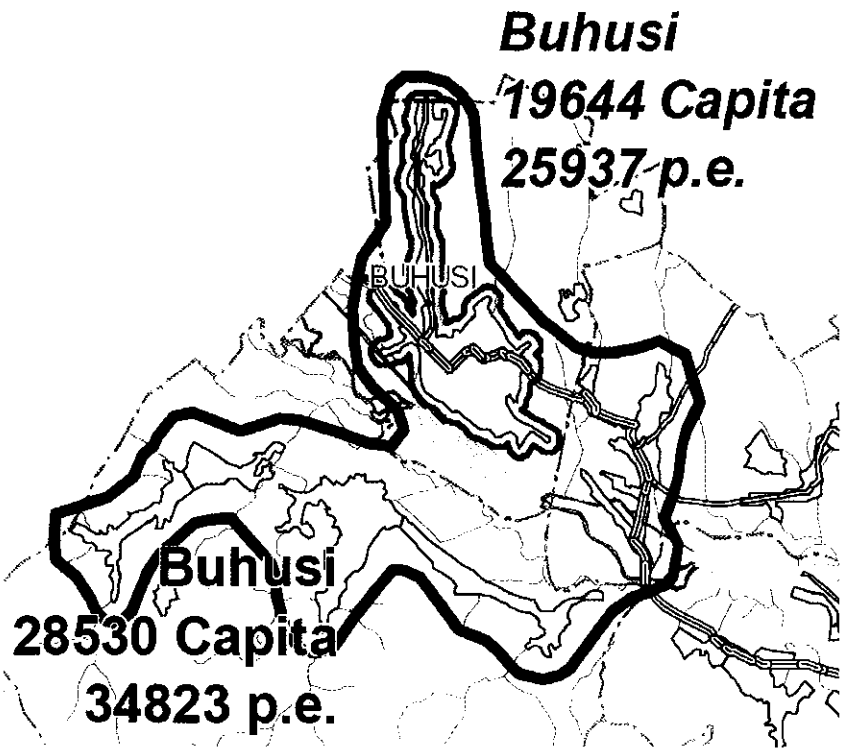

Figure 3-5: Overview of Buhusi Agglomeration

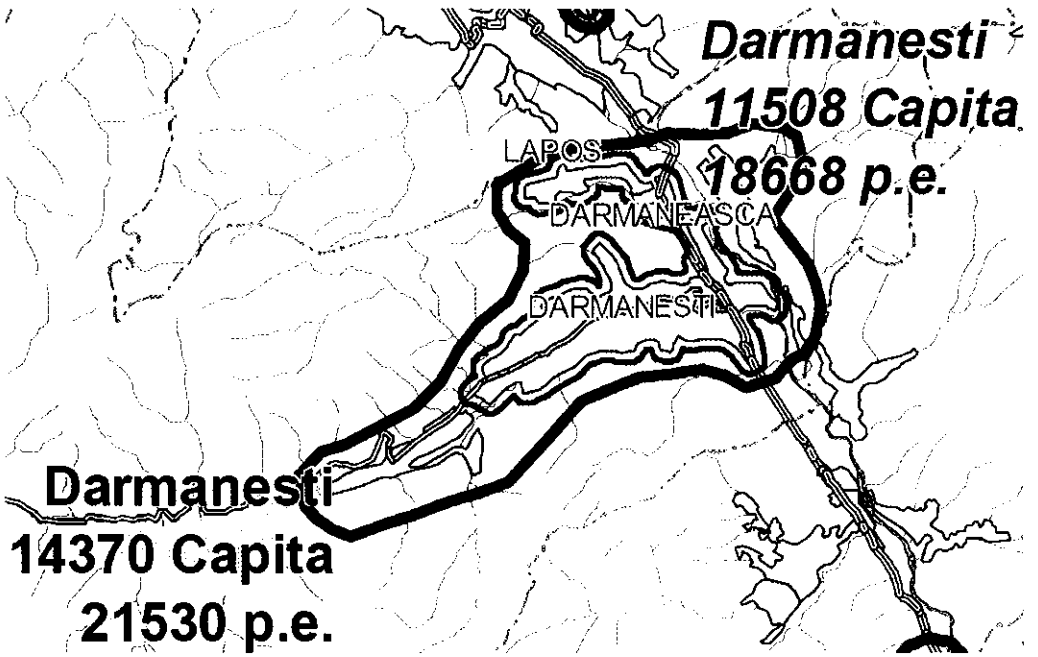

Figure 3-6: Overview of Darmanesti Agglomeration

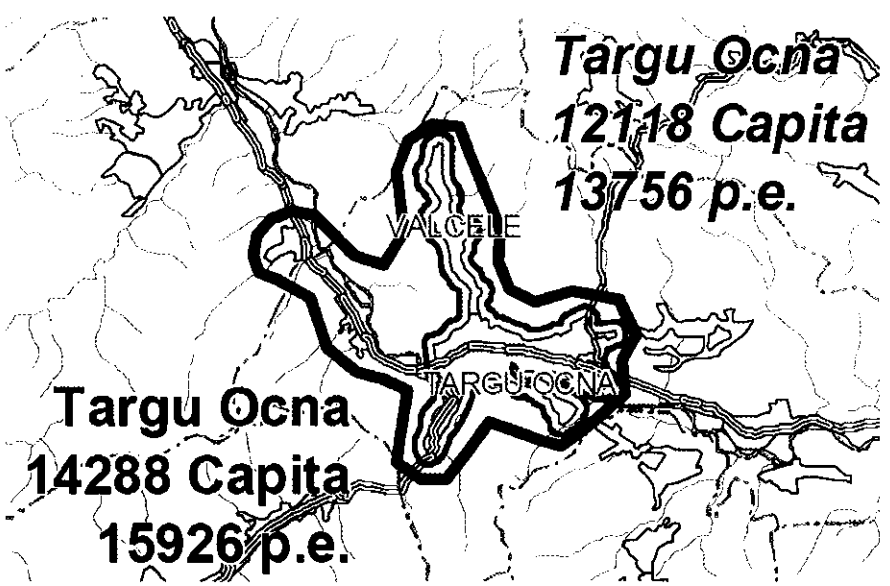

Figure 3-7: Overview of Targu Ocna Agglomeration

The following table shows relations between priority agglomerations with WS investments and water supply areas as they were defined in MP:

AGGLOMERATION = WSZ	WS AREA
Bacau	W01 Bacau + Surroundings
Comanesti-Moinesti (only settlements Moinesti, Gazarie)	W02 Moinesti till Onesti
Buhushi	W09 Buhushi
Targu Ocna	W02 Moinesti till Onesti
Darmanesti	W02 Moinesti till Onesti

Table 3-2: Agglomerations and WS Areas

The water supply areas are shown in the drawing BC-WS-00-001 of MP. Water Supply Areas are geographical areas of uniform characteristics like supply from the same main system, the same topographical characteristics and with a size of approx. 5% – 15% of the county

Cost breakdowns of necessary WS investments for different WS areas are included in the MP, while for the CF project WS investment considerations were undertaken based on the defined priority agglomerations. This approach is according demands provided in finalisation phase of the MP.

3.3 Natural Features

Bacau County has a continental climate, with cold winters and hot summers, and a predominant atmospheric circulation from north and north-west. In mountain areas the climate is moderate-continental with snowfall in winter. Average temperature is between 2℃ in the mountain area and 9℃ in the sub-Carpath ian area.

Bacau County is situated in the North-Eastern part of Romania, with a population of approx. 722,000 inhabitants. The capital of the county is Bacau city, other important cities are Onesti, Comanesti, Moinesti, Buhushi, Slanic Moldova, Targu Ocna and, Darmanesti. The main rivers are the Siret, the Trotus, the Bistrita, the Tazlau and the Berhea. The geography of Bacau county is complex. The west side has mountains while the east features hilly plateaus. The eastern parts of the county are made up of the Siret river valley and hilly areas east of Siret river. The central part with smooth hilly areas is drained by the Tazlau river toward the Trotus river valley. The western and northwestern parts are made up of mountainous areas west of Trotus river.

The geological features of Bacau County comprise the eastern arc of the Carpathian Mountains, the river lowlands and the Moldovian Plateau. The Carpathian Mountains are built up of sedimentary rocks of Cretaceous to Pliocene age. Main tectonic structures are N-S trending fold-thrust belts. The youngest sediments are Quaternary alluvial and fluviatile deposits of the river lowlands.

On the Bacau County territory, there are the following protected areas:

- 12 natural protected areas of national interest, covering a surface of 9,710.70 ha
- 17 natural protected areas of county and local interest, covering a surface of 125.83 ha
- 2 special protected areas (SPA) covering a total surface of 16,030.9 ha, of which 7394.74 ha are located in Bacau County territory.
- 4 sites of community interest (SCI), the first 3 covering a total surface of 5131,70 ha, all of which are located in Bacau County territory.

No.	Name SCI	LEPA	Surface (ha)		SCI overlapping with protected areas (%)	Surface of SCI/ county (ha)
			Total	Surface of SCI/ county (ha)		
1	Creasta Nemirei	Jud. Bacău	3550	3550	100	0.536
2	Slănic	Jud. Bacău	1392	1392	0	0.210
3	Dealul Perchiu	Jud. Bacău	189	189	100	0.028
4	Putnea-Vrancea	No data				
TOTAL			**5131.70**	**5131.70**	**-**	**0.774**

Table 3-3: List of protected areas proposed for the European Natura 2000 Network

CHAPTER 4

PROJECT BACKGROUND

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4 PROJECT BACKGROUND

The present project comprises first measures for improvement of water services in priority agglomerations to be financed by the Cohesion Fund CF. These measures are part of the phase 1 (2010-2015) of the long-term (30 years) investment plan and were generally defined in the county's Master Plan. Final version of Bacau County Master Plan is dated 20/01/2009 and was approved on 04/02/2009.

4.1 Results of the Master Plan

The present chapter includes a short excerpt of main results of the Master Plan, a 17 pages executive summary and detailed data can be found in the MP document.

4.1.1 Conclusions and Key Problems

In Bacau county 47 % or 339,000 of the 722,000 inhabitants are connected to piped public water supply systems, 35 % are connected to sewage network.

The large cities predominantly have aged distribution networks with high water losses amounting to approximately 50 % of production. New networks built in the last years are generally in good condition.

The main existing water supply sources are the Uzului river at lake Poiana Uzului for Bacau city system and cities in Trotus valley (Comanesti, Moinesti, Darmanesti, Targu Ocna, Onesti), the Ciobanus river for the city of Comanesti, Gheraiesti and Margineni groundwater fields for Bacau city and the Poiana Morii groundwater field for the city of Buhushi. There are 2 main WTP's operating, the Caraboaia (Darmanesti) WTP supplies the Bacau city system and cities in Trotus valley, the Ciobanus WTP supplies Comanesti and Asau.

55 of 85 rural communes have water quality parameter levels exceeding the legal limits in their public wells (for most of them the parameter nitrate is critically). For compliance with the water supply regulations, they must all have adequate water supply systems by 2015. Many local groundwater sources are polluted, supply is often only possible by large transport systems.

For the wastewater system and treatment facilities in Bacau County the following problems could be identified:

1. The wastewater inflow to the treatment facilities and the low concentration of degradable pollutants are indicative of the partly high to very high amount of infiltration water leaking into the sewage networks of the concerned cities

2. Damaged old pipe sections (crumbled concrete, clogged sections, concrete pipes penetrated by tree roots, etc.) are not unusual
3. The insufficient connection rate to the wastewater collection systems is leading to high sanitary risks in most of the cities especially in areas where the population is supplied from the drinking water network
4. The wastewater is partly directly discharged into surface water bodies by-passing existing treatment facilities

Most of the sewage networks are older than 40 years and in poor condition, based on experience an infiltration rate of 30 % can be taken as regular. There are only 9 existing WWTP's with mechanical and partly biological treatment, 8 of them need rehabilitation.

22 of 85 investigated industrial units in Bacau County are discharging directly into the rivers (Siret, Trotus, Bistrita, Tazlau and Oituz River). Most of them have at least a mechanical treatment plant, some have also biological treatment. The remaining 63 industrial units are discharging into the existing wastewater network. Most of them have a pre-treatment or a treatment plant with mechanical and biological treatment.

There is no reliable information available regarding sludge disposal sites or localities. In order to avoid any negative impact on the environment, the sludge disposal system needs immediate improvement.

4.1.2 General Development Strategy

An option analysis within the MP explains possible options related to the formation of agglomerations and makes suggestions regarding the most favourable sequence of measures.

As the project presented in the MP is an environmental project, priority is given to the improvement of the wastewater services. Therefore a ranking of the wastewater agglomerations has been executed in accordance with the national targets and the EU Wastewater Directive. The ranking of the water projects follows the prioritisation of the wastewater projects. Only for communes, which are not included in Master Plan wastewater agglomerations, an independent prioritisation of the water part is possible.

When looking at the water supply, the existing public networks are generally supplied with water of adequate quantity and quality, while many of the local public wells (often situated within the localities and near streets) are polluted by nitrates and other substances. Water losses in the aged networks are very high. Therefore the following priority measures are recommended to be taken

- increase of connection rate combined with network rehabilitations
- extension of networks to supply new localities

Because of the high transport costs, preference is to be given to a water supply from local sources for communes where sufficient sources are available. Protection zones for

such sources are necessary and as a result, a policy of sustainable agriculture must be pursued. After reducing the existing very high losses in the networks, the total future demand of the county will be lower than the current water production.

The water supply approach is mainly influenced by the following criteria:

1. Meet compliance dates for potable water quality
2. Implement integrated projects (water supply, wastewater disposal)
3. Determine water supply projects based upon dominant wastewater projects

Criterion 1 points to investments in rural areas, where mainly quality problems are encountered, while Criteria 2 and 3 point to investments in urban areas, where water systems for large numbers of inhabitants can be implemented in a cost-efficient way. For a decision on priority investments, meeting Criteria 2 and 3 leads to the selection of all cities. Fulfilling Criterion 1, i.e. meeting the water supply compliance dates, would require much higher investments than those which are currently foreseen.

4.1.3 Long Term Investment Plan

With pre-dimensioning of the measures and the unit-cost database investments costs and operation and maintenance costs for each water supply area and wastewater agglomeration were calculated.

Based on this calculated costs and taking in consideration the compliance dates of the different communes / agglomerations a phasing of measures has been executed for the water supply and the wastewater system.

The water supply measures comprise an investment volume of 513 million Euro. 40 % or 204 million Euro must be invested until 2015 for achieving compliance in water supply. Great technical, financial and institutional efforts will be necessary for achieving this target. A nearly 100% connection rate in water supply shall be reached in the year 2027.

Until the end of the MP project horizon in the year 2037 wastewater investments comprise 639 million Euro (net, no contingencies) incl. service provision for rural areas that are not part of wastewater agglomerations of this MP (Other Areas). The coverage rate for wastewater services related to capita will then be close to 100 %, 73 % in wastewater agglomerations and 27 % in rural areas (Other Areas).

Given a population of roughly 722,000 (capita) in the year 2007, the Phase 1 projects with a total of 364,000 capita connected to a centralized wastewater system, result in a connection rate of 50 %. The wastewater investments needed for these Phase 1 projects amount to 153 million Euro (net, without contingencies).

For the year 2015, SOP ENV sets a 70 % connection rate (505,000 capita) to a centralized wastewater system to be the target. For this objective to be achieved additional 141,000 capita will have to be connected to the system.

Until 2037 a total number of 4 WWTPs have to be rehabilitated, 3 have to be completely replaced and 53 new WWTPs have to be constructed.

4.1.4 Priority Infrastructure Investment Program

To achieve compliance with EC standards a certain amount of investments is required. But since the cohesion fund budget is limited the investments had to be prioritized according to the criteria of phasing. All 7 agglomerations that have more than 10,000 p.e. and the city of Slanic Moldova were selected as priority agglomerations.

The priority agglomerations in Bacau County are:

1. Agglomeration Bacau
2. Agglomeration Onesti
3. Agglomeration Comanesti
4. Agglomeration Moinesti
5. Agglomeration Buhusi
6. Agglomeration Darmanesti
7. Agglomeration Targu Ocna
8. Agglomeration Slanic Moldova

The priority agglomerations 1 – 8 comprise 8 cities (urban), for which integrated projects comprising water and wastewater have been developed. 6 of these agglomerations were selected for participation on CF financed projects, these are the agglomerations Bacau, Onesti, Moinesti, Buhushi, Darmanesti and Targu Ocna. The estimated net investment amount that is recommended to be financed through CF is 13.191 million Euro for water supply and 80.870 million Euro for wastewater, total 94.061 million Euro net (= 117.953 million Euro gross).

The following table which is also part of Annex C1-7 in MP shows the defined measures, justification is included in Annex C1-6 of MP.

292,347	Bacau	Bacau	Water Treatment Plant	CF	Rehabilitation WTP Caraiposa	LS			2,557
292,347		Bacau	Distribution Network	CF	Rehabilitation of AC parts in Bacau	km	22.00	130	2,860
292,347		Bacau	Distribution Network	CF	Extension of network in Bacau	km	10.00	208	2,075
292,347		Bacau	WWTP	CF	Extension of the existing central WWTP in Bacau	LS			15,103
292,347		Bacau	Wastewater Network	CF	Extension of Bacau sewer system	km	25.65	210	5,386
								Total Bacau	27,981
60,472	Onesti	Onesti	WWTP	CF	Extension and rehabilitation of the existing central WWTP in Onesti	LS			12,817
60,472		Onesti	Wastewater Network	CF	New sewer system for Onesti	km	10	175	1,750
4,139		Borzesti	Wastewater Network	CF	New sewer system for Borzesti	km	2.6	175	452
								Total Onesti	15,019
27,363	Moinesti	Moinesti	Water Main	CF	Main pipe DN300 between main reservoir and existing new pipe from PS Vermesti	km	4.50	313	1,409
27,363		Moinesti	Pumping Station, Reservoirs	CF	Renewal of piping for 2 Reservoirs in Moinesti	LS			300
1,148		Moinesti	Distribution Network	CF	Extensions of network in Moinesti	km	6.00	182	1,090
27,363		Moinesti	WWTP	CF	WWTP Moinesti South, new, tertiary treatment	LS			1,825
27,363		Moinesti	WWTP	CF	Construction of an new central WWTP in Moinesti North	pc	1.00	5,493	5,493
27,363		Moinesti	Wastewater Network	CF	Extension Moinesti North sewer system	km	5.6	188	1,046
27,363		Moinesti	Wastewater Network	CF	New sewer system for Moinesti South	km	23.109	175	4,044
								Total Moinesti	15,205
25,307	Buhusi	Buhusi	Distribution Network	CF	Extensions of network	km	6	203	1,220
25,307		Buhusi	WWTP	CF	Extension and upgradung of the existing central WWTP in Buhusi	LS			7,002
25,307		Buhusi	Wastewater Network	CF	Extension Buhusi sewer system	km	19.8	183	3,630
								Total Buhusi	11,851
18,688	Darmanesti	Darmanesti, Darmaneasca, Lapos	Distribution Network	CF	Extensions of network in Darmanesti, Darmaneasca and Lapos	km	3.0	217	650
13,129		Darmanesti	WWTP	CF	Construction of a new central WWTP in Darmanesti	LS			4,812
4,492		Darmaneasca	Main Collector	CF	Gravity Line Lapos - Darmaneasca	km	0.4	175	66
13,129		Darmanesti	Main Collector	CF	Gravity Line Darmaneasca - Darmanesti	km	1.0	175	169
13,129		Darmanesti	Wastewater Network	CF	New Darmanesti sewer system	km	51.8	183	9,480
1,067		Lapos	Wastewater Network	CF	New sewer system for Lapos	km	6.2	175	1,089
4,492		Darmaneasca	Wastewater Network	CF	New sewer system for Darmaneasca	km	2.4	175	413
								Total Darmanesti	16,679
13,777	Targu ocna	Targu Ocna, Valcele	Distribution Network	CF	Extensions of networks in Targu Ocna and Valcele	km	5.0	209	1,030
12,560		Targu Ocna	WWTP	CF	Construction of a new central WWTP in Targu Ocna	LS			3,817
12,560		Targu Ocna	Wastewater Network	CF	Extension Targu Ocna sewer system	km	13.5	183	2,479
								Total Targu Ocna	7,327

Table 4-1: Defined measures

4.1.5 Changes of Priority Infrastructure Investment Program

Within the FS works following changes of the priority investment program were performed in close cooperation with MEF and the ROC CRAB SA - Compania Regionala de Apa Bacau SA:

1. City of Onesti decided not to participate in CF program, so the agglomeration had to be deleted from CF program
2. Investments for extensions of water supply networks have been cancelled in water supply zones Bacau, Darmanesti and Targu Ocna. This was decided because of a new evaluated connection rate for water supply which is 90 % or even higher and due to budgets constraints.
3. Investments for rehabilitation of water supply network parts in water supply zone Bacau has been cancelled due to budget constraints.
4. In water supply zone Moinesti investments for the main pipe between main Reservoir and existing pipe from pumping station Vermesti have been cancelled due to budget constraints.
5. Investments for rehabilitation of piping of main reservoir in water supply zone Moinesti have been cancelled due to budget constraints.

6. The agglomerations Comanesti and Moinesti have to be merged, following the EU specifications for agglomeration definition. Local political disruptions are not a sufficient justification for splitting of agglomerations.

   The new name of the merged agglomeration is Comanesti-Moinesti. Yet Comanesti still refuses to join the IDA and the ROC thus being not eligible for CF whereas the settlements Moinesti and Gazarie joined both, the IDA and ROC. As a consequence Moinesti and Gazarie were included in the CF project.

   All investment measures, performance indicators, CBA etc. as set out in this FS refer to the settlements Moinesti and Gazari only, not the whole agglomeration Comanesti-Moinesti.

4.2 Reference to Accession Treaty

The Accession Treaty 2005 is an agreement between the EU and Romania / Bulgaria which came into force on 01/01/2007. The relevant demands for water services are defined within annex VII, point 9 ENVIRONMENT, subpoint C WATER QUALITY. Romania has been granted transition periods for compliance with the acquis for urban wastewater collection and treatment and also for drinking water quality according to the following tables:

Agglomeration size	Compliance Date				Compliance with respective Directive
	31.12.2010	31.12.2013	31.12.2015	31.12.2018	
Wastewater collection					
≥ 2,000 P.E.	61 %	69 %	80 %	100 %	91/271/EEC
≥ 10,000 P.E. Intermediate Target acc. to Art. 3, 91/271/EEC		100 %			91/271/EEC, Art. 3
Wastewater treatment					
≥ 2,000 P.E.	51 %	61 %	77 %	100 %	91/271/EEC, secondary treatment
≥ 10,000 P.E.			100 %		91/271/EEC, tertiary treatment

Table 4-2: Compliance deadlines for wastewater collection and treatment

Acquis Communautaires Chap. 22	Agglomeration size (S)	Parameters	Compliance Date with respective Directives
Drinking Water			
	10,000 inhab.> S	oxidizability	31.12.2010
	100,000 inhab. > S >10,000 inhab.	oxidizability, turbidity	
	S > 100,000 inhab.	oxidizability, ammonium, aluminium, pesticides, iron and manganese	
	10,000 inhab.> S	ammonium, nitrates, turbidity, aluminium, iron, lead, cadmium and pesticides	31.12.2015
	100,000 inhab. > S >10,000 inhab.	ammonium, nitrates, aluminium, iron, lead, cadmium, pesticides and manganese	

Note: oxidizability (5 mg/l).

Table 4-3: Compliance Deadlines for Water Supply

4.3 Objectives and Targets

The overall environmental objective is to improve the living standard and the environment, putting a special focus on meeting the environmental acquis according to the Sectoral Operational Programme Environment (SOP ENV)

One of the main goals is to reduce the environment infrastructure (water and sanitation services) gap that exists between the European Union and Romania both in terms of quantity and quality. This should result in more effective and efficient services, while taking the sustainable development and the polluter pays principle into account.

The SOP ENV is setting the following targets:

- Provision of adequate water and sewerage services, at acceptable tariffs, for the population in agglomerations of more than 2,000 inhabitants
- Provision of adequate drinking water quality in all urban agglomerations
- Improvement of purification of watercourses
- Improvement of sludge disposal management
- Creation of innovative and efficient water management structures

The table below gives a list of indicators defined in the SOP:

Indicator	Baseline (2007)	SOP Target (2015)	Long-Term Target (2037)
Localities provided with new/rehabilitated water facilities in a regional system (no. of communes)	45	54	93
New/rehabilitated wastewater treatment **plants** compliant with EU acquis[1)]	2	18	65
Population connected to basic water services in a regional system	47 %	70 %	100 %
Wastewater treated (of the total wastewater volume)	1.3 %	75 %	100 %
Other relevant indicators	--	--	--

Table 4-4: Indicator list for Bacau

[1)] According to Annex 4 of SOP ENV – Implementation Plan of Directive 91/271/EEC

4.3.1 Water Supply

The accession treaty targets regarding the quality of public supplied water will result in directing investments into rural communes with inadequate water quality in public wells that have no networks. For rural communes with inadequate water quality in public wells that have networks of adequate quality, a supply from these networks would provide compliance. In many public wells, the level of oxidizability and the nitrate content are above the set limits.

The deadline to meet the oxidizability standards is 2010, that to meet the nitrate standards is 2015. In many rural communes, it will realistically not be possible to meet these deadlines.

The SOP target aims at achieving a 70 % connection rate to piped water supply by the year 2015. The present rate is 47 %. If the 8 urban communes were fully connected, the rate would increase to 55 %. 70 % could be achieved by further selecting, those 17 rural communes, which have the greatest effect on the connection rate. A ranking table is shown in Annex C4.3 of MP.

For the unpiped water from public wells (which is the only available source in many rural communes), investigations in 2007 showed that 55 of 85 communes had inadequate water quality. Such communes will also need networks with sufficient sources to achieve compliance.

It is in light of these facts that these networks had to be included in Phase 1 (2008-2015) for the long-term investment plan in MP. By pursuing this strategy, a 79 % connection

rate is achieved at the end of Phase 1, which is considerably higher than the 70 % connection rate (SOP criteria) and in addition to this, the respective "full compliance criteria" supersede the "SOP criteria".

The necessary investments for this target are 204 Mil. Euro which is by factor 15 higher than the defined 13.2 Mil. Euro (sum from MP) for WS part of present CF projects.

4.3.2 Wastewater

According to the MP Bacau County comprises 57 wastewater agglomerations above 2,000 P.E. which are scheduled to meet specific deadlines for compliance with the European and the Romanian wastewater legislation. The respective compliance dates have already been mentioned. The relevant list for Bacau County is enclosed in MP as Annex C1.3.

If clustered agglomerations are involved, different deadlines (Phasing) for wastewater collection and wastewater treatment may apply. It was agreed that if a Phase 2 agglomeration is embedded between two Phase 1 agglomerations, the Phase 1 deadline shall be relevant for the considered Phase 2 agglomeration because of technical reasons.

Towns, municipalities and agglomerations over 10,000 P.E. have to be included in Phase 1, which means they have to reach compliance by 2015, All agglomerations between 2,000 and 10,000 P.E. have to be considered for Phase 2 (compliance dates 2015 to 2018). Any agglomerations below 2,000 P.E. form part of Phase 3 (compliance by 2037).

According to Annex 3 of SOP ENV only Caiuti (5,804 P.E.) and Podu Turcului (5,506 P.E.) agglomerations were scheduled to be compliant in waste water treatment at the end of 2007. Compared to a total of existing 901,997 P.E. in 2007 the share of treated wastewater, which according to the SOP should be in compliance with respective EU directives, can be calculated to 1.3 %.

According to Annex 4.1 of SOP ENV until the end of 2015 in total 679,636 P.E. were scheduled to be compliant, which increases the targeted share of total treated wastewater volume to 75.3 %.

Given a population of roughly 722,000 (capita) in the year 2007, the Phase 1 projects with a total of 364,000 capita connected to a centralized wastewater system, result in a connection rate of 50 %. The wastewater investments needed for these Phase 1 projects amount to 153 million Euro (net, without contingencies). For the year 2015, SOP ENV sets a 70 % connection rate (505,000 capita) to a centralized wastewater system to be the target. For this objective to be achieved additional 141,000 capita will have to be connected to the system.

4.4 Socio-Economic Assessment

Socio-economic investigations of the MP have provided information about the demographic development, macro-economy, employment situation, main industries and the water sector. On January 1st, 2007, Bacau County had 721,848 inhabitants, which represent 3.3% of Romanian total population.

The population in Bacau County decreased from 736,347 inhabitants in 1990 to 721,848 inhabitants in 2007 with an annual average shrinkage rate of 0.12 %. This constitutes a much lower decline of population than the national average (0.43 % per year). Different forecasts about population development are shown in the Master Plan, Eurostat's baseline forecast is used as a starting point for the forecasts in the regions and county. The resulting forecast shows a slight decrease in population over the MP period from 721,848 to 689,536 inhabitants, in total 4.5 % decrease from 2007 to 2037.

Also for the economic development different forecasts were compared and discussed in the MP. The GDP in prices of 2007 will increase with an average annual growth rate of 4.7%, the GDP per head in prices of 2007 will be 61,701 RON in 2037.

The average household size comprises 3 inhabitants. The disposable income per head will increase from 930 RON per head, month in 2007 to 3,814 RON in 2037.

4.5 Institutional and Legal Framework

4.5.1 Legislative Framework Linked to Environment Water Sector

After a period of more than four decades of centralised management, Romania decided to return to the local autonomy principle through decentralisation, in this way transferring major and concrete responsibilities to the local public administration, principle reflected in the National Constitution. One of these specific responsibilities mentioned in Law of the local public administration, No 215/2001 republished, refers to the obligation of local administrations to organise their operation efficiently and adequately in order to provide public services. According to this Law, local public administrations have the right to associate with the aim to develop efficient public services of common/regional[1] interest.

Now that Romania has become a member country of the EU, it must comply with the European Directive 98/83/EC on drinking water quality by 2015 and the Directive 91/271/EC on urban wastewater treatment by the end of 2018. For this reason, Romania intends for the period 2010 -2015 to make the necessary investments to comply with the European drinking water indicators for e.g. turbidity, ammonia, aluminium, pesticides, nitrates etc and for urban wastewater collection, treatment and discharge. Also by 2015 waste water collection and treatment is planned to be realized for a number of 263

[1] *In this context, regions are large areas that include more human agglomerations; they should not be regarded as development regions (NUTS II) of Romania.*

agglomerations of more than 10,000 population equivalent (p.e.) and by 2018 in 2,346 agglomerations of between 2,000 and 10,000 p.e.

Having these ambitious objectives, the Ministry of Environment has requested financial assistance from pre-accession programmes (PHARE, ISPA) to support local authorities in creating strong and viable regional operators in the water sector, to ensure an adequate implementation of internationally financed projects and efficient operation of the utilities constructed with European funds.

4.5.1.1 The Harmonization of National Legislation with European Union Legislation

Romania completely accepted the Community Acquis with reference to all the sectors and will ensure the conformity with its provisions and its implementation. In Annex 3.1 is presented the Romanian regulation, lows and ordinance hat transpose European legislation in the Romanian one.

Directive 98/83/EC on the Quality of water intended for human consumption was transposed in Romanian legislation. By 31 December 2015 Romania has to initiate and apply all the necessary measures in order to secure that the drinking water supply takes place in compliance with the provisions of the Directive, by means of establishing the drinking water demand, inspecting water supply systems, surveying and monitoring drinking water quality, disseminating information and reporting.

The purpose of Directive 91/271/EEC is the environment protection against the adverse effects of urban and industrial wastewaters and wastewaters.

The Council Directive 91/271/EEC concerning domestic sewage treatment was completely transposed in the Romanian legislation by G.D. 188/2002 in order to approve the norms regarding wastewater discharge into the aquatic environment (Official Gazette No. 187/20.03.2002).

Considering, firstly, all the aspects regarding the environmental protection but without neglecting the consequent technical or financial ones, deriving from this directive, Romania will apply its article 5(8), stating that the whole territory of the country is a sensitive area.

In order to implement and fulfill the provisions specified in Directive 91/271/EEC on domestic sewage s, Romania requires the following with respect to the domestic sewage s collection (Article 3):

- by 31 December 2013, 263 settlements of more than 10000 p.e. will have been compliant with the Directive, representing 61,9 % of the total biodegradable load;
- by 31 December 2018, 2346 settlements of less than 10000 l.e. will have been compliant with the Directive, representing 38,1 % of the total biodegradable loading;

In order to implement and fulfil the provisions specified in the Directive 91/271/EEC on domestic sewage, Romania requires the following, with respect to the domestic sewage treatment and disposal (Article 4, (1), a),b), and (4)) and Article 5(8) art.5(8):

- by 31st December 2015, 263 settlements of more than 10,000 p.e. will have been compliant with the Directive, representing 61.9 % of the total biodegradable loading;
- by 31st December 2018, 2,346 settlements of less than 10,000 p.e. will comply with the Directive, representing 38. 1 % of the total biodegradable loading.

Romania does not request for a transition period for implementing the provisions specified under Article 7 of the Directive regarding the necessity to carry out an «adequate» wastewaters treatment (as set by the provisions specified under Article 2(9) of the Directive) before being discharged into the emissary, in the case of the settlements of less than 2,000 p.e. and less than 10,000 p.e, situated within coastal areas.

4.5.1.2 Romanian Relevant Legislation

The relevant Romanian Legislation related to the institutional and legal framework for SOP implementation in the water and waste water sector is as follows:

a) Primary legislation
   - Law no. 215/2001 of the local public administration, republished after its amendment made by Law no 286/2006;
   - Law no. 213/1998 regarding the public property and its legal status;
   - Law no. 51/2006 of the local public services (entered into force on 21st March 2007) – general law;
   - Law no. 241/2006 of the water and wastewater service (entered into force on 21st March 2007) – specific law;
   - Law no. 273/2006 regarding the local public finance.

b) Secondary legislation
   - The frame-regulations of the water and wastewater service, approved by the ANRSC President's Order no. 88/2007;
   - The frame terms of reference for the water and wastewater service, approved by the ANRSC President's Order no. 88/2007;
   - The frame contract for providing the water and wastewater service, approved by the ANRSC President's Order no. 88/2007;
   - At present no applicable procedures for water and wastewater service management delegation have been adopted.

c) The Incidental Legislation
   - Law no 31/ 1990 on the trade companies, as amended;

- The Government Ordinance no. 26/2000 on the associations and foundations, as amended;
- The Government Ordinance no. 13/2008.
- The Government Decision 855/2008 regarding the approval of template constitutive act and statute for the Intercommunity Development Associations.

d) Specific Analysis

i. Law 51/2006 on Local Public Service

Law 51/2006 defines and specifies Local Public Services, "as the assembly of activities of general public utility and interest", performed at commune, town, municipality or county level under the lead and coordination and responsibility of the local public authorities. The aim is to satisfy the needs of local communities, one of which is the provision of water and wastewater service.

ii. Law 241/2006 on Water Supply and Wastewater Service Provision

The "Water Supply and Wastewater Public Service" is specified as the assembly of activities of public utility and general economic and social interest, performed for the purpose of catchment, treatment, transport, storage and distribution of drinking or industrial water to all users within a locality's territory, respectively for the collection, transport, treatment, and discharge of the wastewater, rain water and surface water within the urban area of the locality.

The public service regarding water supply has as its main components:

- the water catchment activity, from surface or ground sources;
- the treatment of raw water;
- the transport of drinking and/or industrial water;
- the storage of water;
- the distribution of drinking and/or industrial water.

The public service regarding wastewater has as its main components:

- the collection, transport and discharge of wastewater from the users to the treatment plants;
- the treatment of wastewater and discharge of treated wastewater to the emissary;
- the collection, discharge and appropriate treatment of the waste from the rainwater drains and the insurance of their functionality;
- the discharge, treatment, and storage of sludge and other similar waste materials resulting from the above mentioned activities;

- the discharge of rain and surface water from the urban areas of the municipalities.

iii. Law 213/1998 regarding the public property and its legal status

According to this law, the infrastructure related to the water and wastewater services (water supply and wastewater networks, treatment and ancillary plants, with the corresponding installations, buildings and land) belongs to the public patrimony. The existing infrastructure as at the date of the signing of the Delegation Contract and the assets resulting from the investments carried out during the performance of the Delegation Contract, are thus public assets and are owned by the administrative-territorial units.

iv. Law 215/2001 on Local Public Administration

This law sets out that the local authorities have full and exclusive competencies to the set up, organization, management, monitoring and control of the functioning of the public services of water supply and wastewater.

In some instances counties and not municipalities may have the exclusive competence and responsibility regarding the water supply and wastewater public services. If this is the case, the county will (co)own water and wastewater infrastructure and should therefore participate as a shareholder in the regionalisation process. This is due to Ordinance no. 69/1994, limiting and conditioning the number of local units of management of public utilities, according to the number of inhabitants of the locality.

v. Emergency Ordinance 13/2008

The Ordinance 13/2008 has been introduced, published and set into effect with 26 February 2008. It amends in particular Article 31 of Law 51/2006 and Article 21 of Law 241/2006, so that the in-house principles are now fully reflected in the applicable Romanian legislation.

4.5.2 General Administrative Framework

According to Romania's policy reflected in the SOP Environment the achievement of the objectives for the water and wastewater sector is realized through a process of regionalization, meaning the implementation of an institutional framework within the Project area, suitable to combine the water supply and wastewater services related to the development areas in that region, within a common operating process.

The regionalization is a key element in improving the quality and cost efficiency of local water infrastructure and services in order to fulfil environmental targets, but also to assure sustainability of investments, of operations, of a long term water sector development strategy and of regional balanced growth.

4.5.3 Regional Policy – Institutional Setup in the Romanian Water Sector

The key institutional elements of this regionalization process are:

- the Intercommunity Development Association (IDA);
- the Regional Operating Company (ROC);
- the Delegation Contract.

4.5.3.1 The Intercommunity Development Association (IDA)

The IDA is acting as the sole (controlling) partner over the ROC. It is the unique coordination body representing the common interests of the participating municipalities on the water and wastewater supply services and on the general strategy regarding the tariff and investment policy.

The IDA is acting in the name and on behalf of its members (the municipalities) thus, assuming the delegated competencies. The IDA statutes stipulate, in more detail, important conditions for joining the IDA and stipulates restrictive conditions for leaving the IDA.

The Government Decision 855/2008 regarding the approval of template constitutive act and statute for the Intercommunity Development Associations imposes to IDA's the use of the template constitutive documents in order to assure the implementation of the in-house rules. The compliance with the requirements of this legal provision is an eligibility criterion for the Cohesion Fund Application.

4.5.3.2 The Regional Operating Company (ROC)

The ROC is a commercial company, owned by all or a part of the IDA member municipalities, to which the management of the water and wastewater service is delegated, through the Delegation Contract.

The regionalization process, that provides the basis for the establishment of the ROC, represents an essential element towards achieving the ambitious investment objectives set for the renewal, extension, operation and maintenance of the country's water and wastewater sector assets in order to comply with the targets for water and wastewater set for 2015, respectively 2018. It initiates the development of an institutional and legal framework at regional level, suitable to replace the existing smaller operators and autonomous regions with a stronger and larger new single regional operator intended to

be more effective in operating the services and in this way to acquire sufficient managerial and financial credibility to apply for and obtain EU Cohesion Fund financing.

4.5.3.3 The Delegation Contract

The Delegation Contract for the water and wastewater service's management is a contract agreed between ROC on the one hand (as operator), and IDA in the name and on behalf of its member municipalities (these municipalities are, collectively, the granting authority). It is a unique contract for the entire area of the Project, corresponding to the territorial competency area of all the administrative-territorial units that delegate the management of the water and wastewater services to the ROC.

According to the new Law no 241/2006 on water supply and wastewater services, in case of delegated management for the service's functioning, the local public administration authorities transfer to the regional operator the tasks and the responsibilities regarding the public utilities services' supply, as well as the management and the operation of the related water supply and wastewater systems, on the grounds of a management delegation contract, approved by decision of the granting authority.

According to the strategy approved by SOP Environment, the Delegation Contract is granted directly to the Regional Operator, by the application of the exception to the tendering rule, in compliance with Law 241/2006. The direct granting of the delegation contract is achieved in compliance with the EU "in-house" rules as an exception to the tendering procedures. The foreseen amendments to Laws 51 and 241 also include the provisions regarding the "in-house" rules in those laws.

CHAPTER 5

ANALYSIS OF CURRENT SITUATION AND PROJECTIONS

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5 ANALYSIS OF CURRENT SITUATION AND PROJECTIONS

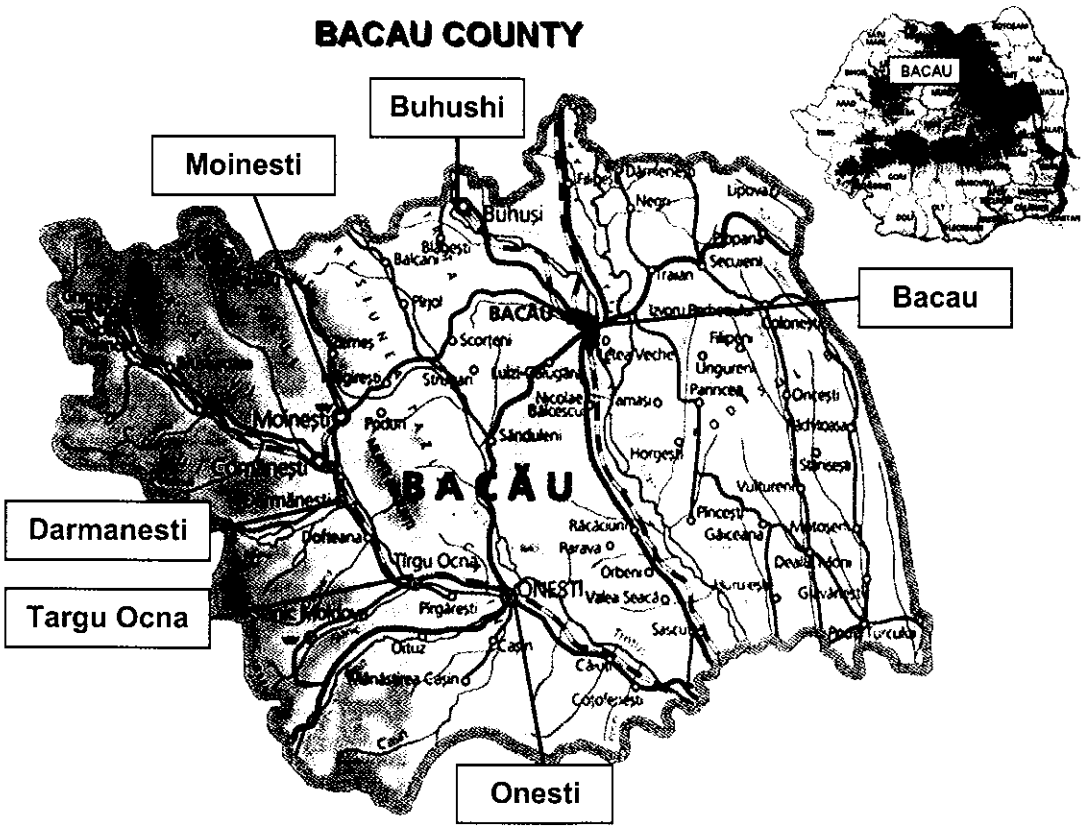

Figure 5-1: Overview of Bacau County

5.1 General Data on Water System

5.1.1 Water Resources

5.1.1.1 General

The water resources of Bacau County comprise surface water and groundwater.

Surface water

The hydrographic network of the County encompasses the Siret river hydrographic basin.

River	Station	Max. flow 2006 [m³/s]	Med. flow 2006 [m³/s]
Siret	Dragesti	1,148	77
Bistrita	Frunzeni	342	20.8
Tazlau	Tazlau	64.2	1.39
Tazlau	Helegiu	465	6.82
Trotus	Vranceni	219	34.7

Table 5-1: County of Bacau – Average flows in the mayor rivers (source: 2006 annual report on the North Eastern Region, refer Masterplan)

The next table summarizes the important surface water sources for the production of drinking water.

Basin	River	Location
Siret / Trotus	Uzul river	Poiana Uzului
Siret / Trotus	Ciobanus river	WTP Ciobanus

Table 5-2: Important surface water sources for the production of drinking water

The next figure extracted from the 'River Basins Management Plan – National Report 2004' illustrates the type of the rivers in the County:

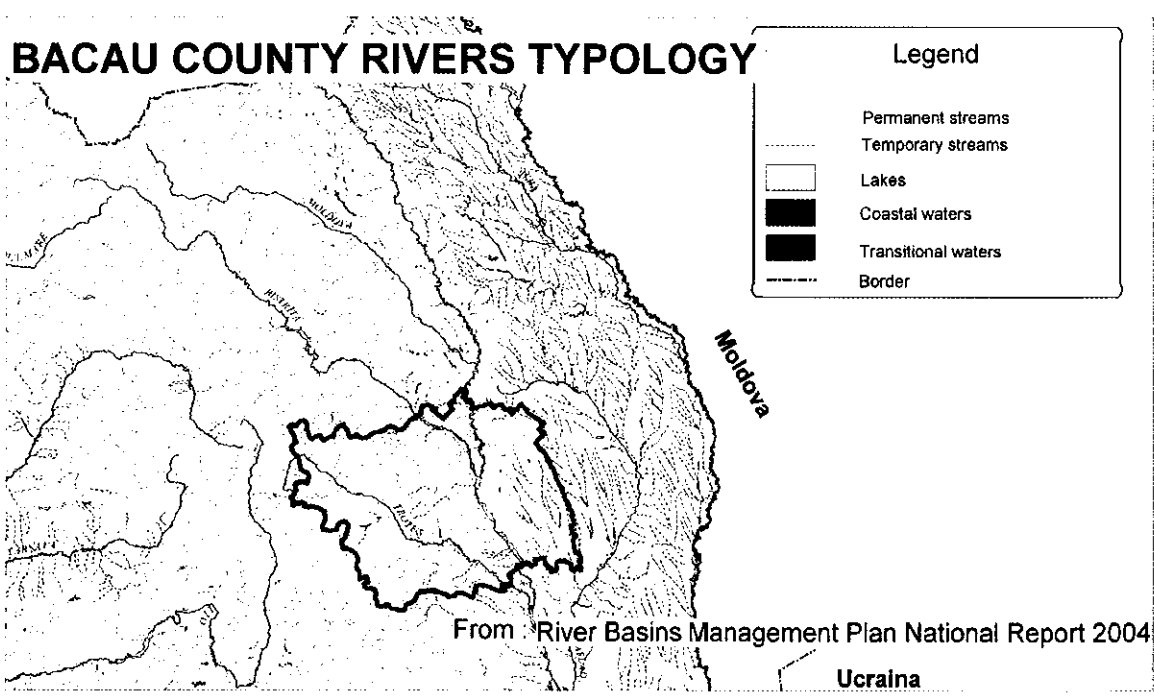

Figure 5-2 : Type and quality of rivers in Bacau County

The next figure provides an overview of the quality of the river waters in the County:

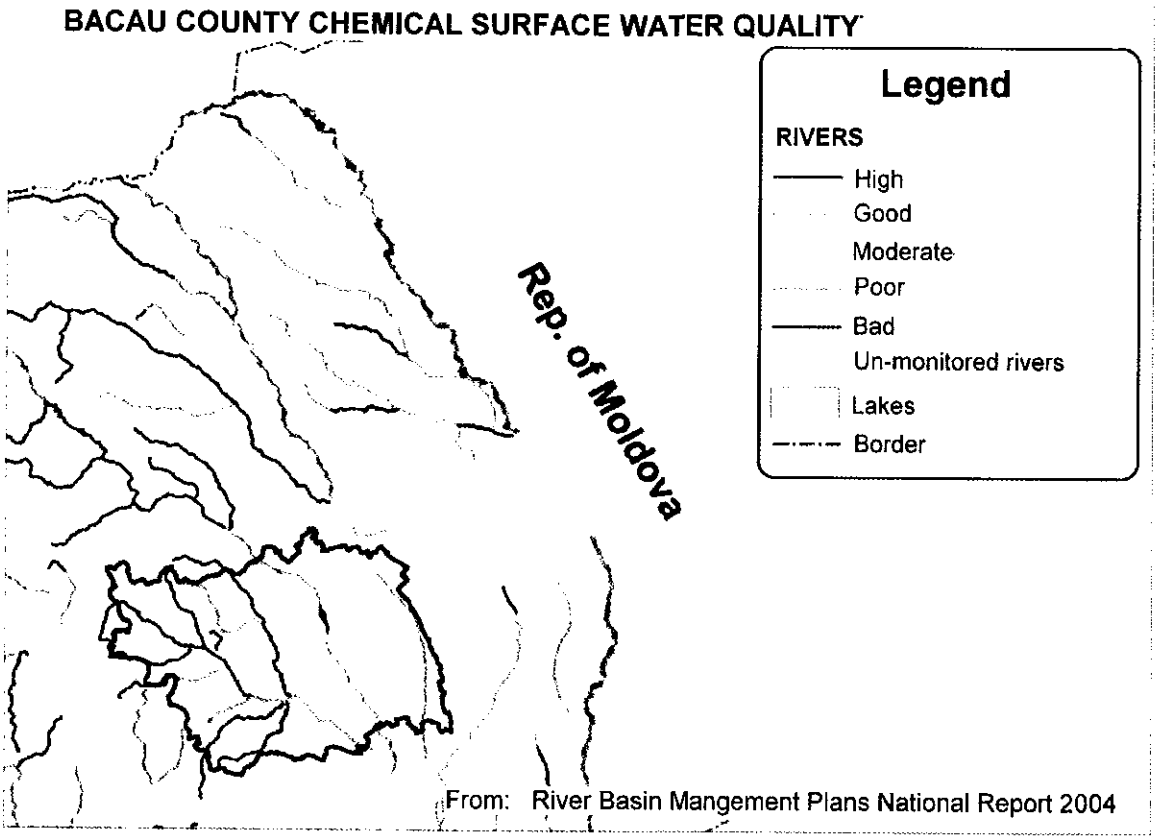

Figure 5-3 : Overview of the quality of the river water in the County

This figure reveals that the quality of River Uzul (which also feeds Lake Poiana Uzului) in particular is 'good'. It is to be noted that the quality of the rivers in the East of the County is lower than those in the West.

The main reservoir, Lake Poiana Uzului, has the following characteristics:

- Main tributary: River Uzul;
- Quality: Oligotrophic;
- Volume 90,000,000 m^3;
- Supply area: Cities and communes located in Trotus Valley and Bacau city (partial).

According to the Council Directive 75/440/EEC the quality of the Poiana Uzului lake water shows an A1 or A2 characteristic with the majority of parameters being somewhere between both categories. This means that a normal physical treatment, chemical treatment and disinfection, e.g pre-oxidation, coagulation, flocculation, decantation, filtration and disinfection will be appropriate to meet the requirement of drinking water quality.

In General water from this Lake Poiana Uzului is useable for the abstraction of drinking water by respecting the characteristics of surface water intended for the abstraction of drinking water (75/440/EEC).

In the table below water quality parameters of several rivers in Bacau County are summarized including River Uzul (Uz) which feeds Lake Poiana Uzului.

Nr. Crt.	Rau	Sectiune	Indicatori - 2006					
			CBO5	CCOMn	CCOCr	NH_4^+ mg/l	PO_4 mg/l	P total
1	Siret	Lespezi	3.98	6.98	14.50	0.470	0.126	0.016
23	Bistrița canal UHE	Zănești	2.07	2.93	7.44	0.093	0.004	0.022
24	Bistrița (albia veche)	Frunzeni	2.48	3.44	8.06	1.219	0.064	0.056
25	Valea lui Ion	Am.sat Valea lui Ion	5.11	11.43	25.60	0.248	0.292	0.071
26	Bistrița canal UHE	Șerbănești	2.24	4.73	9.00	0.153	0.105	0.033
27	Bistrita (albia veche)	Av. Lac Agrement Bacău	2.11	4.90	12.29	0.251	0.101	0.032
28	Bistrița (albia veche)	Av. Bacău	15.22	18.20	37.56	10.307	1.785	0.537
29	Siret	Galbeni	3.58	7.40	12.05	0.427	0.157	0.052
30	Trotuș	Ghimeș - Făget	1.64	3.99	5.38	0.102	0.098	0.031
31	Ciobănuș	Ciobănuș	3.77	7.29	8.66	0.132	0.246	0.075
32	Asău	Asău	2.58	5.99	10.16	0.240	0.128	0.041
33	Urmeniș	Comănești	5.02	9.08	24.85	1.649	0.814	0.263
34	Uz	Am. Lac Poiana Uzului	1.65	4.76	7.85	0.141	0.128	0.040
35	Izvor Alb	Am.Lac Poiana Uzului	1.13	3.69	6.08	0.233	0.094	0.030
36	Pr. Plopu	Am.Lac Poiana Uzului	1.17	3.87	6.68	0.217	0.105	0.030
37	Pr. Groza	Am.lac Poiana Uzului	1.08	3.57	4.21	0.301	0.140	0.049
38	Uz	Av.lac Poiana Uzului	2.08	5.52	9.33	0.258	0.217	0.068
39	Slănic	Av. Slănic Moldova	2.60	5.49	16.65	0.249	0.122	0.038
40	Trotuș	Av. Dărmănești	2.45	6.24	10.22	0.307	0.083	0.027
41	Trotuș	Am.Tg. Ocna	2.17	5.35	11.20	0.338	0.120	0.038
42	Oituz	Am .Onești	1.88	4.20	9.78	0.171	0.059	0.018
43	Cașin	Am .Onești	1.82	4.27	9.28	0.152	0.119	0.038
44	Tazlău Sărat	Am. Bolătău	1.78	4.62	9.31	0.183	0.077	0.025
45	Tazlău Sărat	Tescani	2.18	4.53	15.40	0.461	0.042	0.015
46	Tazlău	Helegiu	2.60	5.80	13.18	0.073	0.065	0.020
47	Trotuș	Vrânceni	3.47	6.97	17.57	0.229	0.091	0.030
48	Trotuș	Comăței						

Table 5-3: County of Bacau – overview of the quality of river water

Groundwater

Groundwater resources are available in the main river valleys and in the tributary valleys. Some of these sources are polluted by agriculture, waste sites, wastewater disposal, industries and other activities.

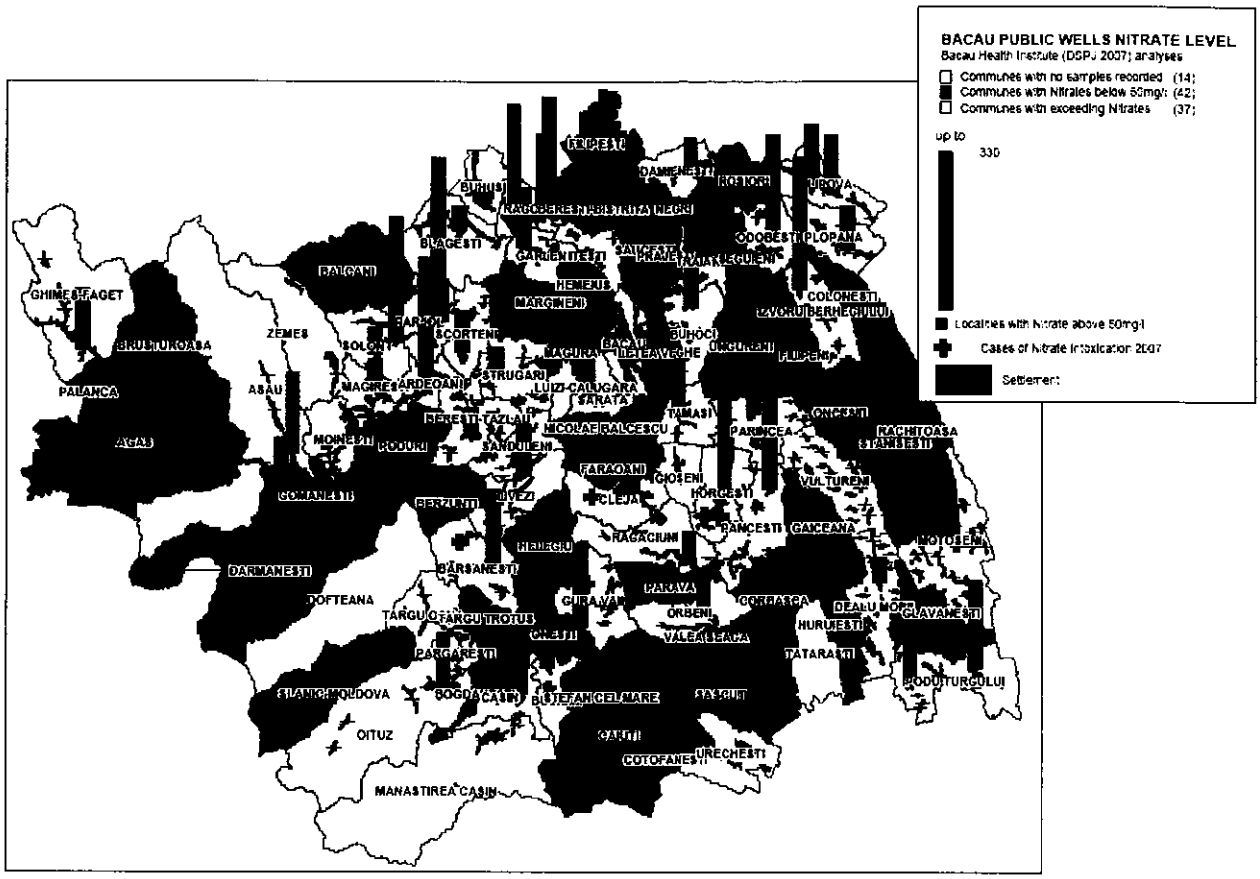

Figure 5-4: Nitrate levels at public wells (data 2007, see MP)

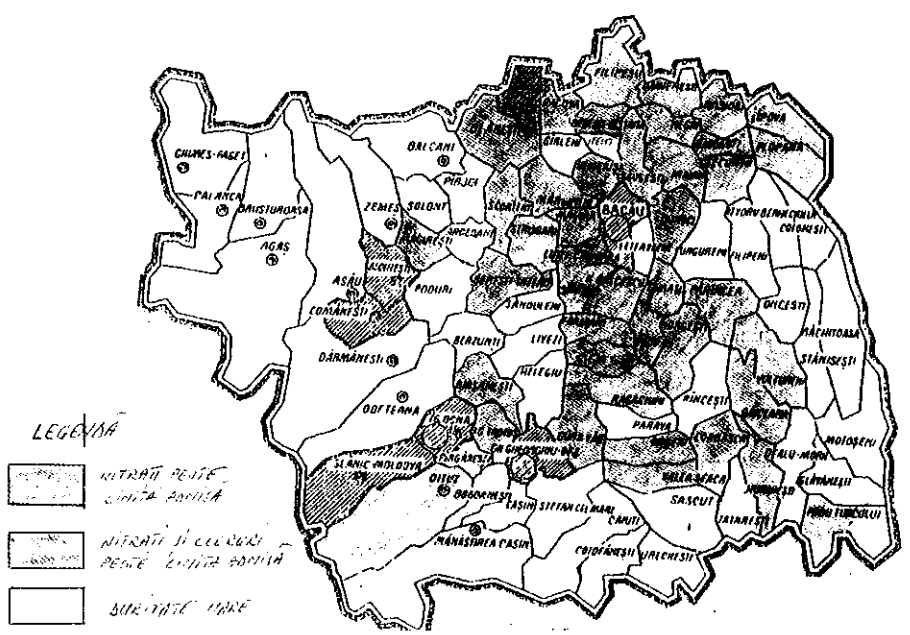

Figure 5-5: Nitrate pollution of unpiped water at public wells (2002-2007 data, figure from MH, see MP)

The main groundwater sources are:

- Margineni, Hemeius and Gheraiesti well fields: supply of Bacau City (partial).
- Poiana Morii groundwater fields: supply of Buhusi city.

Local springs are also available especially in the mountain regions.

The next table contains information on resources specific to the WSZ included in the present Feasibility Study.

	Supply from [m^3/year in 2008]			
WSZ	**Surface Water (Poiana Uzului Lake – Darmanesti WTP)**		**Ground Water**	
Bacau	8,970,392		Well fields: Margineni: 4,376,966 Gheraiesti: 4,008,008	
Moinesti	1,946,006		*None*	
Buhusi	*None*		Well fields Poiana Morii: 900,000	
Darmanesti	734,659		*None*	
Targu Ocna	1,498,000		*None*	
TOTAL	**13,149,057**	**59 %**	**9,284,974**	**41 %**

Table 5-4: County of Bacau – sources of supply for the WSZ – data from operator

5.1.1.2 General Situation of Supply for WSZs

Except of WSZ Buhusi and City of Comanesti all WSZs are supplied by the Water treatment Plant Caraboaia nearby Darmanesti. In Bacau City there are additional groundwater sources; WSZ Buhusi is supplied only by groundwater. Furthermore WTP Caraboaia also supplies several other cities/communes/localities which are not part of this FS.

The storage lake Poiana Uzului which is supplying WTP Caraboaia is located approx. 8 km in the west of City of Darmanesti. There is a sufficient protection area due to the location of this lake. The lake is situated in a non-settled valley only with forest and no agricultural use or even no industrial use.

Groundwater

The groundwater sources used for potable water production (Margineni, Gheraiesti, Hemeius for Bacau and Poiana Morii for Buhusi) are located in the Bistrita valley. Two further water sources in Buhusi (groundwater source Coscau and Bistrita) are existing. These are only used additionally to Poiana Morii during high peak days in summer. Another groundwater field is existing (groundwater field Frunzeni), but it is out of use since approx. twenty years. There is no M&E equipment installed.

The next table summarizes the used groundwater (GW) sources in the defined WSZs of the County Bacau to supply drinking water.

GW Source	Type	Capacity [l/s]	Average Annual Withdrawal [1,000 m^3]	Water Supply Zone
Gheraiesti + Hemeius + Margineni well fields	150 wells	685	9,884,676 (2003 – 2008)	Bacau
Poiana Morii well field and Coscau and Bistrita drains	8 wells, 2 drain systems	59	950,000 (2003 – 2008)	Buhusi

Table 5-5: County of Bacau – sources of supply for the WSZ

Local groundwater protection areas including fences and borders are existing at the wellfields.

5.1.1.3 WSZ Bacau

5.1.1.3.1 Water Quantity

WSZ Bacau is supplied by several water sources:

- Water Treatment Plant Caraboaia ; pumping station capacity for Bacau: 250 l/s
- Groundwater source Margineni (Margineni I and II) capacity: 160 l/s
- Groundwater source Hemeius (Hemeius I and II) capacity: 190 l/s
- Groundwater source Gheraiesti (Gheraiesti I and II) capacity: 335 l/s
- Additional Groundwater sources in the communes of Margineni, Magura, Hemeius and Letea Veche.

Water from WTP Caraboaia is transported approx. 65 km by a steel pipe DN 800. On the way to Bacau there is one additional chlorination station in locality Stejaru, commune of Scorteni, approx. 17 km located in the east of Bacau City.

The table below shows the numbers of wells per wellfields.

GW Field	Number of wells	Capacity [l/s]
Margineni I	28	80
Margineni II	16	80
Hemeius I	13	110
Hemeius II	5	80
Gheraiesti I	44	195
Gheraiesti II	44	140

Table 5-6: Overview of wells per groundwater field in WSZ Bacau

Monthly variation of water production / supply

The next figure provides the production of water for the year 2008 and 2009.

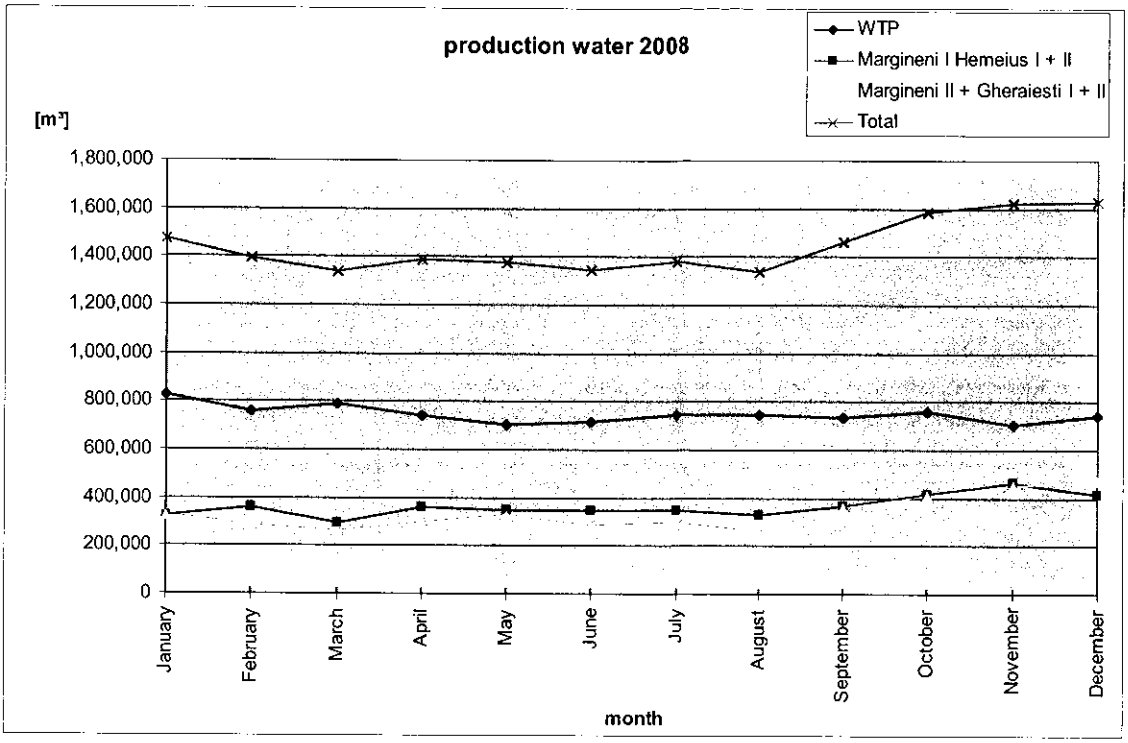

Figure 5-6: Monthly production of water for WSZ Bacau in 2008

A total of 17,363,016 m³ were supplied in 2008, 52% from the WTP at Darmanesti and 48% from the well fields.

The next figure gives an overview of the situation of billed and produced water in the year 2008

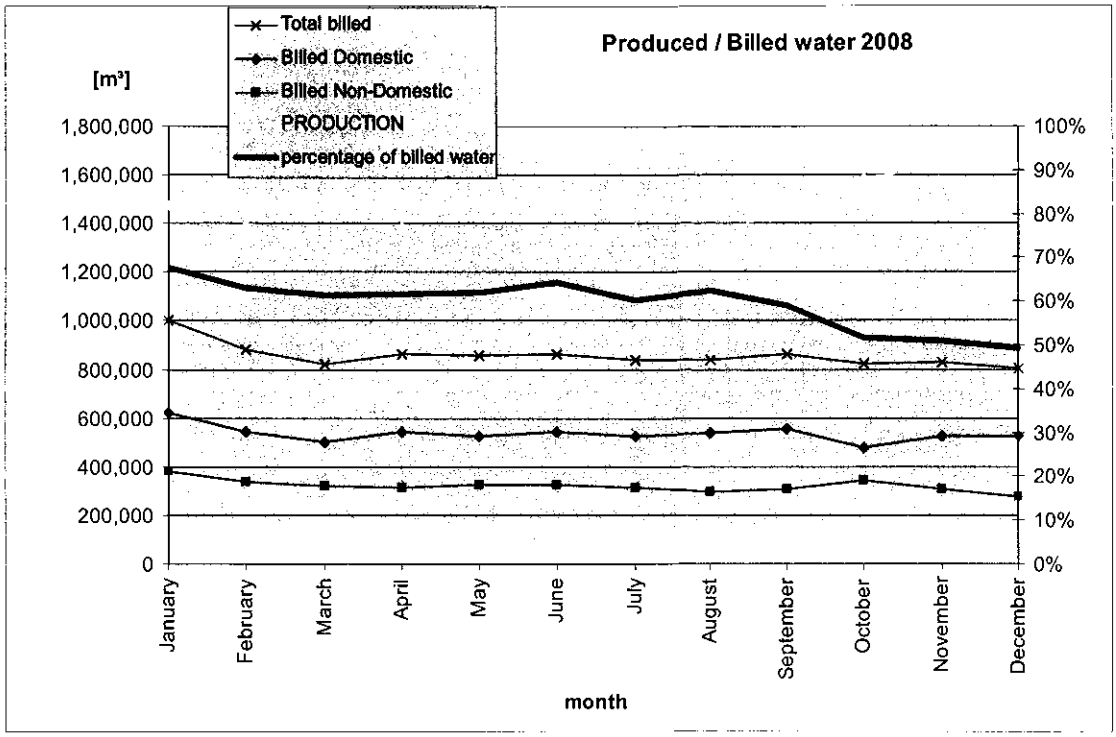

Figure 5-7: Overview of produced and billed water in 2008 for WSZ Bacau

The yearly average of billed water in 2008 sums up to 60 %.

The next figure gives an overview of the situation of billed and produced water in the year 2009, except December.

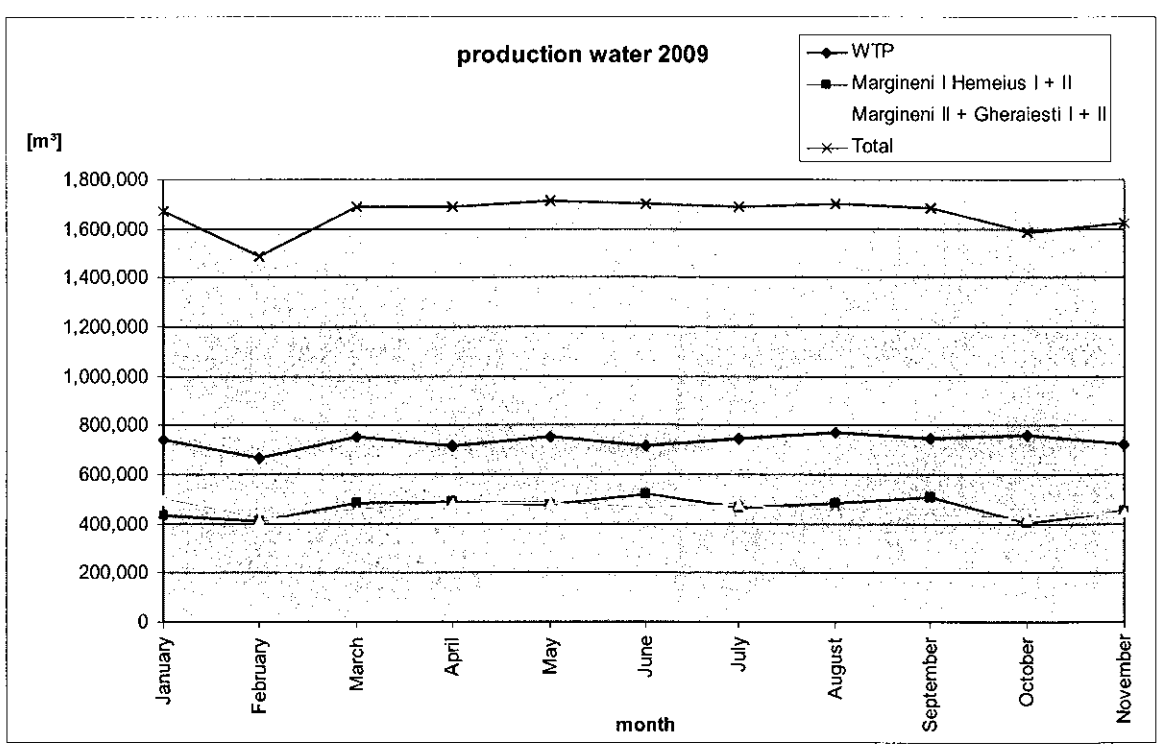

Figure 5-8: Monthly production of water for WSZ Bacau in 2009, except December

A total of 18,246,633 m^3 were supplied in 2009 until November 2009, 44% from the WTP at Darmanesti and 56% from the well fields. So the production of water in 2009 is higher than in 2008.

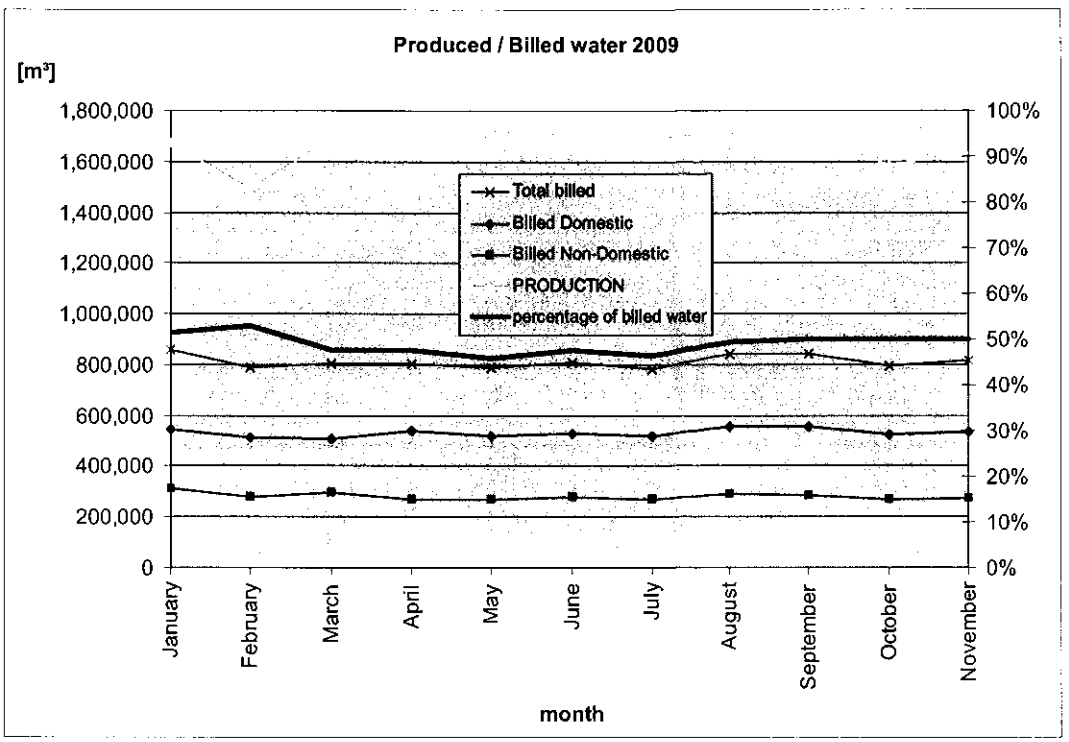

Figure 5-9: Overview of produced and billed water in 2009, except December, for WSZ Bacau

The yearly average of billed water in 2009, except December, sums up to 49 %.

The next figure shows the water production for the years 2003 – 2008.

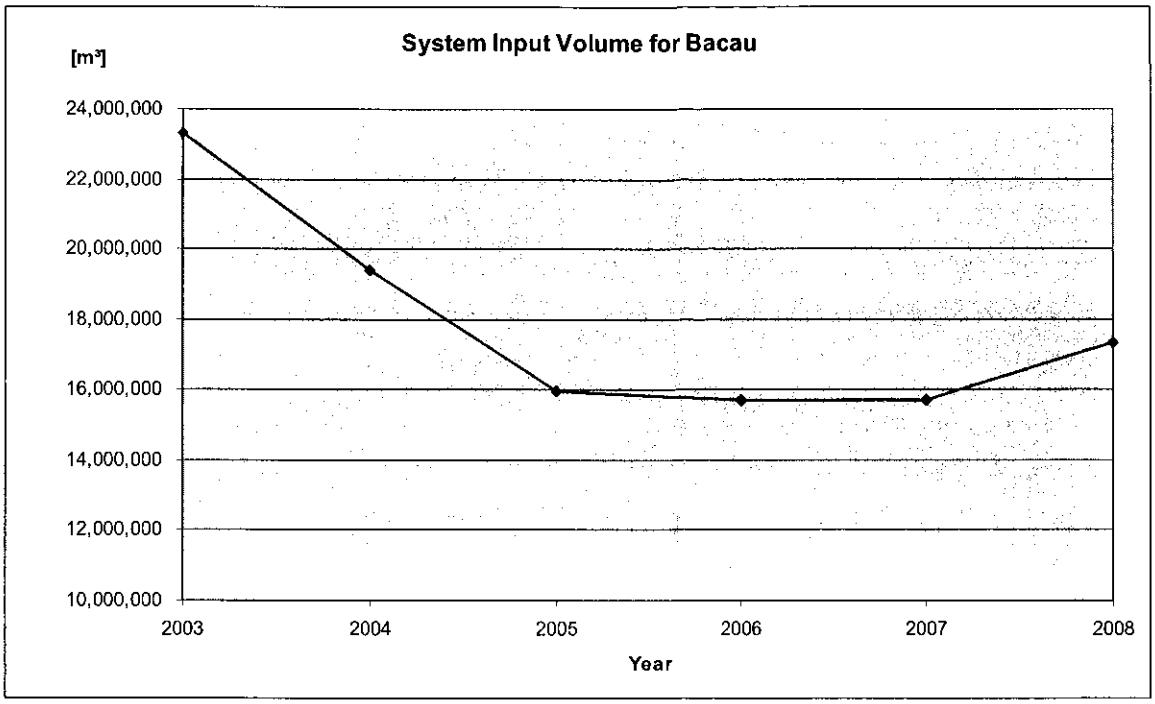

Figure 5-10: System Input Volume from 2003 – 2008 for WSZ Bacau

The figures in the next table confirm that the capacity of the existing systems is sufficient to supply drinking water to the inhabitants of the WSZ over the project horizon:

Nr.	Potable water source	Number of pumps	Pumping Station	Maximum capacity 2010 [l/s]	Maximum capacity 2012 [l/s]	Maximum demand until 2037 [l/s]
1a	WTP Caraboaia	2	Caraboaia	250	800 (Only Area Mojnesti-Onesti)	**658***
1b	WTP Barati			0	800	
2	Margineni I, Hemeius I + II well fields	6	Margineni	280	No Potable Supply	
3	Margineni II, Gheraiesti I + II well fields	6	Gheraiesti	415	No Potable Supply	
TOTAL WSZ BACAU				**945**	**800**	**658***

Table 5-7: Overview of capacity vs. demand WSZ Bacau

* includes also industrial water which is planned to be provided by Ground Water sources

The maximum demand in the table above includes demands calculated in Annex to the CBA, and shows that a supply only by the WTP Barati, which is under construction now (ISPA project), can be done.

5.1.1.3.2 Water Quality

Quality of distributed water to the WSZ is shown in the following table.

WATER QUALITY DATA:

Year 2008		TREATED water from WTP Caraboaia	RAW water		TREATED water		
Parameters	**Limit EC 98**	RSV (Barati)	Gheraiesti	Margineni	Barati	Gheraiesti	Margineni
Oxidability	5 mg/l O_2	2.3	0.8	0.5			
Turbidity	1 NTU	3.61	0.45	0.41			
Ammonium NH_4^+	0.5 mg/l	0	0	0			
Nitrate NO_3	50 mg/l	3.34	4.4	33.5			
Nitrite NO_2^-	0.05 mg/l	0	0.005	0			
Iron Fe	200 µg/l	106	15	9			
Manganese Mn	50 µg/l	5	121	6			
Lead Pb	10 µg/l	0	0	0			
Cadmium Cd	5 µg/l	0	0	0			
Chlorid Cl-	250 mg/l	9.9	28.3	90.7			
Sulfat SO42-	250 mg/l	25.1	33.4	90.3			
Chromate Cr6+	50 µg/l	0	0	0			
Copper Cu2+	2 mg/l	0	0	0			
Nichel Ni2+	20 µg/l	0	0	0			
pH	>6.5 / <9.5	7	7.1	7			
Enterococci	0 No/100 ml	-	-	-			
E. coli	0 No/100 ml	-	-	-			

Table 5-8: Water Quality of raw and treated water in WSZ Bacau

5.1.1.4 WSZ Moinesti

5.1.1.4.1 Water Quantity

WSZ Moinesti is supplied only by Water Treatment Plant Caraboaia.

Monthly variation of water production / supply

The next figure provides the production of water for the year 2008 and 2009.

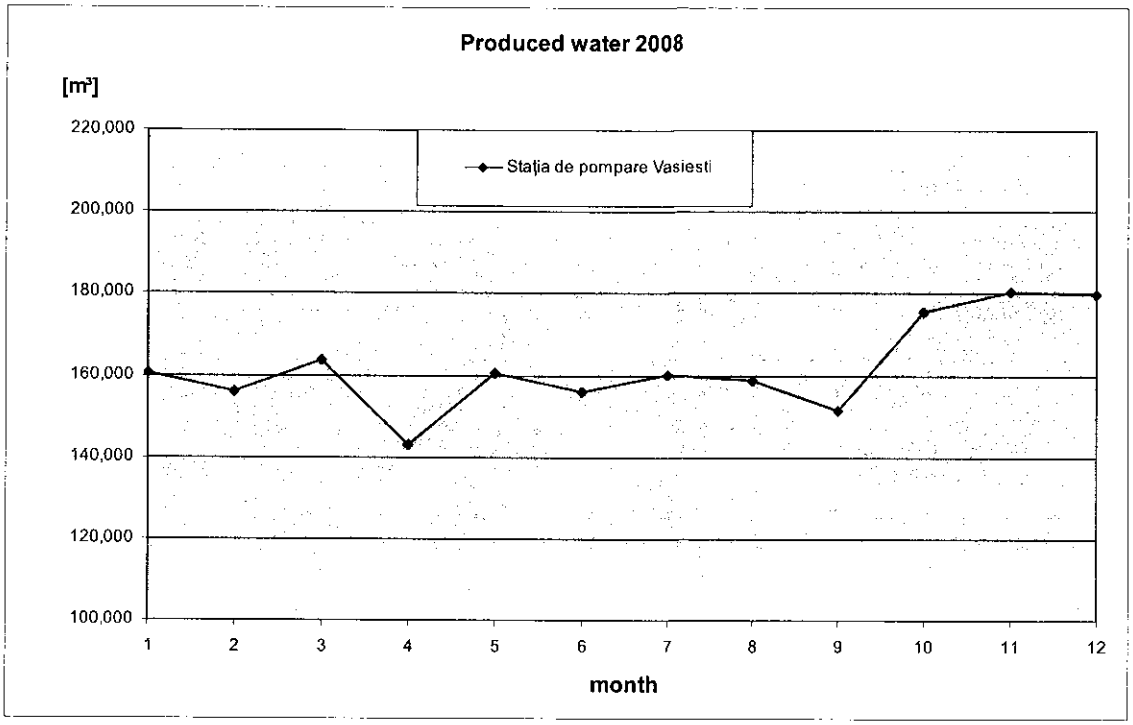

Figure 5-11: Monthly production of water for WSZ Moinesti in 2008

A total of 1,946,006 m³ were supplied in 2008, 100% from the WTP Caraboaia at Darmanesti.

The next figure gives an overview of the situation of billed and produced water in the year 2008

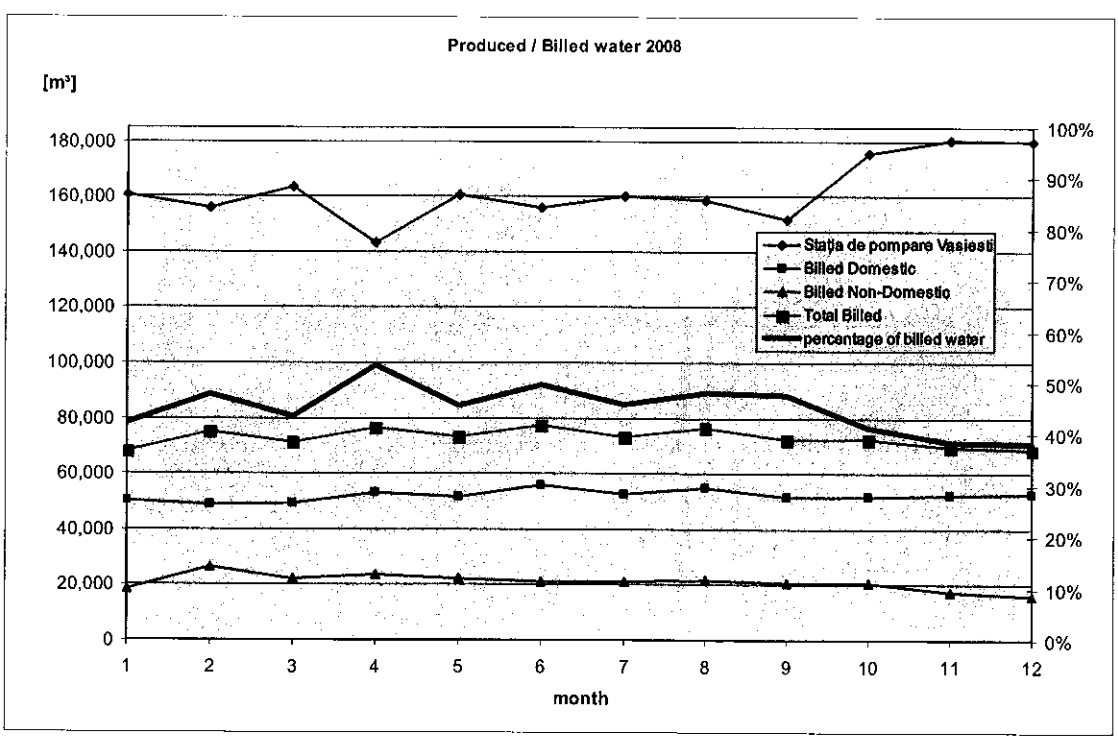

Figure 5-12: Overview of produced and billed water in 2008 for WSZ Moinesti

The yearly average of billed water in 2008 sums up to 45 %.

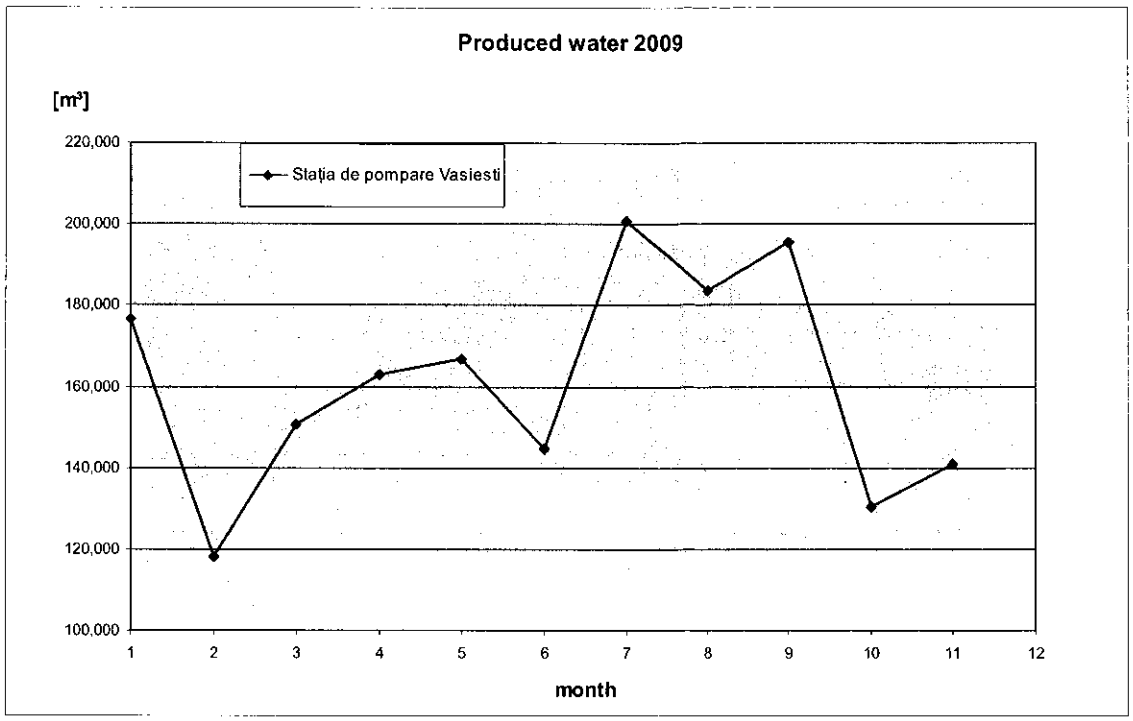

Figure 5-13: Monthly production of water for WSZ Moinesti in 2009, except December

A total of 1,771,839 m^3 were supplied in 2009 until November 2009, 100 % from the WTP at Darmanesti.

The next figure shows the water production for the years 2003 – 2008.

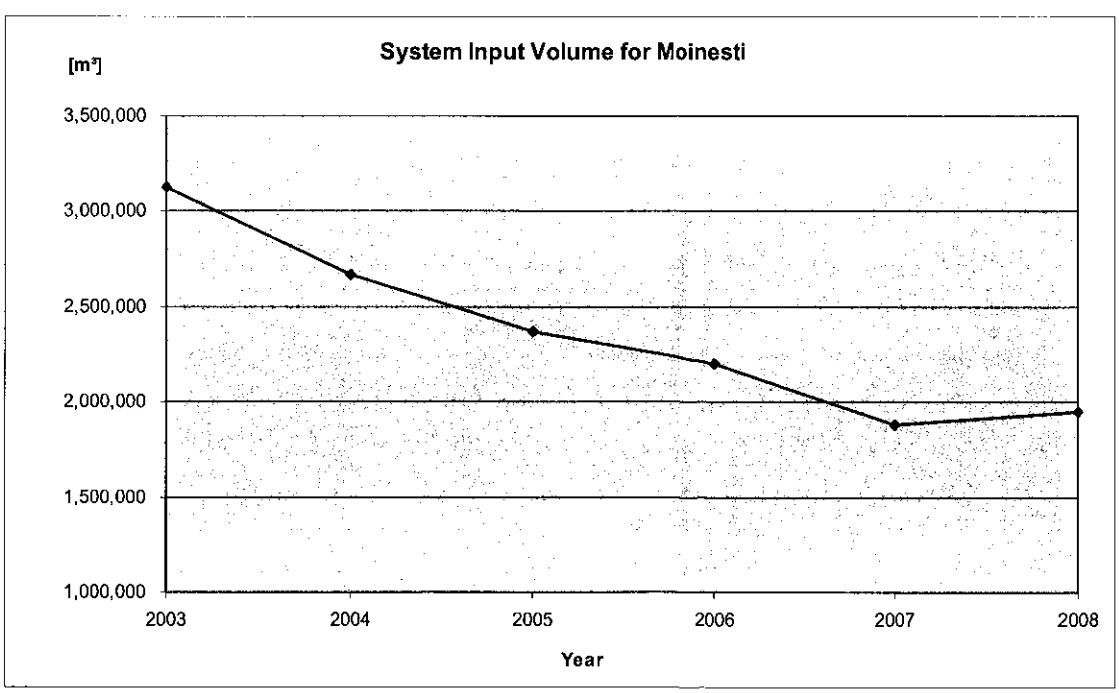

Figure 5-14: System Input Volume from 2003 – 2008 for WSZ Moinesti

The figures in the next table confirm that the capacity of the existing systems is sufficient to supply drinking water to the inhabitants of the WSZ over the project horizon:

Nbr.	Raw water source	Number of pumps	Pumping Station	Maximum capacity [l/s]	Maximum demand until 2037 [l/s]
1	WTP Caraboaia	2	Caraboaia	230	59

Table 5-9: Overview of capacity vs. demand WSZ Moinesti

The maximum demand in the table above includes demands calculated in Annex to the CBA, and shows sufficient capacity of the main, which was designed also to supply Darmanesti and partly Comanesti.

5.1.1.4.2 Water Quality

Quality of distributed water to the WSZ is shown in the following table:

WATER QUALITY DATA:

Parameters	Limit EC 98	Concentration
Oxidability	5 mg/l O_2	
Turbidity	1 NTU	
Ammonium NH_4^+	0.5 mg/l	
Nitrate NO_3	50 mg/l	
Nitrite NO_2^-	0.05 mg/l	

Table 5-10: Water Quality of water in WSZ Moinesti

As shown in the table above in Moinesti there are significant problems with turbidity what is caused by the insufficient treatment at WTP Caraboaia. Furthermore there are also problems with the oxidability which is really high. Water quality analysis for WSZ Moinesti is made and monitored by the National Health Agency, called "Autoritatea de Sanatate Publica a Judetului Bacau". Due to the fact that not all important parameters are controlled and measured it is important that the water quality analysis system and water quality monitoring system must be improved.

5.1.1.5 WSZ Buhusi

5.1.1.5.1 Water Quantity

WSZ Buhusi is supplied only by groundwater sources. There are three groundwater sources within WSZ Buhusi:

- Poiana Morii
- Bistrita
- Coscau

Usually only water from groundwater source Poiana Morii is used for water supply. Bistrita and Coscau are used as additional water sources during peak days. There is another groundwater source called Frunzeni which is not used since approx. 20 years and even no pumps and any electrical equipment is installed any more.

Monthly variation of water production/supply

The next figure provides the production of water for the year 2008.

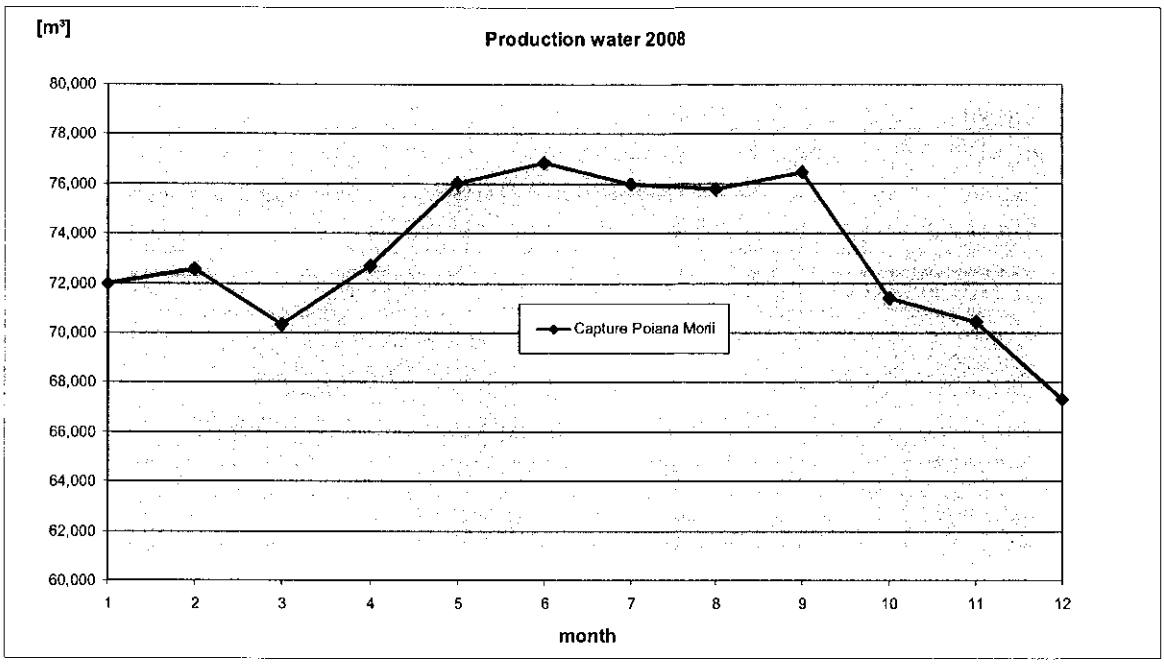

Figure 5-15: Monthly production of water for WSZ Buhusi in 2008

A total of 900,000 m³ were supplied in 2008, 100% from groundwater source Poiana Morii.

The next figure gives an overview of the situation of billed and produced water in the year 2008.

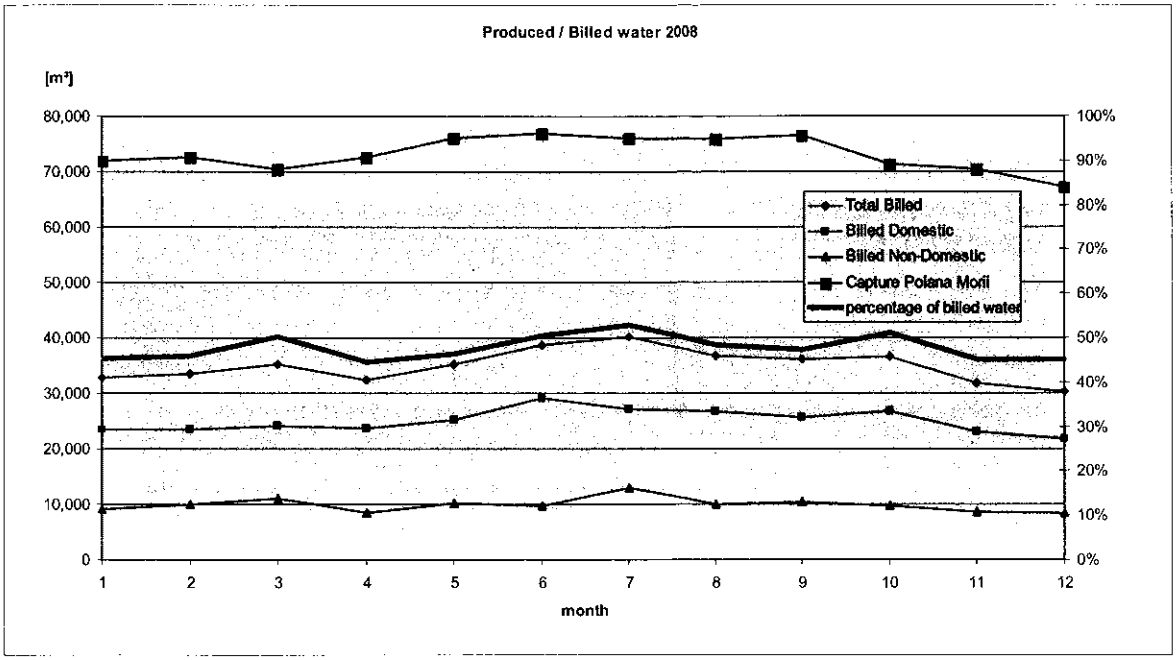

Figure 5-16: Overview of produced and billed water in 2008 for WSZ Buhusi

The yearly average of billed water in 2008 sums up to 48 %.

The next figure shows the water production for the years 2003 – 2008.

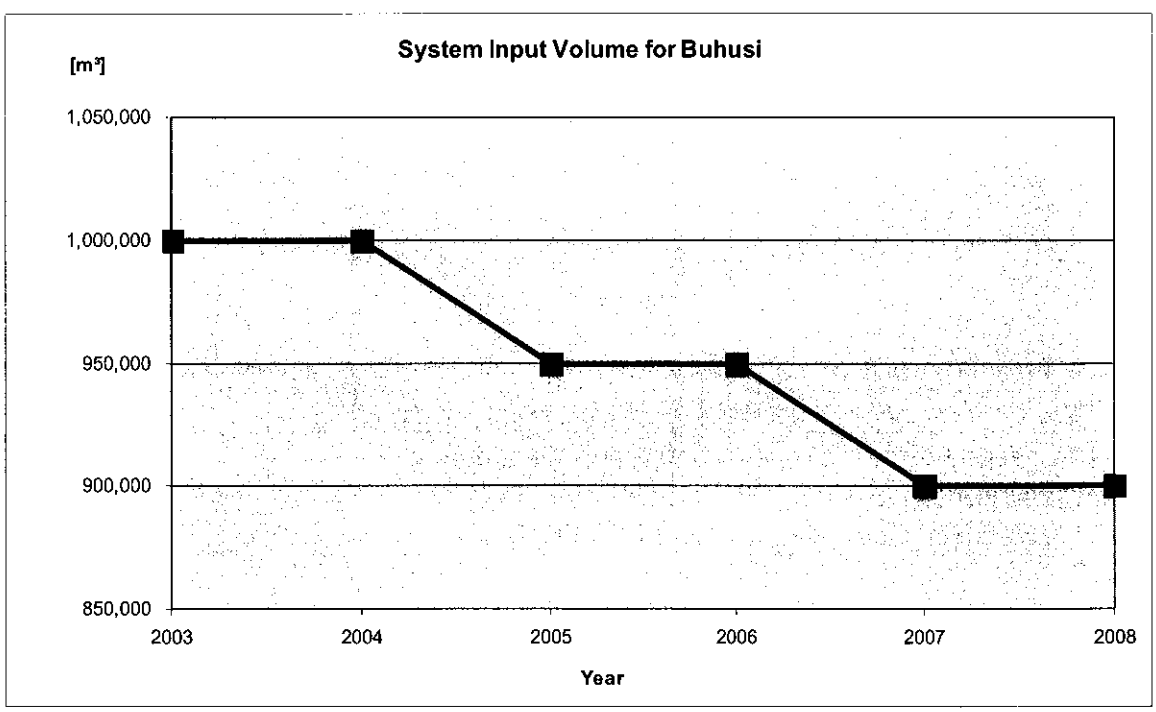

Figure 5-17: System Input Volume from 2003 – 2008 for WSZ Buhusi

The figures in the next table confirm that the capacity of the existing systems is sufficient to supply drinking water to the inhabitants of the WSZ over the project horizon.

Nbr.	Raw water source	Number of wells	Maximum capacity [l/s]	Maximum demand until 2037 [l/s]
1	Poiana Morii	8	35	42
2	Bistrita	drain	4	
3	Coscau	drain	20	
TOTAL WSZ BUHUSI			59	42

Table 5-11: Overview of capacity vs. demand WSZ Buhusi

The maximum demand in the table above includes demands calculated in Annex to the CBA, and shows that for a sufficient supply also the Coscau source must be kept in operation.

5.1.1.5.2 Water Quality

Quality of distributed water to the WSZ is shown in the following table.

WATER QUALITY DATA:

Parameters	Limit EC 98	RAW water			TREATED water
		Poiana Morii	Coscau	Bistrtita	at RSV 1,000 m³
Enterococi	0 No/100 ml	0	0	0	
E. coli	0 No/100 ml	0	0	0	
Ammonium NH_4^+	0.5 g/l	0	m0	0	-
Nitrate NO_3	50 mg/l	33	45	19	-
Nitrite NO_2^-	0.05 mg/l	0	0	0	-
Cl	250 mg/l	51	51	34	-
Oxidability	5 mg/l O_2	5.9	5.4	6.3	-
pH	>6.5 / <9.5	7	7	7	-

Table 5-12: Water Quality in WSZ Buhusi

The over handed water quality analysis data are very poor, the monitoring and measuring system is to improve.

5.1.1.6 WSZ Darmanesti

WSZ Darmanesti is supplied only by Water Treatment Plant Caraboaia. It is connected to the pressure pipe which is feeding also Moinesti supply system.

Monthly variation of water production / supply

The next figure provides the production of water for the year 2008.

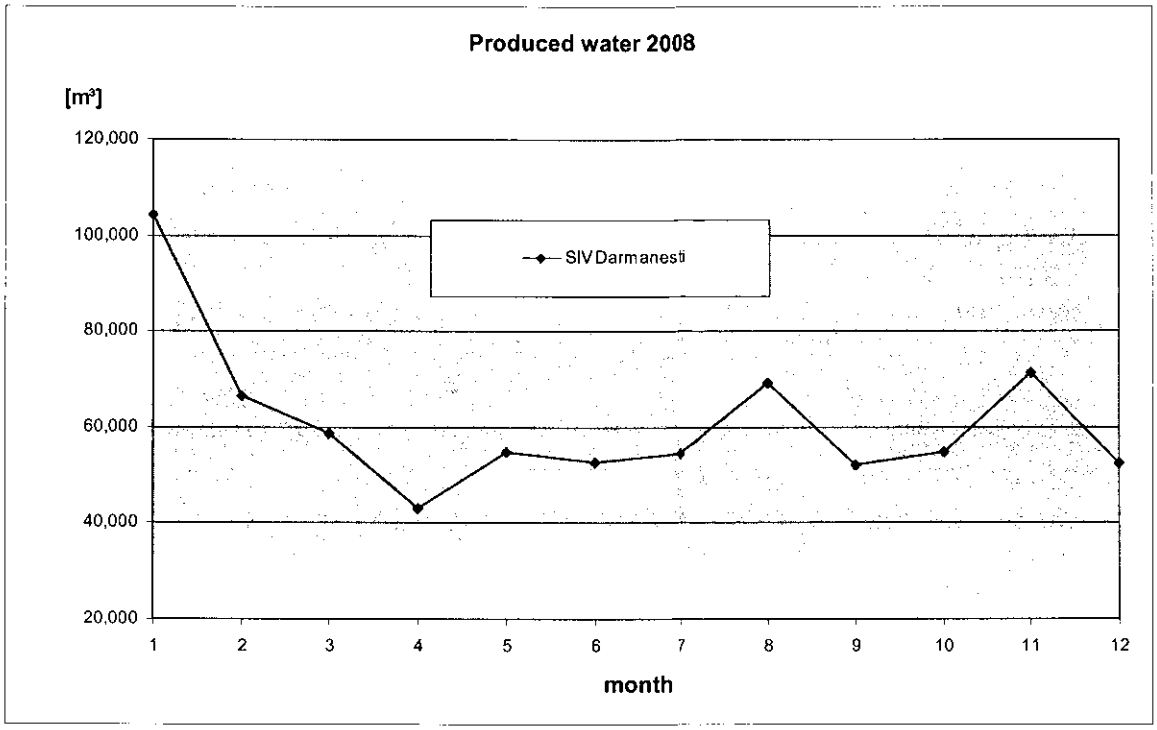

Figure 5-18: Monthly production of water for WSZ Darmanesti in 2008

A total of 734,659 m³ were supplied in 2008, 100% from the WTP Caraboaia at Darmanesti.

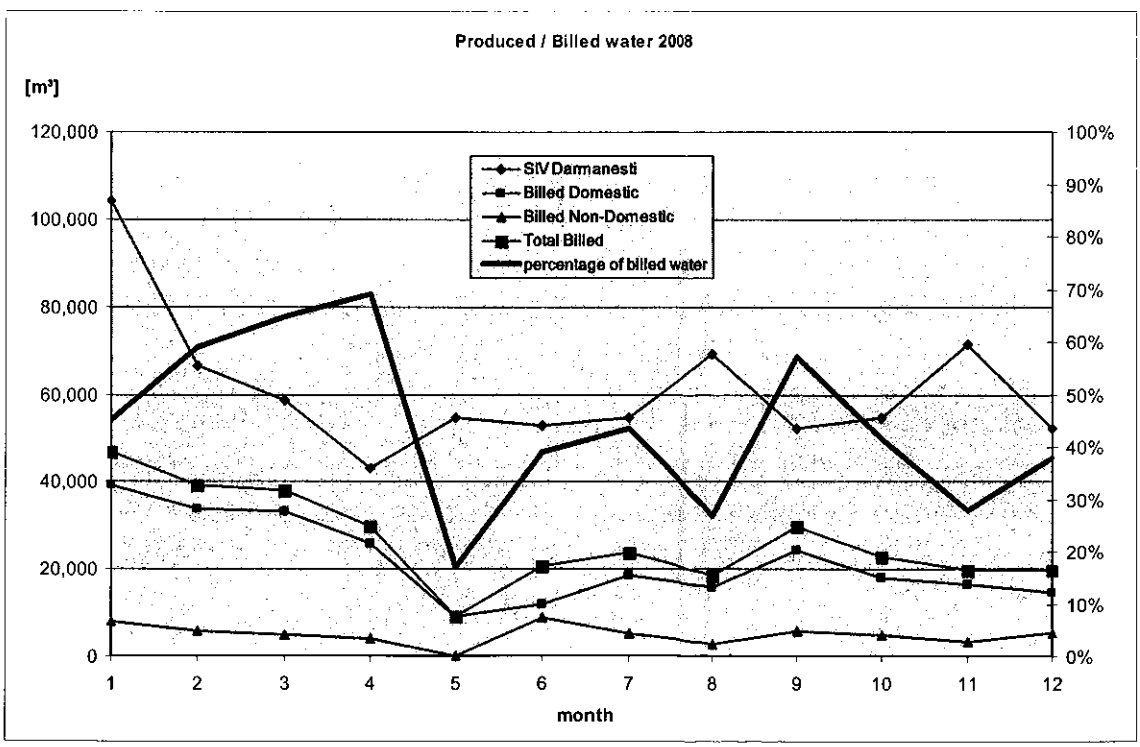

Figure 5-19: Overview of produced and billed water in 2008 for WSZ Darmanesti

The provided data from the operator sum up to an average of 51% level of losses in the year 2008.

200