LIST OF FIGURES

ABSTRACT

Chapter 10

1) Content of Chapter 10

This chapter presents the project defined for the priority agglomerations in the County of Bacau and gives the impact of this project on the existing situation in the water sector. It includes details about the characteristics of each measure and its justification.

Technical specifications as well detailed system calculations (process calculation and description, hydraulic compilation based on respective flows and loads, etc.) are given in the annex volume II. Reference to these annexes is given respectively for each of the proposed system components.

The proposed technical assistance has been described since it is a main accompanying instrument for successful project implementation. This will include strengthening the managerial, administrative, and commercial capacity of the operating company in order to ensure reliability of the system in place. In Addition, construction supervision will be subject of an international contract to guarantee putting in place a reliable improved water service according to valid standards.

The cost breakdown of all investment as well as operation and maintenance costs is presented in this chapter, including construction cost estimates and costs for accompanying measures. The investment cost breakdown for each agglomeration is separated in the main project components. In order to ease determination of impact of each work on the project, values before and immediately after project implementation are presented separately.

Costs for implementation and for operation and maintenance will build the basis for calculations in the Financial and Economic Sections of the FS

Finally, the aggregation of unit costs as a result of investment costs and quantities of implemented infrastructure has been carried out according to the given template.

10 PROJECT PRESENTATION

10.1 Overall Project Presentation

10.1.1 Investment Strategy

10.1.1.1 General

For water as well as for wastewater, the investment strategy targets the most cost-efficient solutions for improvement of the services with regard to the financing constraints. Small changes of the Master Plan output have been integrated in the Feasibility Study as result of the option analysis and more detailed study of the existing situation in all agglomerations. Nevertheless, the key Strategy of the Master Plan has not been changed.

Apart from the consideration of the objectives for financing through the cohesion fund and the relevant development strategies and programmes, the following elements have been the main steps for definition of detailed project measures in the Feasibility study.

- The guidance of the Master Plan and confirmation of compliance issues;
- Detailed study of the existing situation;
- Review of central / de-central options and clustering;
- Study of supply strategies;
- Detailed option analysis
- Harmonisation of measures between the water and wastewater sector;

The definition of investment itself has been setup already in the Master Plan. The present chapter includes a review of this strategy.

The water supply sector will benefit from extension of the distribution networks for full compliance with the Directive and Accession Treaty in the selected water supply zones. In addition, water supply sources have been proposed for improvement in order to ensure compliance with Directive (80/778/EEC) for water intended for human consumption. Compliance with the directive (98/83/EC) for treated water has been considered by improvement of water treatment units.

The wastewater sector measures have been quantified towards compliance with the UWWD (91/271/EEC). For wastewater collection, compliance is reached for all agglomerations of more 10,000 P.E. as intermediate target according to Article 3 of the Directive. Wastewater treatment, with improvement and/or new construction of effective facilities, will be compliant through inclusion of tertiary treatment.

Improvement measures have been harmonized and crosschecked for both water and wastewater sectors.

10.1.1.2 Investment Priorities and Strategy of Improvement

Only a limited number of projects were recognised as priority for Cohesion Fund co-financing. This selection was supported by the analyses of the actual national environmental and economic situation and is in accordance with the Cohesion Fund requirements. The following facts have been taken into consideration:

- the actual state of implementation of environmental priorities;
- national obligations of implementation of environmental policy in time frame 2007-2018 in accordance with the adopted national programmes and sectoral Operational Plan (SOP Environment);
- estimated costs of implementation of EU Directives by sectors;
- negotiated transitional periods for implementation of investment-intensive EU Directives;
- eligibility criteria of Cohesion Fund co-financing (Council Regulation (EC) No. 1164/94, Commission regulation (EC) No. 16/2003, Further Indicative Guidelines for the Candidate Countries (COM (2003) 110 final, 12.3.2003);
- limited amount of Cohesion Fund resources allocated to Romania;
- availability of national matching financial sources;
- established institutional framework.

In addition to the criteria of Urban Wastewater Directive (91/271/EEC, 98/15/EC) in wastewater sector the following criteria were considered to define the priority list of investments for Cohesion Fund co-financing:

- implementation of Water Framework Directive for surface water bodies (Sub-River Basins) and groundwater bodies (protected areas for potable water)
- financially most intensive investments
- negotiated of transition period
- readiness of the projects

In addition to the criteria of Drinking Water Directive (80/778/EEC, 91/858/EEC, 90/656/EEC and 91/692/EEC) in drinking water protection and supply sector the following criteria were considered to define the priority list of investments for Cohesion Fund co-financing:

- implementation of Water Framework Directive – sustainable water supply and protection on the Sub-River Basin scale
- financially most intensive investments
- readiness of the projects

10.1.1.3 Identification of Immediate Interventions

In going through all the existing infrastructures in the priority agglomerations in Bacau, it appears that development in all components is necessary. A closer view reveals that improvement measures have been carried out in last years, as described in chapter 5. Several programmes have been implemented and local project financing (Local Council, Operator, etc.) assured small interventions in the water and wastewater sectors.

The strategy for definition of measures is based on the long-term investment plan, already designed in the Master Plan. Nevertheless, concrete needs and necessary interventions have been studied in the frame of the feasibility study.

In order to ensure reliability of the systems, interventions should be concentrated on efficient improvement towards fulfilling the compliance requirements.

The compliance requirements are necessary. Nevertheless, measures have to be defined in a way that other profits can be reached as an immediate target like the efficient and reliable protection of water resources, improvement of safety by chemical handling and keeping the installations running until the end of their service lives.

The wastewater sector is much more cost-intensive than water supply and localities above 10,000 P.E. have to reach compliance for wastewater collection and treatment by 2018. This reveals directly that priority investment has to be allocated immediately for this purpose. This investment should than be cost-effectively allocated in connecting these localities to an existing central wastewater treatment rather than the construction of a new independent WWTP. The decision has been made in comparing the central and the de-central solution as mentioned earlier in this chapter.

Moreover, existing wastewater treatment plants for agglomerations above 10,000 P.E. have to meet the required third treatment stage and respective investment should be foreseen.

Finally, at least about 90% connection rate should be reached by the CF project and near 100% by additional ROC efforts.

The compliance requirements are here also necessary. Nevertheless, measures have to be defined in a way that other profits can be reached as an immediate target like the efficient and reliable protection of surface and groundwater, choosing the most appropriate constellation for future extensions and keeping the installations running until the end of their service lives.

Sector	Directive	Subject of compliance	Measures	Immediate interventions identified in priority agglomeration for Phase I (Cohesion Fund)
Water	Accession Treaty, Cohesion fund	Connection rate after project (2015)	• Extend network and connect 90 % • Extend sources acc. to new demand • Connect unserved part of the agglom. • Harmonize with wastewater measures	• Extension of water supply network in Moinesti WSZ • Extension of water supply network in Buhusi WSZ
	80/778/EEC	Raw water quality	• Improve existing water sources • Secure existing water sources • Develop new alternative sources	-
	98/83/EC	Treated water quality (2015)	• Improve existing water treatment • Install new treatment adjusted to quality • Include efficient technologies to minimize costs for O&M	• Rehabilitate WTP including sludge treatment
	EC & Romanian standards	Security and efficiency	• Rehabilitate very old water mains • Protect water sources • Rehabilitate reservoirs • Renew worn out equipment • Install stand-by components	• Rehabilitate WTP including sludge treatment
	EC & Romanian standards	Safety	• Secure environment and personnel • Improve safety equipments by chemical handling, etc.	• Rehabilitate WTP including sludge treatment
Wastewater	Accession Treaty, Cohesion fund 91/271/EEC	Connection rate after project (2015) Wastewater treatment – (2018)	• Extend network and connect 90 % • Extend treatment acc. to new flow • Connect unserved part of the agglom. • Harmonize with water supply measures	• Network Extension in Bacau Agglomeration • Network Extension in Moinesti Agglomeration • Network Extension in Buhusi Agglomeration • Network Extension in Darmanesti Agglomeration • Network Extension in Targu Ocna Agglomeration • Extension Tertiary Treatment in Bacau Agglomeration • Extension Tertiary Treatment in Moinesti North and new Wastewater Treatment Plant incl. Tertiary Treatment in Moinesti South • New Wastewater Treatment Plant incl. Tertiary Treatment in Buhusi Agglomeration • New Wastewater Treatment Plant incl. Tertiary Treatment in Darmanesti Agglomeration New Wastewater Treatment Plant incl. Tertiary Treatment in Targu Ocna Agglomeration
	EC & Romanian standards	Sludge strategy		• Action Plan for Bacau Agglomeration • Action Plan for Moinesti Agglomeration • Action Plan for Buhusi Agglomeration • Action Plan for Darmanesti Agglomeration • Action Plan for Targu Ocna Agglomeration

Table 10-1: Summary of identified immediate interventions (Priorities for Cohesion Fund)

General time frame for implementation

The objective is to complete, test run and hand-over the works to the Regional Operating Company in 2015 ('After Project').

The details are provided in the Chapter 14.

Main difficulties and constraints foreseen

Water Supply

With regards to the measures related to Drinking Water Supply, the rehabilitation of the WTP Caraboaia will constitute the most difficult part of the works.

The network extensions will be laid into urbanised zones which by definition are more or less densely populated. In addition, the construction of pipe lines in developed areas is often a difficult exercise as any damage to existing infrastructure (at the exception of the roads that will anyway have to be reinstated after the works) must obviously be avoided.

If the level of information on other underground infrastructure is similar to the one on the water systems, a careful detection campaign will have to be carried out before the work can start to avoid severe, dangerous, and costly damages and interruption of services (gas, electricity, communication, wastewater ...) to the population.

Waste Water

To the Consultants point of view the main difficulties and constraints foreseeable are linked to the absorption capacity of the Beneficiary (ROC). This specifically refers to limited availability of qualified personnel. The parallel implementation of WWTP and wastewater network investment in a very narrow time frame will put a significant challenge upon the ROC which is hardly to be compensated by contracting of Consultants.

In addition to the ROCs limitations, a mass of infrastructural works contracts (water supply and wastewater) will have to be contracted internationally in the years 2010 – 2014 which consequently will lead to decreased availability of qualified bidders with adequate capacity to cope with the future works contracts. Hence the ROCs implementation and coordination skills in the field of infrastructural projects will be of utmost importance.

10.1.2 Main Impact of Measures and Performance Indicators Water Supply

The actual state of the different systems is illustrated and described in Chapter 5. In most cases, the pictures are 'self-explanatory' to confirm that the equipment / systems lack proper maintenance and are in a poor condition. Most of them need thorough rehabilitation or replacement.

The next table summarizes the investment measures proposed in the present Feasibility Study to improve the water supply systems in the five Agglomerations of the project:

Water Supply Zone	Investment Measures	Quantities	Justification
Bacau	Rehabilitation of WTP Caraboaia	1	At the existing plant there are very high water losses due to the fact that no sludge treatment is existing. All wet sludge is discharged into a creek nearby the plant. Furthermore the quality of the treated water has a turbidity which is not in line with the Directive **98/83/EC. On the other hand the electrical and mechanical equipment, pipe galleries and the total backwash and filter equipments are in a bad condition and have to be rehabilitated.**
	Rehabilitation of Asbestos Cement pipes (these investments are financed by 'other funds' and will not be covered by Cohesion Fund)	24,4 km	Measurements in the district Serbanesti (refer to Annex 3-3) show that the old Asbestos Cement pipes cause a very high level of losses .Approx. above 80% (in district Serbanesti). These old (built in 1960) pipes made up of Asbestos Cement shall be rehabilitated.
Moinesti	Network extensions Installation of Standard House Connections	3.5 km 315 pcs	2008 connection rate = 84% Number of additional people connected = 840 p Connection rate after project = 90%

Water Supply Zone	Investment Measures	Quantities	Justification
Buhusi	Network extensions Installation of Standard House Connections	6.3 km 300 pcs	2008 connection rate = 85% Number of additional people connected = 820 p Connection rate after project = 90%

Table 10-2: Summary of investment measures

Main impact of investment measures

The next table summarizes the main impacts of the various measures recommended for implementation:

Measures	Main Impacts
WATER SUPPLY	
Rehabilitation of WTP Caraboaia	The Level of losses will be reduced; The water quality will be improved; The consumption of energy will be optimized; The reliability of the chlorination process will be improved; The security situation (esp. by chlorination process) will be improved; An additional sludge treatment will improve the environmental situation; The overall system, treatment and filtration process performance will be improved.
Rehabilitation of Asbestos Cement pipes (these investments are financed by 'other funds' and will not be covered by Cohesion Fund)	The Level of losses in these old pipes will be reduced
Network extensions incl. Installation of new water meters (*all WSZs*)	The connection rate is ≥ 90%

Table 10-3: Main impact of Investment Components

Main result of each investment component

The next table provides an overview of the main results of each investment component per WSZ:

WSZ	Investment components	Main Results
Bacau	Rehabilitation of WTP Caraboaia	Reduction of water losses → saving of approx. 1.8 million m³/year Improvement of water quality especially regarding turbidity Implementation of sludge treatment
	Rehabilitation of Asbestos Cement pipes (these investments are financed by 'other funds' and will not be covered by Cohesion Fund)	Reduction of water losses → saving of approx. 835,000 m³/year
Moinesti	Network extensions and Installation of Standard House Connections	Connect 840 additional people (connection increased from 84% to 90%).
Buhusi	Network extensions and Installation of Standard House Connections	Connect 820 additional people (connection increased from 85% to 90%).

Table 10-4: Main results of Investment Components

10.1.2.1 Water Supply Zone Bacau

10.1.2.1.1 Rehabilitation WTP Caraboaia

Water Treatment Plant Caraboaia, located nearby Darmanesti, is the most important water source for County Bacau. At the moment all important and also the biggest City systems including the biggest industrial cities are supplied by this WTP. Roughly half of the population of Bacau County are connected to WTP Caraboaia.

The WTP Caraboaia is not well operated at the moment. There are a lot of water losses, all the backwash water is discharged untreated into a creek, due to inefficient mixing and flocculation processes no good results of treatment (esp. turbidity) can be achieved.

Rehabilitation of WTP Caraboaia will improve the general situation of the plant. Water losses will decrease by implementing facilities for sludge dewatering and a new treatment technology. Furthermore a new mixing chamber will be built to improve the mixing and flocculation process. These measures will also affect water quality of treated water.

Year 2008	Produced TOTAL	Produced Onesti	Produced Bacau	Produced Comanesti	for Process	losses
	[m³]	[m³]	[m³]	[m³]	[m³]	[%]
Jan	2,551,245	no data	no data	no data	no data	no data
Feb	2,322,901	878,084	756,316	366,901	321,600	13.84%
Mrch	2,415,447	887,124	790,766	399,007	338,550	14.02%
Apr	2,132,211	881,991	741,751	347,658	160,811	7.54%
May	2,093,835	960,145	702,813	366,286	64,591	3.08%
June	2,177,798	999,337	714,667	384,170	79,624	3.66%
July	2,233,001	1,065,989	747,079	392,957	26,976	1.21%
Aug	2,256,270	1,056,959	749,035	418,652	31,624	1.40%
Sep	2,203,495	946,681	734,735	371,201	150,878	6.85%
Okt	2,255,819	896,333	761,324	279,067	319,095	14.15%
Nov	2,150,800	890,365	704,375	352,319	203,741	9.47%
Dec	2,211,414	925,968	742,099	393,055	150,292	6.80%
TOTAL	**27,004,236**	**10,388,976**	**8,144,960**	**4,071,273**	**1,847,782**	**6.84%**

Table 10-5: Water Losses at WTP Caraboaia in 2008

Additional Sludge dewatering facilities will cause water losses of approx. 7.8 m³/d respectively approx. 2,847 m³/year (max. daily sludge: 12 t, dry solid : 35%) This sums up to approx. 0,11 per mill of water losses (produced water : 69,120 m³/d). Comparing to the year 2008 this would mean a saving of more than 1.8 million m³ raw water.

Note: WTP Caraboaia is included in this chapter because it was agreed to include this investment in the agglomeration Bacau although the agglomeration will only be supplied by the WTP Barati after the project and not more by Caraboaia.

10.1.2.1.2 Rehabilitation of Asbestos Cement pipes in Bacau City

Due to budget constraints the Rehabilitation of Asbestos Cement pipes in Bacau City will be financed not by Cohesion Fund. The financing will be done by any other funds. The pipes made up of Asbestos Cement were built approx. in the year 1960. In the meantime the pipes are damaged and show a high level of losses. Just for example: in district Serbanesti there is a level of losses of higher than 80%. Details and recordings about that can be found in Annex 3-3.

In total 24 .4 km of pipes made up of AC will be rehabilitated. This will save also a big amount of water in WSZ Bacau.

10.1.2.1.3 Performance Indicators Water Supply Zone Bacau for CF measures

Item	Indicator	Unit	Before Project	After Project
2.1.1.	Total population in service area concerned (water supply zone)	capita*1000	197	195
2.1.2	Service Coverage: Percent of population connected to water supply system (2.1.3/2.1.1)	% of 2.1.1	90	90
2.3.6	Specific domestic water consumptions	lcd	104	97
2.4.14	Population served per length of water supply network (distribution network + water mains)	capita/km	909	899
2.4.15	Production capacity installed (minimum capacity of wells, pumping stations, WTP)	1000 m3/d	69.1	69.1
2.4.7	Length of transmission mains	km	79	79
2.4.8	Percent of transmission mains rehabilitated	% of 2.4.7		0
2.4.10	Length of distribution network	km	116	116
2.4.11	Percent of distribution network rehabilitated	% of 2.4.10		0
2.5.1	Total non-revenue water (IWA standard: Total system input - total water sold)	1000 m^3/d	34.81	21.62
2.5.2	Percent of non-revenue water (2.5.1/2.2.1)	% of 2.2.1	55	46
2.5.4	Percent of real water losses (physical losses) in the network (excluding technical losses in the WTP)	%	33	41
2.5.5	Real water losses per number of connections (at average system pressure of 30 -40 m)	litres/con/day	1,364	1,249
2.7.1	Average electricity consumption (treatment plant + pumping stations)	1000 kWh/a	4745	5332
2.7.2	Average electricity consumption (treatment plant + pumping stations) per volume of water produced	kWh/m^3	0.2	0.3
2.8.4	Metering level (2.8.1. Total number of connections with water meter / 2.4.19 Total number of water service connections)	% of 2.4.19	96.5	100

Table 10-6: Performance Indicators Bacau

The impact of the proposed measures (CF) on the operation and maintenance costs is summarized in the table below.

Cost Item	Before Project	After Project	Savings [€/y]	% of reduction
Energy	614,605	417,513	197,092	32%
Chemicals/Materials	291,930	183,350	108,580	37%
Staff	2,525,934	2,520,088	5,845	0.23%
Maintenance*	207,484	262,615	-55,131	-27%
Others	1,892,152	2,471,126	-578,974	-31%
TOTAL	**5,532,104**	**5,854,692**	**-322,588**	**-6%**

Table 10-7: O&M Impact of Measures Water Supply Zone Bacau

*Note: Maintenance costs for rehabilitated WTP Caraboaia are included due to the fact that investments for Rehabilitation of WTP Caraboaia are allocated to WSZ Bacau

10.1.2.2 Water Supply Zone Comanesti - Moinesti

10.1.2.2.1 Extension Water Supply Network Moinesti

As described in chapter 3 only settlements of Moinesti and GAzarie are considered.

The proposed extensions for water supply network in Moinesti increase the connection rate to 90 % and ensure the supply of the population with drinking water.

Moinesti will be supplied in future by the new PS Vermesti. Connection of Water supply system Moinesti to this PS is already done. For filling the RSVs in Moinesti they use at the moment the old PS Vasiesti because the new PS Vermesti is operated by Apa Serv Bacau. But by creation of one ROC in Bacau it will be no problem to use PS Vermesti. The advantage by this solution is also that at PS Vermesti a chlorination station is existing, so that the old chlorination station at RSV Pini can be decommissioned as well as chlorination with Calciumhypochlorite at RSV Micleasca.

Furthermore it is necessary to cut the connection of district Hangani to RSV Hangani because RSV Hangani is working as pressure break tank. District Hangani shall be connected to the main pipe laying in the National road DN 2G (a part of that district is already connected to that pipe). Otherwise a sufficient pressure level and also a sufficient fire flow cannot be ensured. On the other hand there is enough storage capacity in the RSVs of Parc Pini, Micaleasca and Christea (total 8,040 m^3) in combination with the PS Vermesti (RSV of 300 m^3) which can pump whenever it is necessary. This is also shown in the next figure:

Figure 10-1: Measures proposed to change the water supply sytem

The modified water supply system for Moinesti shall work like shown in the next figure :

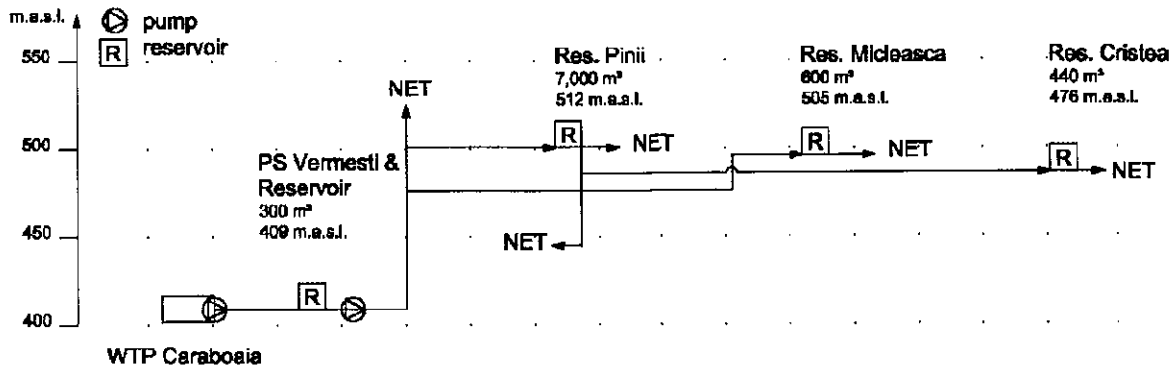

Figure 10-2: Modified water supply sytem of Moinesti

It is also proposed to implement a SCADA System which allows to control the operation time of the pumping station Vermesti. Therefore it is necessary to equip the automatically valves in the RSVs (already existing, refer to chapter 5) with a communication tool connected to the PS Vermesti.

10.1.2.2.2 Performance Indicators Water Supply Zone Moinesti

Item	Indicator	Unit	Before Project	After Project
2.1.1.	Total population in service area concerned (water supply zone)	capita*1000	24	24
2.1.2	Service Coverage: Percent of population connected to water supply system (2.1.3/2.1.1)	% of 2.1.1	84	90
2.3.6	Specific domestic water consumptions	lcd	88	82
2.4.14	Population served per length of water supply network (distribution network + water mains)	capita/km	436	429
2.4.15	Production capacity installed (minimum capacity of wells, pumping stations, WTP)	1000 m3/d	5.2	4.4
2.4.7	Length of transmission mains	km	22	22
2.4.8	Percent of transmission mains rehabilitated	% of 2.4.7		0
2.4.10	Length of distribution network	km	24	28
2.4.11	Percent of distribution network rehabilitated	% of 2.4.10		0
2.5.1	Total non-revenue water (IWA standard: Total system input - total water sold)	m^3/d	2.66	1.90
2.5.2	Percent of non-revenue water (2.5.1/2.2.1)	% of 2.2.1	51	44
2.5.4	Percent of real water losses (physical losses) in the network (excluding technical losses in the WTP)	%	42	40

Item	Indicator	Unit	Before Project	After Project
2.5.5	Real water losses per number of connections (at average system pressure of 30 -40 m)	liters/con/day	273	211
2.7.1	Average electricity consumption (treatment plant + pumping stations)	1000 kWh/a	1,057	1,105
2.7.2	Average electricity consumption (treatment plant + pumping stations) per volume of water produced	kWh/m³	0.6	0.7
2.8.4	Metering level (2.8.1. Total number of connections with water meter / 2.4.19 Total number of water service connections)	% of 2.4.19	62.8	100

Table 10-8: Performance Indicators Moinesti

The impact of the proposed measures on the operation and maintenance costs is summarized in the table below.

Cost Item	Before Project	After Project	Savings [€/y]	% Reduction
Energy	80,853	72,161	8,692	11%
Chemicals/Materials	8,918	7,105	1,813	20%
Staff	160,291	159,267	1,024	0.64%
Maintenance	33,660	39,150	-5,490	-16%
Others	364,906	147,087	217,819	60%
TOTAL *	**648,628**	**424,770**	**223,858**	**35%**

Table 10-9: O&M Impact of Measures Water Supply Zone Moinesti

*Note : Treatment costs are mentioned in the table for WTP Caraboaia

10.1.2.3 Water Supply Zone Buhusi

10.1.2.3.1 Extension Water Supply Network Buhusi

The proposed extensions for water supply network in Buhushi increase the connection rate to 90 % and ensure the supply of the population with drinking water.

10.1.2.3.2 Performance Indicators Water Supply Zone Buhusi

Item	Indicator	Unit	Before Project	After Project
2.1.1.	Total population in service area concerned (water supply zone)	capita*1000	20	20
2.1.2	Service Coverage: Percent of population connected to water supply system (2.1.3/2.1.1)	% of 2.1.1	85	90
2.3.6	Specific domestic water consumptions	lcd	61	83
2.4.14	Population served per length of water supply network (distribution network + water mains)	capita/km	309	290
2.4.15	Production capacity installed (minimum capacity of wells, pumping stations, WTP)	1000 m3/d	5.1	5.1
2.4.7	Length of transmission mains	km	18	18
2.4.8	Percent of transmission mains rehabilitated	% of 2.4.7		0
2.4.10	Length of distribution network	km	36	42
2.4.11	Percent of distribution network rehabilitated	% of 2.4.10		0
2.5.1	Total non-revenue water (IWA standard: Total system input – total water sold)	m^3/d	1.15	1.37
2.5.2	Percent of non-revenue water (2.5.1/2.2.1)	% of 2.2.1	50	45
2.5.4	Percent of real water losses (physical losses) in the network (excluding technical losses in the WTP)	%	42	33
2.5.5	Real water losses per number of connections (at average system pressure of 30 -40 m)	liters/con/day	199	194
2.7.1	Average electricity consumption (treatment plant + pumping stations)	1000 kWh/a	725	869
2.7.2	Average electricity consumption (treatment plant + pumping stations) per volume of water produced	kWh/m^3	0.9	0.8
2.8.4	Metering level (2.8.1. Total number of connections with water meter / 2.4.19 Total number of water service connections)	% of 2.4.19	81.4	100

Table 10-10: Performance Indicators Buhusi

The impact of the proposed measures on the operation and maintenance costs is summarized in the table below.

Cost Item	Before Project	After Project	Savings [€/y]	% Reduction
Energy	81,908	99,391	-17,483	-21%
Chemicals/Materials	4,875	7,897	-3,022	-62%
Staff	135,839	129,348	6,491	4.78%
Maintenance	493	19,469	-18,976	-3846%
Others	37,886	35,152	2,734	7%
TOTAL	**261,002**	**291,258**	**-30,256**	**-12%**

Table 10-11: O&M Impact of Measures Water Supply Zone Buhusi

10.1.2.4 Water Supply Zone Darmanesti

There are no measures proposed for Cohesion Fund for the Water Supply Zone of Darmanesti. The existing connection rate is already 90 %.

10.1.2.5 Water Supply Zone Targu Ocna

There are no measures proposed on Cohesion Fund for the Water Supply Zone of Targu Ocna. The existing connection rate is already 97 %.

10.1.3 Main Impact of Measures and Performance Indicators Waste Water

10.1.3.1 Agglomeration Bacau

10.1.3.1.1 Wastewater Network

The extension of the wastewater collection system has been established together with C.A.B. (former name R.A.G.C. Bacau). The following table lists the main characteristics of investments proposed for the wastewater collection system in Bacau.

Description	Quantity	Unit
Network extensions for Bacau, Letea Veche, Hemeius and Margineni	42,486	m
Pumping Stations	6	pieces

Table 10-12: WW Network Bacau, List of proposed investments

Proposed investments ensure a connection rate of 90 % to the sewer system within given compliance dates and consistence of water supply and wastewater networks.

10.1.3.1.2 Wastewater Treatment Plant

The WWTP Bacau is located at the south-eastern side of the agglomeration Bacau. The whole agglomeration is served by one central plant.

The waste water treatment plant is under refurbishment, ISPA Project Number ISPA /2002 RO 16 P PE 018

The existing WWTP will be extended on the established site within the current site boundaries. Additional land purchase is not necessary. The proposed treatment concept employs existing structures and equipment to utmost extent.

The following investment measures are necessary and are proposed for Cohesion Fund financing.

WWTP Bacau – Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for extension / upgrading of existing WWTP**	**Unit**	**Quantity**	**Justification / Objective**
1	**Mechanical Treatment**			
1.1	No investments in the mechanical treatment are required; the existing plant is currently reconstructed and sufficient.			The existing mechanical treatment is sufficient and up to date.
2	**Biological Treatment**			
2.1	Adjustment of distribution chamber 4	pieces	1.0	Existing structure must be adjusted to the provided plant operation
2.2	Adjustment of aeration tank 1 by replacing the submerged wall between the aerated and anoxic zone	pieces	1.0	Existing structure must be adjusted to the provided plant operation
2.3	Replacement/Adjustment of fine bubble diffuser system in aeration tank 1	pieces	1.0	Facilitate oxygen supply for activated sludge tank. Tank 1 is already equipped but the diffuser system must be adjusted to the provided plant operation.
2.4	Demolition and rebuilding of aeration tank 2	pieces	1.0	The concrete structure of the existing tank is in a poor condition. For a better operation the old tank is demolished and replaced by a new tank with the same volume and the same water depth like aeration tank 1
2.5	Installation of fine bubble diffuser system in aeration tank 2	pieces	1.0	Tank 2 is not yet equipped with diffuser systems
2.6	Extension of the existing rotary piston blowers	pieces	1.0	To provide oxygen supply and to provide 1 stand-by blower.
2.7	Installation of a chemical precipitation unit	pieces	1.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Bistrita River. Compliance with urban wastewater treatment directive 91/271/EEC.
2.8	Extension of the existing SCADA system.	Pieces	1	Operation of extended system. Optimisation of treatment process, reduction of energy consumption, data acquisition for improved O&M.
3	**Sludge Treatment**			
	The sludge dewatering building will be extended	pieces	1.0	Extension to create space for backup aggregates
3.1	The existing sludge dewatering machine for primary sludge is at the capacity limit. An additional machine will be installed as backup	pieces	1.0	Backup for constantly running sludge dewatering
3.2	The existing sludge dewatering machine for secondary sludge is at the capacity limit. An additional machine will be installed as backup	pieces	1.0	Reduction of secondary sludge volume. Optimisation of consecutive sludge treatment steps like aerobic digestion and sludge dewatering.
3.3	Construction of an additional anaerobic digester to provide adequate anaerobic digestion capacity incl. pumps, machinery hall piping, mixing, heating etc..	pieces	1.0	Reduction of organic solids, minimization of odour emission, stabilization of sludge.
3.4	The existing sludge dewatering machine for treated sludge is at the capacity limit. An additional machine will be installed as backup	pieces	1.0	Backup for constantly running sludge dewatering Reduction of sludge volume. Support of agricultural sludge re-use (application of sludge as dung with adequate machinery on the field).
3.8	Construction of a process water tank, capacity 2,200 m³.	pieces	1.0	To provide a continuously re-charge from sludge treatment. The stability of the treatment process will be optimised by buffering peak loads.
3.9	Construction of a sludge storage area.	Pieces	1.0	Support of sludge disposal strategy.
4	**High Water Pump Station**			
4.1	Construction of a high water pumping station incl. overflow weir and valves.	pieces	1.0	Provide effluent in case of flood events.
5	**Miscellaneous and Equipment**			
5.1	Laboratory equipment and rehabilitation of laboratory building	lump sum	1.00	
5.2	Truck for sludge transport (container vehicle)	pieces	1.00	
5.3	Hydro cleaner for wastewater network	pieces	1.00	

WWTP Bacau – Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for extension / upgrading of existing WWTP**	**Unit**	**Quantity**	**Justification / Objective**
	(combined flushing / suction vehicle)			
5.4	Auto drains for wastewater network (suction vehicle)	pieces	2.00	
5.5	Observation Wells	pieces	5.00	

Table 10-13: WWTP Bacau, List of proposed Investments

10.1.3.1.3 Performance Indicators Wastewater Agglomeration Bacau

Expected improvements after implementing the selected investment components are summarized with the performance indicators in the table below.

N°	Performance Indicators	Unit	Bacau	
			Before Project	After Project
3.4.4	Total generated load in agglomeration	1000*p.e.	237.00	234.00
3.4.6	Connection rate of generated load: connected load to collection system / total generated load (UWWTD Art.2(5))	% of 3.4.4	77	92
3.2.1.8	Sewer Infiltration rate: Volume of infiltration water into the wastewater network / total wastewater volume collected	% of 3.2.1	51	52
3.4.1	Total Biological load (BOD_5)	1000 kg BOD/d	5.7	12.9
3.6.5.2	Percent of wastewater network rehabilitated (related to existing network)	% of 3.6.6	0.00	0.00
3.6.8	Number of overflow devices in the network	number	8	8
3.7.7	Capacity of WWTPs in Population equivalent (p.e.); *calculation base Art. 2.6 – dir - 91/271 EEC*	1000 p.e.	no data	240.80
3.7.8.10	Volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC	1000 m3/d	no data	54.20
3.7.8.11	Percent of volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5) (3.7.8.11 / 3.2.1.)	% of 3.2.1	no data	100
3.9.5	Average electricity consumption per year	1000 kWh/a	1,967	5,062
3.9.6	Average electricity consumption per volume of wastewater treated (3.9.5./3.7.8)	kWh/m³	0.086	0.256

Table 10-14: Performance Indicator Wastewater Agglomeration Bacau

The following table shows the impact of all investment measures on Operation & Maintenance Costs Wastewater for Bacau Agglomeration

Cost Item	Cost before project [€/year]	Cost after project [€/year]	Savings [€/year]	% Reduction
Energy	246,742	402,906	-156,164	-63%
Chemicals/Materials	164,210	579,004	-414,793	-253%
Staff	1,438,749	1,172,813	265,935	18%
Maintenance	89,692	467,792	-378,100	-422%
Others	669,625	1,425,063	-755,438	-113%
TOTAL	**2,609,018**	**4,047,579**	**-1,438,561**	**-55%**

Table 10-15: Impact of Measures on O&M Costs Wastewater Agglomeration Bacau

10.1.3.2 Agglomeration Comanesti-Moinesti

Due to the fact that Comanesti is not eligible for CF because it refused to join the IDA and the ROC, the following descriptions, figures and performance indicators only refer to Moinesti and Gazarie as part of the agglomeration Comanesti-Moinesti.

10.1.3.2.1 Wastewater Network (Moinesti, Gazarie)

The extension of the wastewater collection system has been established together with Apa Prim. The following table lists the main characteristics of investments proposed for the wastewater collection system in Moinesti.

Description	Quantity	Unit
Network extensions for Moinesti	21,639	m
Pumping Stations	3	pieces

Table 10-16: WW Network Moinesti, List of proposed investments

Proposed investments ensure a connection rate of 90 % to the sewer system within given compliance dates and consistence of water supply and wastewater networks.

10.1.3.2.2 Wastewater Treatment Plant (Moinesti, Gazarie)

The WWTP Moinesti is located at the middle of the agglomeration Comanesti-Moinesti close to Tazlaul Sarat River. The agglomeration is served by two plants, WWTP Moinesti North (existing) and WWTP Moinesti South (not existing yet) which must be located at the southern end of the agglomeration. The existing WWTP is extended at the existing site, to utmost extent within the current site boundaries. The proposed treatment concept employs existing structures to a smaller extent.

The following investment measures for WWTP Moinesti North are necessary and are proposed for Cohesion Fund financing.

WWTP Moinesti North - Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for extension / upgrading of existing WWTP**	**Unit**	**Quantity**	**Justification / Objective**
1	**Mechanical Treatment**			
1.1	Construction of a new inlet pumping station 200 l/s, hman ca. 8 m	pieces	1.0	
1.2	Construction of a new screening building with two lines of fine screens width 10 mm, low voltage switchgear room, blowers for aerated grit and grease chamber, grit classifier and reception station for septic sludge	pieces	1.0	
1.3	Construction of aerated grit and grease chambers, 60 m³ volume each	pieces	2.0	Elimination of grease and grit to avoid operational problems in subsequent process steps
1.4	Installation of a new inflow meter (Parshall Flume or similar)	pieces	1.0	
2	**Biological Treatment**			
2.1	Construction of activated sludge tanks with simultaneous aerobic sludge stabilization (total sludge age 25 days) with submersible mixers and fine bubble diffuser systems.	m³	13,000	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Tazlaul Sarat River. Compliance with urban wastewater treatment directive 91/271/EEC.
2.2	Installation of rotary piston blowers for oxygen supply.	pieces	3.0	Facilitate oxygen supply and to provide 1 stand-by blower.
2.3	Construction of a sludge pumping station (return sludge, excess sludge).	pieces	1.0	
2.4	Construction of secondary settling tanks, diameter 20 m, 2/3 depth 4.13 m	pieces	2.0	
2.5	Installation of a chemical precipitation unit	pieces	1.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Tazlaul Sarat River. Compliance with urban wastewater treatment directive 91/271/EEC.
2.6	Installation of medium / low voltage switchgear and SCADA system.	pieces	1	Operation of extended system. Optimisation of treatment process, reduction of energy consumption, data acquisition for improved O&M.
3	**Sludge Treatment**			
3.1	Reconstruction of 1 existing Imhoff Tank as gravity sludge thickener for secondary sludge. Effluent dry solids ca. 2.5 %.	pieces	1.0	Reduction of secondary sludge volume. Optimisation of consecutive sludge dewatering.
3.2	Installation of a recessed plate filter press for sludge dewatering incl. polymer station and transport belts. Resulting DS ca. 35 %.	pieces	1.0	Reduction of sludge volume.
3.3	Construction of a sludge storage area for 6 months storage time.	pieces	1.0	Support of sludge strategy as proposed in chapter 7
4	**Miscellaneous and Equipment**			
4.1	Observation Wells	pieces	3.00	
4.2	Auto drain for wastewater network (suction vehicle)	pieces	1.00	

Table 10-17: WWTP Moinesti North, List of proposed Investments

The following investment measures for WWTP Moinesti South are necessary and are proposed for Cohesion Fund financing.

WWTP Moinesti South - Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for new WWTP**	**Unit**	**Quantity**	**Justification / Objective**
1	**Mechanical Treatment**			
1.1	Construction of a new inlet pumping station 50 l/s, hman ca. 8 m	pieces	1.0	
1.2	Construction of a new screening building with one line of fine screens width 10 mm with bypass channel, low voltage switchgear room, blowers for aerated grit and grease chamber.	pieces	1.0	
1.3	Construction of aerated grit and grease chamber with bypass channel, 29 m³ volume	pieces	1.0	Elimination of grease and grit to avoid operational problems in subsequent process steps
1.4	Installation of a new inflow meter (Parshall Flume or similar)	pieces	1.0	
2	**Biological Treatment**			
2.1	Construction of activated sludge tanks with simultaneous aerobic sludge stabilization (total sludge age 25 days) with submersible mixers and fine bubble diffuser systems.	m³	3,400	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into receiving body. Compliance with urban wastewater treatment directive 91/271/EEC.
2.2	Installation of rotary piston blowers for oxygen supply.	pieces	2.0	Facilitate oxygen supply and to provide 1 stand-by blower.
2.3	Construction of a sludge pumping station (return sludge, excess sludge).	pieces	1.0	
2.4	Construction of secondary settling tanks, diameter 16 m, 2/3 depth 3.49 m	pieces	1.0	
2.5	Installation of a chemical precipitation unit	pieces	1.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into receiving body. Compliance with urban wastewater treatment directive 91/271/EEC.
2.6	Installation of medium / low voltage switchgear and SCADA system.	pieces	1.0	Operation of extended system. Optimisation of treatment process, reduction of energy consumption, data acquisition for improved O&M.
3	**Sludge Treatment**			
3.1	Construction of a gravity sludge thickener for secondary sludge. Effluent dry solids ca. 2.5 %.	pieces	1.0	Reduction of secondary sludge volume. Optimisation of consecutive sludge dewatering.
4	**Miscellaneous and Equipment**			
4.1	Observation Wells	pieces	2.00	
4.2	Laboratory Equipment	lump sum	1.00	

Table 10-18: WWTP Moinesti South, List of proposed Investments

10.1.3.2.3 Performance Indicators Wastewater Agglomeration Comanesti-Moinesti (Moinesti, Gazarie)

Expected improvements after implementing the selected investment components are summarized with the performance indicators in the table below.

N°	Performance Indicators	Unit	Comanesti-Moinesti	
			Before Project	After Project
3.4.4	Total generated load in agglomeration	1000*p.e.	27.00	27.00
3.4.6	Connection rate of generated load: connected load to collection system / total generated load (UWWTD Art.2(5))	% of 3.4.4	59	93
3.2.1.8	Sewer Infiltration rate: Volume of infiltration water into the wastewater network / total wastewater volume collected	% of 3.2.1	54	43
3.4.1	Total Biological load (BOD_5)	1000 kg BOD/d	0.8	1.5
3.6.5.2	Percent of wastewater network rehabilitated (related to existing network)	% of 3.6.6	0.00	0.00
3.6.8	Number of overflow devices in the network	number	0	0
3.7.7	Capacity of WWTPs in Population equivalent (p.e.); *calculation base Art. 2.6 – dir - 91/271 EEC*	1000 p.e.	no data	31.70
3.7.8.10	Volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC	1000 m3/d	no data	4.14
3.7.8.11	Percent of volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5) (3.7.8.11 / 3.2.1.)	% of 3.2.1	no data	100
3.9.5	Average electricity consumption per year	1000 kWh/a	87	582
3.9.6	Average electricity consumption per volume of wastewater treated (3.9.5./3.7.8)	kWh/m³	0.110	0.385

Table 10-19: Performance Indicator Wastewater Agglomeration Comanesti-Moinesti

The following table shows the impact of all investment measures on Operation & Maintenance Costs Wastewater for Comanesti-Moinesti Agglomeration

Cost Item	Cost before project [€/year]	Cost after project [€/year]	Savings [€/year]	% Reduction
Energy	9,901	64,739	-54,838	-554%
Chemicals/Materials	542	77,313	-76,771	-14172%
Staff	78,067	61,798	16,268	21%
Maintenance	165	235,285	-235,120	-142414%
Others	41,544	73,463	-31,920	-77%
TOTAL	**130,219**	**512,599**	**-382,380**	**-294%**

Table 10-20: Impact of Measures on O&M Costs Wastewater Agglomeration Comanesti-Moinesti

10.1.3.3 Agglomeration Buhusi

10.1.3.3.1 Wastewater Network

The extension of the wastewater collection system has been established together with Directia de Gospodarire Comunala. The following table lists the main characteristics of investments proposed for the wastewater collection system in Buhusi.

Description	Quantity	Unit
Network extensions for Buhusi	20,141	m
Pumping Stations	11	Pieces

Table 10-21: WW Network Buhusi, List of proposed investments

Proposed investments ensure a connection rate of 90 % to the sewer system within given compliance dates and consistence of water supply and wastewater networks.

10.1.3.3.2 Wastewater Treatment Plant

The WWTP Buhusi is located in the middle of the agglomeration Buhusi. The whole agglomeration is served by one central plant. The existing WWTP will be abandoned. A new plant will be built on public property located eastern to the existing Plant.

The following investment measures are proposed for Cohesion Fund financing.

WWTP Buhusi - Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for extension / upgrading of existing WWTP**	**Unit**	**Quantity**	**Justification / Objective**
1	**Mechanical Treatment**			
1.1	Construction of a new inlet pumping station 250 l/s, hman ca. 8 m	pieces	1.0	
1.2	Construction of a new screening building with two lines of fine screens width 10 mm, low voltage switchgear room, blowers for aerated grit and grease chamber, grit classifier and reception station for septic sludge	pieces	1.0	
1.3	Construction of aerated grit and grease chambers, 74 m³ volume each	pieces	2.0	Elimination of grease and grit to avoid operational problems in subsequent process steps
1.4	Installation of a new inflow meter (Parshall Flume or similar)	pieces	1.0	
2	**Biological Treatment**			
2.1	Construction of activated sludge tanks with simultaneous aerobic sludge stabilization (total sludge age 25 days) with submersible mixers and fine bubble diffuser systems.	m³	14,700	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Bistrita River. Compliance with urban wastewater treatment directive 91/271/EEC.
2.2	Installation of rotary piston blowers for oxygen supply.	pieces	3.0	Facilitate oxygen supply and to provide 1 stand-by blower.
2.3	Construction of a sludge pumping station (return sludge, excess sludge).	pieces	1.0	
2.4	Construction of secondary settling tanks, diameter 23 m, 2/3 depth 4.13 m	pieces	2.0	
2.5	Installation of a chemical precipitation unit	pieces	1.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Bistrita River.

WWTP Buhusi - Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for extension / upgrading of existing WWTP**	**Unit**	**Quantity**	**Justification / Objective**
2.6	Installation of medium / low voltage switchgear and SCADA system.	pieces	1	Compliance with urban wastewater treatment directive 91/271/EEC. Operation of extended system. Optimisation of treatment process, reduction of energy consumption, data acquisition for improved O&M.
3	**Sludge Treatment**			
3.1	Construction of a gravity sludge thickener for secondary sludge. Effluent dry solids ca. 2.5 %.	pieces	1.0	Reduction of secondary sludge volume. Optimisation of consecutive sludge dewatering.
3.2	Installation of a recessed plate filter press for sludge dewatering incl. polymer station and transport belts. Resulting DS ca. 35 %.	pieces	1.0	Reduction of sludge volume.
3.3	Construction of a sludge storage area for 6 months storage time.	pieces	1.0	Support of sludge strategy as proposed in chapter 7
4	**Miscellaneous and Equipment**			
4.1	Observation Wells	pieces	3.00	
4.2	Auto drain for wastewater network (suction vehicle)	pieces	1.00	

Table 10-22: WWTP Buhusi, List of proposed Investments

10.1.3.3.3 Performance Indicators Wastewater Agglomeration Buhusi

Expected improvements after implementing the selected investment components are summarized with the performance indicators in the table below.

N°	Performance Indicators	Unit	Buhusi	
			Before Project	After Project
3.4.4	Total generated load in agglomeration	1000*p.e.	26.00	25.70
3.4.6	Connection rate of generated load: connected load to collection system / total generated load (UWWTD Art.2(5))	% of 3.4.4	62	92
3.2.1.8	Sewer Infiltration rate: Volume of infiltration water into the wastewater network / total wastewater volume collected	% of 3.2.1	26	8
3.4.1	Total Biological load (BOD_5)	1000 kg BOD/d	0.1	2.1
3.6.5.2	Percent of wastewater network rehabilitated (related to existing network)	% of 3.6.6	0.00	0.00
3.6.8	Number of overflow devices in the network	number	1	1
3.7.7	Capacity of WWTPs in Population equivalent (p.e.); *calculation base Art. 2.6 – dir - 91/271 EEC*	1000 p.e.	no data	34.80
3.7.8.10	Volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC	1000 m3/d	no data	2.53
3.7.8.11	Percent of volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5) (3.7.8.11 / 3.2.1.)	% of 3.2.1	no data	100
3.9.5	Average electricity consumption per year	1000 kWh/a	151	299
3.9.6	Average electricity consumption per volume of wastewater treated (3.9.5./3.7.8)	kWh/m³	0.850	0.323

Table 10-23: Performance Indicator Wastewater Agglomeration Buhusi

The following table shows the impact of all investment measures on Operation & Maintenance Costs Wastewater for Buhusi Agglomeration

Cost Item	Cost before project [€/year]	Cost after project [€/year]	Savings [€/year]	% Reduction
Energy	18,617	20,786	-2,169	-12%
Chemicals/Materials	5,000	49,332	-44,332	-887%
Staff	112,678	89,567	23,111	21%
Maintenance	33	227,984	-227,951	-688095%
Others	9,619	39,039	-29,420	-306%
TOTAL	**145,948**	**426,708**	**-280,760**	**-192%**

Table 10-24: Impact of Measures on O&M Costs Wastewater Agglomeration Buhusi

10.1.3.4 Agglomeration Darmanesti

10.1.3.4.1 Wastewater Network

The extension of the wastewater collection system has been established together with Apa Serv Bacau. The following table lists the main characteristics of investments proposed for the wastewater collection system in Darmanesti.

Description	Quantity	Unit
Network extensions for Darmanesti	50,832	m
Pumping Stations	14	pieces

Table 10-25: WW Network Darmanesti, List of proposed investments

Proposed investments ensure a connection rate of 90 % to the sewer system within given compliance dates and consistence of water supply and wastewater networks.

10.1.3.4.2 Wastewater Treatment Plant

The existing WWTP of Darmanesti is located in the middle of the town and serves a block of flats with high population density. It has only mechanical treatment and is not sufficient for the whole town. Because of the size and the location of the WWTP, it is recommended to dismantle the old WWTP and build a new central WWTP in the south eastern part of Darmanesti where a site in public ownership is available.

The following investment measures are necessary and are proposed for Cohesion Fund financing.

WWTP Darmanesti - Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for new WWTP**	**Unit**	**Quantity**	**Justification / Objective**
1	**Mechanical Treatment**			
1.1	Construction of a new inlet pumping station 140 l/s, hman ca. 8 m	pieces	1.0	
1.2	Construction of a new screening building with two lines of fine screens width 10 mm, low voltage switchgear room, blowers for aerated grit and grease chamber, grit classifier and reception station for septic sludge	pieces	1.0	
1.3	Construction of aerated grit and grease chambers, 44 m³ volume each	pieces	2.0	Elimination of grease and grit to avoid operational problems in subsequent process steps
1.4	Installation of a new inflow meter (Parshall Flume or similar)	pieces	1.0	Existing inflow meter is part of the old inflow channel which will be dismantled
2	**Biological Treatment**			
2.1	Construction of activated sludge tanks with simultaneous aerobic sludge stabilization (total sludge age 25 days) with submersible mixers and fine bubble diffuser systems.	m³	9,200.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Trotus River. Compliance with urban wastewater treatment directive 91/271/EEC.
2.2	Installation of rotary piston blowers for oxygen supply.	pieces	3.0	Facilitate oxygen supply and to provide 1 stand-by blower.
2.3	Construction of a sludge pumping station (return sludge, excess sludge).	pieces	1.0	Existing structures must be replaced / upgraded for reliable plant operation
2.4	Construction of secondary settling tanks, diameter 20 m, 2/3 depth 3.16 m	pieces	2.0	
2.5	Installation of a chemical precipitation unit	pieces	1.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Trotus River. Compliance with urban wastewater treatment directive 91/271/EEC.
2.6	Installation of low voltage switchgear and SCADA system.	pieces	1	Operation of extended system. Optimisation of treatment process, reduction of energy consumption, data acquisition for improved O&M.
3	**Sludge Treatment**			
3.1	Construction of gravity sludge thickeners for secondary sludge. Effluent dry solids ca. 2.5 %.	pieces	2.0	Reduction of secondary sludge volume. Optimisation of consecutive sludge treatment steps like sludge dewatering.
3.2	Installation of 1 recessed plate filter press for sludge dewatering incl. Polymer station and transport belts. Resulting DS ca. 35 %.	pieces	1.0	Reduction of sludge volume.
3.3	Construction of a sludge storage area for 6 months storage time.	pieces	1.0	Support of sludge strategy as proposed in chapter 7
4	**Miscellaneous and Equipment**			
4.1	Observation Wells	pieces	3.00	
4.2	Laboratory Equipment	lump sum	1.00	
4.3	Dismantling of existing WWTP	lump sum	1.00	

Table 10-26: WWTP Darmanesti, List of proposed Investments

10.1.3.4.3 Performance Indicators Wastewater Agglomeration Darmanesti

Expected improvements after implementing the selected investment components are summarized with the performance indicators in the table below.

N°	Performance Indicators	Unit	Darmanesti	
			Before Project	After Project
3.4.4	Total generated load in agglomeration	1000*p.e.	0.00	18.50
3.4.6	Connection rate of generated load: connected load to collection system / total generated load (UWWTD Art.2(5))	% of 3.4.4	0	94
3.2.1.8	Sewer Infiltration rate: Volume of infiltration water into the wastewater network / total wastewater volume collected	% of 3.2.1	0	1
3.4.1	Total Biological load (BOD_5)	1000 kg BOD/d	no data	1.3
3.6.5.2	Percent of wastewater network rehabilitated (related to existing network)	% of 3.6.6	0.00	0.00
3.6.8	Number of overflow devices in the network	number	0	0
3.7.7	Capacity of WWTPs in Population equivalent (p.e.); *calculation base Art. 2.6 – dir - 91/271 EEC*	1000 p.e.	no data	21.50
3.7.8.10	Volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC	1000 m3/d	no data	0.99
3.7.8.11	Percent of volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5) (3.7.8.11 / 3.2.1.)	% of 3.2.1	no data	100
3.9.5	Average electricity consumption per year	1000 kWh/a	0	134
3.9.6	Average electricity consumption per volume of wastewater treated (3.9.5./3.7.8)	kWh/m³	0.000	0.373

Table 10-27: Performance Indicator Wastewater Agglomeration Darmanesti

The following table shows the impact of all investment measures on Operation & Maintenance Costs Wastewater for Darmanesti Agglomeration.

Cost Item	Cost before project [€/year]	Cost after project [€/year]	Savings [€/year]	% Reduction
Energy	0	17,026	-17,026	-
Chemicals/Materials	0	27,628	-27,628	-
Staff	0	39,728	-39,728	-
Maintenance	0	269,917	-269,917	-
Others	0	24,215	-24,215	-
TOTAL	**0**	**378,514**	**-378,514**	**-**

Table 10-28: Impact of Measures on O&M Costs Wastewater Agglomeration Darmanesti

10.1.3.5 Agglomeration Targu Ocna

10.1.3.5.1 Wastewater Network

The extension of the wastewater collection system has been established together with Consiliul Local Targu Ocna. The following table lists the main characteristics of investments proposed for the wastewater collection system in Targu Ocna.

Description	Quantity	Unit
Network extensions	24,120	m
Pumping Stations	9	Pieces

Table 10-29: WW Network Targu Ocna, List of proposed investments

Proposed investments ensure a connection rate of 90 % to the sewer system within given compliance dates and consistence of water supply and wastewater networks.

10.1.3.5.2 Wastewater Treatment Plant

The existing waste water treatment plant is located in the eastern part of Targu Ocna. The capacity of the WWTP is insufficient and the site is endangered by flooding. So it is recommended to dismantle the old WWTP and build a new central WWTP within an area of higher flood protection. There is already a site available (ca. 1.2 ha) which is adjacent to the existing plant but higher situated. The available site is in public ownership.

The following investment measures are necessary and are proposed for Cohesion Fund financing.

WWTP Targu Ocna - Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for new WWTP**	**Unit**	**Quantity**	**Justification / Objective**
1	**Mechanical Treatment**			
1.1	Construction of a new inlet pumping station 120 l/s, hman ca. 8 m	pieces	1.0	
1.2	Construction of a new screening building with two lines of fine screens width 10 mm, low voltage switchgear room, blowers for aerated grit and grease chamber and reception station for septic sludge	pieces	1.0	
1.3	Construction of aerated grit and grease chambers, 36 m³ volume each	pieces	2.0	Elimination of grease and grit to avoid operational problems in subsequent process steps
1.4	Installation of a new inflow meter (Parshall Flume or similar)	pieces	1.0	Existing inflow meter is part of the old inflow channel which will be dismantled
2	**Biological Treatment**			
2.1	Construction of activated sludge tanks with simultaneous aerobic sludge stabilization (total sludge age 25 days) with submersible mixers and fine bubble diffuser systems.	m³	6,800.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Trotus River. Compliance with urban wastewater treatment directive 91/271/EEC.
2.2	Installation of rotary piston blowers for oxygen supply.	pieces	3.0	Facilitate oxygen supply and to provide 1 stand-by blower.
2.3	Construction of a sludge pumping station (return sludge, excess sludge).	pieces	1.0	Existing structures must be replaced / upgraded for reliable plant operation
2.4	Construction of secondary settling tanks, diameter 16 m, 2/3 depth 4.13 m	pieces	2.0	
2.5	Installation of a chemical precipitation unit	pieces	1.0	Implementation of tertiary treatment (Nitrogen and phosphorus elimination), hence reduction of discharge of nutrients into the Trotus River. Compliance with urban wastewater

WWTP Targu Ocna - Main Characteristics of WWTP and Sludge Treatment Investment				
No.	**Proposed Investment for new WWTP**	**Unit**	**Quantity**	**Justification / Objective**
2.6	Installation of low voltage switchgear and SCADA system.	pieces	1	treatment directive 91/271/EEC. Operation of extended system. Optimisation of treatment process, reduction of energy consumption, data acquisition for improved O&M.
3	**Sludge Treatment**			
3.1	Construction of gravity sludge thickeners for secondary sludge. Effluent dry solids ca. 2.5 %.	pieces	1.0	Reduction of secondary sludge volume. Optimisation of consecutive sludge treatment steps like sludge dewatering.
3.2	Installation of 1 recessed plate filter press for sludge dewatering incl. Polymer station and transport belts. Resulting DS ca. 35 %.	pieces	1.0	Reduction of sludge volume.
3.3	Construction of a sludge storage area for 6 months storage time.	pieces	1.0	Support of sludge strategy as proposed in chapter 7
4	**Miscellaneous and Equipment**			
4.1	Observation Wells	pieces	2.00	
4.2	Laboratory Equipment	lump sum	1.00	
4.3	Dismantling of existing WWTP	lump sum	1.00	

Table 10-30: WWTP Targu Ocna, List of proposed Investments

10.1.3.5.3 Performance Indicators Wastewater Agglomeration Targu Ocna

Expected improvements after implementing the selected investment components are summarized with the performance indicators in the table below.

N°	Performance Indicators	Unit	Targu Ocna	
			Before Project	After Project
3.4.4	Total generated load in agglomeration	1000*p.e.	13.80	13.60
3.4.6	Connection rate of generated load: connected load to collection system / total generated load (UWWTD Art.2(5))	% of 3.4.4	46	88
3.2.1.8	Sewer Infiltration rate: Volume of infiltration water into the wastewater network / total wastewater volume collected	% of 3.2.1	46	33
3.4.1	Total Biological load (BOD_5)	1000 kg BOD/d	0.4	1.0
3.6.5.2	Percent of wastewater network rehabilitated (related to existing network)	% of 3.6.6	0.00	0.00
3.6.8	Number of overflow devices in the network	number	0	0
3.7.7	Capacity of WWTPs in Population equivalent (p.e.); *calculation base Art. 2.6 – dir - 91/271 EEC*	1000 p.e.	no data	15.90
3.7.8.10	Volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC	1000 m3/d	no data	2.40
3.7.8.11	Percent of volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5) (3.7.8.11 / 3.2.1.)	% of 3.2.1	no data	100
3.9.5	Average electricity consumption per year	1000 kWh/a	0	361
3.9.6	Average electricity consumption per volume of wastewater treated (3.9.5./3.7.8)	kWh/m³	0.000	0.412

Table 10-31: Performance Indicator Wastewater Agglomeration Targu Ocna

The following table shows the impact of all investment measures on Operation & Maintenance Costs Wastewater for Targu Ocna Agglomeration.

Cost Item	Cost before project [€/year]	Cost after project [€/year]	Savings [€/year]	% Reduction
Energy	1,654	28,732	-27,077	-1637%
Chemicals/Materials	2,305	29,955	-27,650	-1200%
Staff	24,771	24,613	158	1%
Maintenance	2,750	173,236	-170,485	-6199%
Others	8,375	24,968	-16,593	-198%
TOTAL	**39,856**	**281,503**	**-241,648**	-606%

Table 10-32: Impact of Measures on O&M Costs Wastewater Agglomeration Targu Ocna

10.2 Investment Measures

The proposed investments (main works exclusive contingencies, design, supervision) in constant prices 2009 for both water and wastewater are presented in the following subchapter. More detailed descriptions can be found in the annexes and drawings.

10.2.1 Water Supply

10.2.1.1 Water Supply Zone Bacau

10.2.1.1.1 Water Treatment

10.2.1.1.1.1 Rehabilitation WTP Caraboaia

WTP Caraboaia is the most important water source for County Bacau. Most important measures to be executed there are replacement of M&E equipment (for filter backwashing process), a new inflow metering and regulation chamber as well as a new rapid mixing, coagulation and flocculation chamber. Furthermore a new sludge treatment / dewatering is foreseen.

The existing facilities of WTP Caraboaia shall be rehabilitated. The existing process shall be completed and rehabilitated as described here below :

Step 1: Pre-oxidation (new)

Step 2: Flocculation (replacement, new treatment technology) will be improved by replacing the mixing chamber.

Step 3: Decantation (existing)

Step 4: Filtration and backwash process (rehabilitation)

Step 5: Final disinfection (rehabilitation)

In addition, a PAC (Powder Activated Carbon) dosing possibility , especially for emergency cases, shall be applied.

Also in addition, a treatment line for the produced sludge aiming at dewatering and stabilizing it shall be added to the plant.

The sludge is removed from the decantors. The following new process is applied :

Step 1: Thickening (gravity thickener)

Step 2: Centrifugal dewatering with polymer dosing

The production of sludge is estimated to be max 12 t/d (plant functioning at full capacity over 24 hrs) with a DS (dry solid) content of 35%. Disposal of the sludge at landfill site is proposed.

Proposed Investment Measures and Justification

To implement the above mentioned treatment concept, the following investment measures are necessary and are proposed for Cohesion Fund financing.

WTP Caraboaia - Main Characteristics of WTP rehabilitation		
No.	**Proposed Investment for rehabilitation of WTP Caraboaia**	**Justification / Objective**
1	**Water Treatment**	
1.1	New Inlet Flow metering chamber including MID, piping and penstocks, connection to decantors, respectively demolition of the old chamber	Implementation of SCADA for controlling and operating the subsequent process steps
1.2	Additional new Pre-Oxidation with CLO_2	Increase of efficiency in the treatment of organic content and turbidity reduction
1.3	Replacement of Rapid Mixing / Flocculation chamber	Improvement of decantation. Increase of efficiency in the treatment of organic content and turbidity reduction
1.4	Additional new powder activated carbon treatment	In the event that the influent water quality is critical, a powder activated carbon suspension is dosed at the flocculation chamber to absorb/remove excess organics or toxic substances out of the water
1.5	New treatment technology (FeCl3)	Improvement of decantation. Increase of efficiency in the treatment of organic content and turbidity reduction
1.6	Rehabilitation Filter Station including replacement of piping and E&M equipment (backwash pumps, air scour blower, ...)	Reducing water losses, improvement of backwash process
1.7	New backwash water retention tank including sludge pumps	Improvement of decantation. Increase of efficiency in the treatment of organic content and turbidity reduction by return of liquors
2	**Sludge Treatment**	
2.1	Construction of a new gravity thickener including sludge pumps	Mechanical thickening of the sludge from the decantors.
2.2	Construction of sludge dewatering unit including centrifuge, including containers and sludge pumps, additional drying beds if necessary	Dewatering of sludge: reduction of volume of sludge production. DS content by 30-35 % after dewatering.
2.3	Filtrate retention tank including filtrate pumps	Improvement of decantation. Increase of efficiency in the treatment of organic content and turbidity reduction by return of liquors

Table 10-33: Summary Investment of Rehabilitation WTP Caraboaia

Summary of investment costs

Description	Building Number	Type	Unit	Size	Roughly Estimated Costs		Comment
					Unit costs [EUR]	Total costs [EUR]	
Demolition Works Inlet Chamber		Civil	m³	500	9	4,500	
Inlet / Rapid Mixing & Flocculation Chamber		Civil	m³	600	100	60,000	
Inlet / Rapid Mixing & Flocculation Chamber		M+E	LS	1	59,000	59,000	1 x 7,000 EUR Rapid mixer unit; 2 x 6,000 EUR low speed mixer units; 2 x 5,000 EUR for chemical dosing facilities; Quality Monitoring 10.000, Rest LS 20,000 EUR
ClO2 make up & dosing facility		Civil	m³	500	250	125,000	
ClO2 make up & dosing facility		M+E	LS	1	170,000	170,000	ClO2 make up & dosing facility 150,000, Rest LS 20,000 EUR
Inlet Flow Metering Chamber		Civil	m³	30	100	3,000	
Inlet Flow Metering Chamber		M+E	LS	1	9,000	9,000	1 x MID DN 600 for 8,000 EUR; Rest LS 1,000 EUR
Distribution Chamber Clarifier		Civil	m³	60	100	6,000	
Distribution Chamber Clarifier		M+E	LS	1	11,000	11,000	3 x DN 500 penstocks (3 x 3,000 EUR); Rest LS 2,000 EUR
Filter Station		Civil	LS	1	50,000	50,000	Rough estimation for civil rehabilitation of filter gallery and maschine room
Filter Station		M+E	LS	1	854,500	854,500	backwash pumps 3 x 20,000 EUR, air scour blower 3 x 20,000 EUR, compressed service air station incl. piping 2 x 19,000 EUR, rehabilitation of piping filter gallery and maschine room LS 1 x 20,000 EUR, Armatures 250,000 EUR, Filter control panels 18 x 3,500 EUR, central filter control unit 1 x 45,000 EUR, measurement equipment LS 35,000 EUR, filter nozzles 5,000 x 15 EUR, air dryer unit 3x 7,000 EUR, filter sand 350 m3 x 250 EUR, Rest LS 100,000 EUR
Final disinfection (chlorination)		M+E	LS	1	200,000	200,000	LS according to Unit Rates (only equipment)
Final disinfection (chlorination)		Civil	LS	1	20,000	20,000	Rehabilitation of Chlorination, Coagulant storage and Dosing facility
Modification of polymer dosing		M+E	LS	1	20,000	20,000	LS 20,000 EUR for relocation of dosing line, implementation of control, etc.
Coagulant Storage & Dosing Facility		Civil	LS	1	20,000	20,000	Coagulant Storage & Dosing facility will be located in existing building
Coagulant Storage & Dosing Facility		M+E	LS	1	48,000	48,000	Tank 1 x 20,000 EUR; Membrane Pumps 3 x 5,000 EUR; MID 2 x 1,500 EUR; Rest LS 10,000 EUR
Backwashwater Retention Tank		Civil	m³	400	100	40,000	
Backwashwater Retention Tank		M+E	LS	1	12,000	12,000	2 x 5,000 EUR sludge pumps, Rest LS 2,000 EUR
Gravity Thickener		Civil	m³	254	300	76,200	
Gravity Thickener		M+E	LS	1	45,000	45,000	1 x 25,000 EUR picket fence, 2 x 5,000 EUR sludge pumps, Rest LS 10,000 EUR
Sludge Dewatering		Civil	m³	806	250	201,500	
Sludge Dewatering		M+E	LS	1	225,000	225,000	1 x 150,000 EUR dewatering unit, 1 x 20,000 EUR polymer unit incl. Acessories, 2 x 5,000 EUR sludge pumps, 1 x 25,000 EUR sludge conveyor system, Rest LS 20,000 EUR
Filtrate retention tank		Civil	m³	50	100	5,000	
Filtrate retention tank		M+E	LS	1	8,000	8,000	2 x 3,000 EURO filtrate pumps, Rest LS 2,000 EUR
PAC Unit		Civil	LS	1	95,829	95,829	Total 500,000 inclusive electrical works, SCADA and miscellaneous
PAC Unit		M+E	LS	1	271,163	271,163	
Electrical Works incl. SCADA System (approx. 25% of M&E costs)		M+E	LS	1	483,166	483,166	

Table 10-34: Detailed Investment of Rehabilitation WTP Caraboaia

Description	Costs [€]
Construction Works	**790,083**
Assembling	**287,303**
Machinery and Equipment including SCADA	**2,513,900**
TOTAL NET Investment Costs	**3,591,286**

Table 10-35: Summary Investment of Rehabilitation WTP Caraboaia

Scope of works

1. Demolition of existing Inlet chamber and building of a new inflow metering chamber and a new inlet rapid mixing as well as flocculation chamber including distribution to the clarifier ; furthermore necessary agitators and static mixers and according E&M equipment as well as access to power supply, etc. ...
2. New piping from Inlet chamber to clarifier including washing out, MID, control, measurement and recording equipment, necessary couplings and penstocks (piping material : GRP or steel) as well as according E&M equipment and access to power supply, etc. ...
3. ClO_2 – Generation Plant (1+1) including all necessary control, measurement and recording equipment as well as necessary safety equipment (e.g. emergency shower, eye wash, access to potable water, ...), necessary piping including coupling, as well as according E&M equipment and access to power supply, etc. ...
4. Powder activated carbon handling, suspension and dosing unit: Installation of big bag handling system (hoist runway beam, lifting frame, discharge chute, dust collector), srew volumetric feeder, washdown hopper, liquid slurry eductor, eccentric screw type PAC suspension dosing pumps, Control unit/panel, necessary piping including coupling, as well as according E&M equipment and access to power supply, etc. ...

5. Coagulant Storage and Dosing Facility (1+1) including tank, membrane pumps, MIDs all necessary control, measurement and recording equipment as well as necessary safety equipment (e.g. emergency shower, eye wash, access to potable water, ...), necessary piping including coupling, as well as according E&M equipment and access to power supply, etc. ...
6. Chlorination System (1+1) including all necessary control, measurement and recording equipment as well as necessary safety equipment (e.g. emergency shower, eye wash, safety box, access to potable water, ...), necessary piping including coupling, as well as according E&M equipment and access to power supply, etc. ...
7. Modification of Polymer dosing esp. implementation of control, measuring and recording units
8. Civil rehabilitation of filter gallery and engine room
9. Installation of new backwash pumps, air scour blowers and compressed service air station including piping, coupling, necessary control, measurement and recording equipment , E&M equipment, armatures, etc ... .Installation of new Filter control panels, new filter control unit, air dryer, new filter nozzles and exchanging of filter sand
10. Installation of new backwash water retention tank including sludge pumps (1+1) including piping, coupling, necessary control, measurement and recording equipment , E&M equipment
11. Installation of new Gravity Thickener including sludge pumps (1+1) including piping, coupling, necessary control, measurement and recording equipment , E&M equipment
12. Sludge dewatering system including dewatering unit, polymer unit, sludge pumps (1+1), sludge conveyor system, piping, coupling, necessary control, measurement and recording equipment , E&M equipment
13. Filtrate retention tank including filtrate pumps (1+1), piping, coupling, necessary control, measurement and recording equipment , E&M equipment
14. Installation of SCADA

The Layout drawing is presented in the next figure (drawing BC-FS-WS-155), for details regarding the water treatment and sludge treatment please refer to drawings BC-FS-WS-150 /151 /152 /153 /154 /156 of this FS.

Figure 10-3: Layout drawing of Rehabilitation of WTP Caraboaia

Changing of the coagulant to Ferric Chloride is justified by several JAR – Tests which have been executed by the Laboratory at WTP Caraboaia. The results of these tests can be found in Annex 3-5. All tests show that ferric chloride is more efficient by treating the raw water of Lake Poiana Uzului, especially regarding the turbidity and the colour.

Apa Serv confirmed, that they have tested ferric chloride in the past and the result was that the treated water was yellow due to the yellow ferric chloride. The Consultant has no doubts regarding the colour of the treated water because the dosing, mixing and sedimentation process will be improved. That is also stated by the JAR-tests provided (refer to Annex 3-5).

Summary of O&M costs

Cost Item	Before Project (year 2009) *	After Project	Savings [€/y]	% Reduction
Energy	335,646	179,053	156,593	47%
Chemicals/Materials	150,282	164,608	-14,326	-10%
Staff	466,941	285,562	181,379	39%
Maintenance**	9,902	10,774	-871	-9%
Others	1,209,345	671,743	537,602	44%
TOTAL	**2,172,116**	**1,311,740**	**860,376**	**40%**

Table 10-36: Summary O&M Costs WTP Caraboaia,

*Due to the fact that data for the year 2008 were not sufficient the year of "before project" was set to 2009.

**Maintenance costs included in WSZ Bacau

10.2.1.1.1.2 Rehabilitation of Water Supply Network (pipes made up of Asbestos Cement)

In Bacau City several pipes are made up of Asbestos Cement. Due to the high level of losses (refer to Annex 3-3-1) these parts are proposed to rehabilitate. These investments will be financed by 'other funds'.

All information about the rehabilitation of Asbestos Cement parts is summarized in the table below :

ID	Name of Street	Length [m]	existing	diameter after rehabilitation	material before rehabilitation
1	Viilor	228	100	100	AC
2	Tineretului	646	150	150	AC
3	Corbului	568	100	100	AC
4	Arinilor	250	100	100	AC
5	Frunzei	254	100	100	AC
6	Nicu Enea South	323	100	100	AC
7	Tecuciului	615	150	200	AC
8	Dorului	397	150	150	AC
9	Ghioceilor	625	150	150	AC
10	Nicu Enea North	376	100	100	AC
11-1	Birladului	1,968	150	200	AC
11-2	Birladului	1,915	150	200	AC
12	Calea Romanului	2,320	150	150	AC
13	Calea Romanului	2,490	150	200	AC
14	Calea Romanului	612	150	150	AC
15	Tecuciului	744	150	150	AC
16	Victor Babes	819	150	150	AC
17	Alexandru Tolstoi	548	150	150	AC
18	Bicaz	1,029	150	150	AC
19	Bucegi	894	100	100	AC
20	Narciselor	331	100	100	AC
21	Henri Coanda	444	300	200	AC
22	Henri Coanda/Condorilor	382	300	150	AC
23	Republicii	3,105	250	250	AC
24	Bicaz	1,112	200	200	AC
25	Republicii	1,411	100	100	AC
		24,406			AC : Asbestos Cement

Table 10-37: Network rehabilitation WSZ Bacau

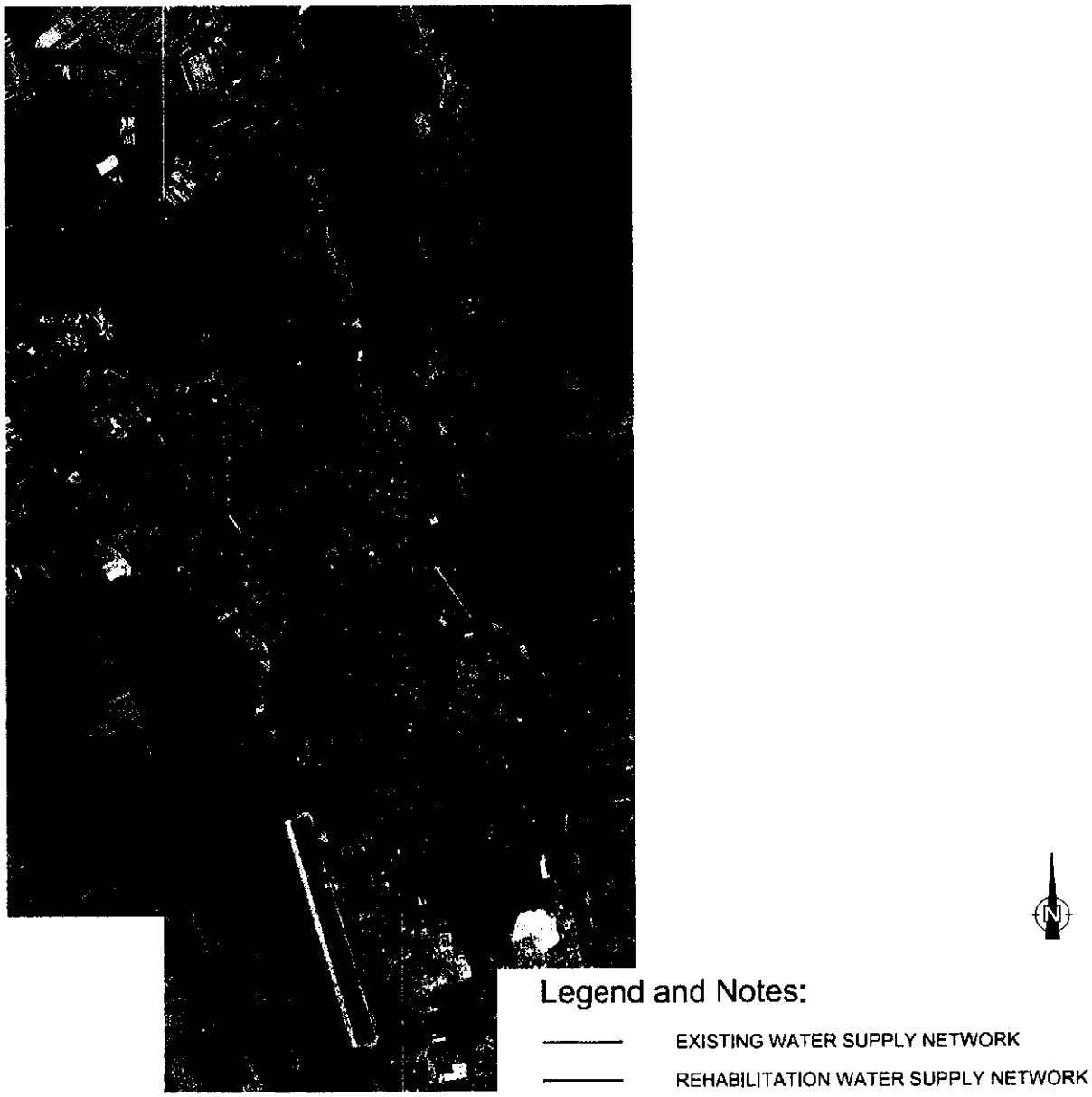

Figure 10-4: Proposed Water Supply Rehabilitation WSZ Bacau

Summary of investment costs

Diameter	Length [m]	Unit Costs[€/m]	Material	Investments [€]
below/equal 110	4,635	110	HDPE	509,853
below/equal 150	8,122	130	HDPE	1,055,910
below/equal 200	8,544	180	HDPE	1,537,895
below/equal 250	3,105	220	HDPE	683,045
below/equal 300	0	250	HDPE	0
TOTAL	**24,406**			**3,786,704**

Table 10-38: Investment Costs Network rehabilitation WSZ Bacau

Scope of work

- Rehabilitation/replacement of pipe lines in the streets listed above
- Re-Connection of existing House connection

10.2.1.2 Water Supply Zone Comanesti-Moinesti

10.2.1.2.1 Extension Water Supply Network

The existing connection rate for water supply was evaluated during this FS to 84% (within Moinesti and Gazarie). The water supply extensions have been studied according to the existing water supply network. After project the connection rate for water supply is 90 % for Moinesti and Gazarie like shown in the figure here below.

City of Comanesti and the remaining localities are supplied by another operator. The systems are by the way independent.

All information is summarized in the tables below :

Street	Length [m]	Diameter [mm]	Material	House Connections	New connected inhabitants
Str. Lucacesti	909	110	HDPE	81	216
Str. 1 Mai	886	150	HDPE	79	211
Str. Livezilor	936	150	HDPE	85	227
Str. Martir Closca	798	150	HDPE	70	186
TOTAL	**3,529**	**below 150**	**HDPE**	**315**	**840**

Table 10-39: Network extensions WSZ Comanesti-Moinesti

Figure 10-5: Proposed Water Supply Extension WSZ Comanesti-Moinesti

Summary of investment costs

Diameter	Quantity	Unit	Unit cost [€]	Cost [€]
below DN 150	3,529	m	130	458,752
Standard	315	pc	600	189,000
Bulk	-		-	-
Sum				**647,752**

Table 10-40: Investment Costs Network extensions WSZ Comanesti-Moinesti

Scope of works

- Construction of pipe lines in the streets listed above including necessary equipment like zone valves and meters, washouts and air release valves as appropriate, etc.
- Decomissioning of RSV Hangani and reconnecting existing network to existing main pipes

10.2.1.3 Water Supply Zone Buhusi

10.2.1.3.1 Extension Water Supply Network

The existing connection rate for water supply was evaluated during this FS to 85%. The water supply extensions have been studied according to the existing water supply network. After project the connection rate for water supply is 90 %. All information is summarized in the tables below :

Street	Length [m]	Diameter [mm]	Material	House Connections	New connected inhabitants
Str. Orbic	892	110	HDPE	43	116
Str. Orbic	5,390	150	HDPE	257	704
TOTAL	**6,282**	**below 150**	**HDPE**	**300**	**820**

Table 10-41: Network extensions WSZ Buhusi

Water supply network Existing

Water supply network Extension

Figure 10-6: Proposed Water Supply Extension WSZ Buhusi

Summary of investment costs

Diameter	Quantity	Unit	Unit cost [€]	Cost [€]
below DN 150	6,282	m	130	816,672
Standard	300	pc	600	180,000
Bulk	-		-	-
Sum				**996,672**

Table 10-42: Investment Costs Network extensions WSZ Buhusi

Scope of works

- Construction of pipe lines in the streets listed above including necessary equipment like zone valves and meters, washouts and air release valves as appropriate, etc.

10.2.2 Wastewater

The following chapter describes the proposed investment measures for wastewater to be included into the project for Bacau County. Both, wastewater collection and treatment have been analyzed and investments have been proposed in order to meet the relevant objectives.

This chapter includes mainly the results of calculations, assessments and discussions while all the details, tables and supporting documents are included in the relevant annexes.

10.2.2.1 Agglomeration Bacau

10.2.2.1.1 Wastewater Network

The extension of the wastewater collection system has been established together with C.A.B. (former name R.A.G.C. Bacau). The sewers were sized taking into account the existing population and the population in the area which will be connected to this network in the future years.

To achieve a connection rate of at least 90 % within this project, 42.486 km of sewer extensions and 5 pumping stations are to be added to the existing wastewater collection system. The PS Magura (PS 6) will be financed out of own resources.

The following table lists the extensions to the wastewater collection system in Bacau.

Street Name	Length [m]	Diameter [mm]	Material
Calea Barladului (in completare)	1,000	250	PVC
B-dul Unirii (in completare)	200	250	PVC
Tecuciului (in completare)	100	250	PVC
Silozului	1,000	250	PVC
Ioan Roata	1,000	250	PVC
Romantei	200	250	PVC
Siretului	300	250	PVC
Constantin Platon	350	250	PVC
Cpt. Ernest Tartescu	300	250	PVC
Cpt. Vasile Marica	300	250	PVC
Col. H. Draghici	500	250	PVC
Gen. Gr. Cantili	400	250	PVC
Gen. Eremia Grigorescu	400	250	PVC
Lt. Col. Ion Zarnescu	200	250	PVC
Cpt. Ion Boros	100	250	PVC
Mr. Alex Velican	200	250	PVC
Cpt. Victor Precup	100	250	PVC
Dimitrie Busila	200	250	PVC
Prunului	200	250	PVC
Muncii	500	250	PVC
Lt. Bolocan	150	250	PVC
Cezar Uncescu	700	250	PVC
Gral. Dr. Dragomir Badiu	150	250	PVC
Slt. Zeletin	300	250	PVC
Gh. Vrinceanu	300	250	PVC
Viselor	500	250	PVC
Frunzei	650	250	PVC
Sperantei	400	250	PVC
Cantonului	200	250	PVC
Poet Carlova	100	250	PVC
A. D. Xenopol	100	250	PVC
Arcade Septilici	300	250	PVC
Arinilor	1,300	250	PVC
Brandusei	300	250	PVC
Cerbului	100	250	PVC
G. Cosbuc	100	250	PVC
Calea Republicii (Praktiker)	2,200	250	PVC
Toporasi	600	250	PVC
Ciresoaia	1,000	250	PVC
Infratirii (capat)	150	250	PVC
Chimiei	1,110	250	PVC
Scanteiei	185	250	PVC
Aeroportului	300	250	PVC
St. Luchian	200	250	PVC
Narciselor(in continuare)paralel cu calea ferata	700	250	PVC
Agudului	550	250	PVC
DN 11-Calea Onesti (de la Narciselor pana	2,200	250	PVC

Street Name	Length [m]	Diameter [mm]	Material
la Gen. Gusa)			
Dorului	1,804	250	PVC
Ion Creanga	647	250	PVC
Constantin Musat	679	250	PVC
Total Bacau City	**25,525**		
Margineni	3,494	250	PVC
Letea Veche	4,096	250	PVC
Hemeius	9,371	250	PVC
Total Agglomeration Bacau	**42,486**		

Table 10-43: WW Network Extensions Bacau

The following figure shows the proposed sewer network extensions for the Agglomeration Bacau.

Figure 10-7: Proposed Sewer Extension Agglomeration Bacau

10.2.2.1.2 Wastewater Pumping Stations

To ensure that the wastewater will be properly discharged to the wastewater treatment plant from all parts of the agglomeration, 5 new wastewater pumping stations must be located within the wastewater collection system (secondary network pumping stations). The PS Magura (PS 6) will be financed out of own resources.

Total No.	Pumping Station	Remarks	Design Capacity	Pressure Head	Pressure Line Diameter	Pressure Line Length
--	--	--	l/s	m	mm	m
1	PS1	New, Separate System, Secondary Network	4	2	100	-
2	PS2	New, Separate System, Secondary Network	4	2	100	-
3	PS3	New, Separate System, Secondary Network	4	2	100	150
4	PS4	New, Separate System, Secondary Network	4	2	100	-
5	PS5	New, Separate System, Secondary Network	4	2	100	-

Table 10-44: New WW PS Bacau

10.2.2.1.3 Wastewater Treatment Plant

The WWTP Bacau is located at the south-eastern side of the agglomeration Bacau. The whole agglomeration is served by one central plant.

The waste water treatment plant is under refurbishment, ISPA Project Number ISPA /2002 RO 16 P PE 018

The existing WWTP will be extended on the established site within the current site boundaries. Additional land purchase is not necessary. The proposed treatment concept employs existing structures and equipment to utmost extent.

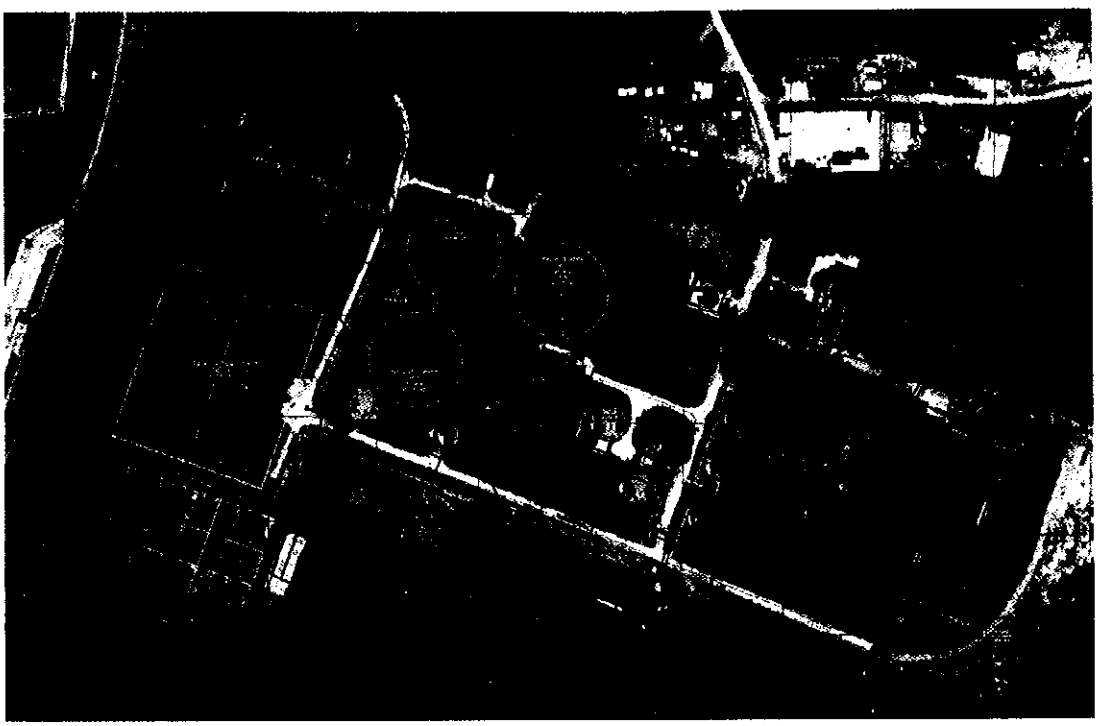

Figure 10-8: Layout Plan WWTP Bacau

Basic Design Parameters

The basic design parameters concerning the calculation of flows and loads are presented in Chapter 8.3 of this Feasibility Study.

The following table shows the settlements of the agglomeration Bacau that will be connected to the WWTP.

Settlement	Total Capita	Compliance Phase 1	Compliance Phase 2	Compliance Phase 3	Area
		2015	2018	2037	
Sohodol	565			565	Rural
Crihan	604	604			Rural
Padureni	478	478			Rural
Trebes	824	824			Rural
Valea Budului	402	402			Rural
Fantanele	229			229	Rural
Margineni	3,561	3,561			Rural

Settlement	Total Capita	Compliance Phase 1	Compliance Phase 2	Compliance Phase 3	Area
		2015	2018	2037	
Barati	1,937	1,937			Rural
Hemeius	1,706	1,706			Rural
Lilieci	2,402	2,402			Rural
Saucesti	2,007		2,007		Rural
Bogdan Voda	482		482		Rural
Letea Veche	2,687	2,687			Rural
Dealu Mare	338	338			Rural
Magura	2,934	2,934			Rural
Bacau	179,442	179,442			Urban
Total	**200,598**	**197,315**	**2,489**	**794**	
Cumulated Capita			**199,804**	**200,598**	
Percent		**98%**	**100%**	**100%**	

Table 10-45: WWTP Bacau, Connected Population

The resulting design flow data are presented in the following table.

Design Flow Data			
Daily Flow	$Q_{day,DW}$	73,965	m³/d
	$Q_{24,DW}$	3,082	m³/h
Maximum Dry Weather Flow	$Q_{max,DW}$	3,720	m³/h
		1,033	l/s
Maximum Design Flow	$Q_{max,Storm}$	5,899	m³/h
		1,638	l/s

Table 10-46: WWTP Bacau, Design Flow

Relevant industries which might produce a considerable amount of wastewater flow and load have been determined in details based on measured values of the industrial indirect dischargers' cadastre. A summary of the determined industrial flows in the agglomeration Bacau is given in the following table. The flows have been included in abovementioned design flow data.

Industrial Flow Data				
Industry	**Flow m³/month**	**Flow m³/month**	**Flow m³/month**	**Flow m³/month**
	2006	**2007**	**2008**	**Average**
AGENTUL ECONOMIC - **S.C. AGRICOLA INTERNATIONAL S.A.** - departamentul **"ABATORUL DE PASARI"**	31,129	32,644	11,051	24,941
AGENTUL ECONOMIC - **S.C. AGRICOLA INTERNATIONAL S.A.** - departamentul **"AVICOLA"**	818	992	818	876
AGENTUL ECONOMIC - **S.C. AGRICOLA INTERNATIONAL S.A.** - departamentul **"CARBAC - ABATOR"** transformat in **SALBAC DRY SALAMI**	19,585	17,006	7,848	14,813
AGENTUL ECONOMIC - **S.C. AGRICOLA INTERNATIONAL S.A.** - departamentul **"CARBAC - FRIGORIFER - racord 1"** transformat in **S.C.EUROPROD - racord 1**	4,061	14,503	5,959	8,174
AGENTUL ECONOMIC - **S.C. AGRICOLA INTERNATIONAL S.A.** - departamentul **"CARBAC - FRIGORIFER - racord 2"** transformat in **S.C.EUROPROD - racord 2**	2,990	7,351	1,928	4,090
AGENTUL ECONOMIC - **S.C. AGRICOLA INTERNATIONAL S.A.** - departamentul **"CARBAC - FRIGORIFER - racord 3"** transformat in **S.C.EUROPROD - racord 3**	683	849	1,019	850

Industrial Flow Data				
Industry	**Flow m³/month**	**Flow m³/month**	**Flow m³/month**	**Flow m³/month**
	2006	**2007**	**2008**	**Average**
AGENTUL ECONOMIC - **S.C. AGRICOLA INTERNATIONAL S.A. -** departamentul 2 **"F.N.C."**	5,189	6,629	5,226	5,681
AGENTUL ECONOMIC - **S.C. AEROSTAR S.A.**	30,712	22,390	15,212	22,771
AGENTUL ECONOMIC - **S.C. ALMERA INTERNATIONAL S.R.L.**	3,757	3,895	3,404	3,685
AGENTUL ECONOMIC - **S.C. ARENA CITY CENTER**			3,044	3,044
AGENTUL ECONOMIC - **S.C. ASCO S.A.**	6,862	9,023	9,176	8,354
AGENTUL ECONOMIC - **S.C. BERE LICHIOR MARGINENI**	21,779	11,580	6,458	13,273
AGENTUL ECONOMIC - **S.C. BILLA ROMANIA - unitate 804**	766	976	1,068	937
AGENTUL ECONOMIC - **S.C. BILLA ROMANIA - unitate 805**			390	390
AGENTUL ECONOMIC - **S.C. COMAT S.A.**	3,577	2,914	2,830	3,107
AGENTUL ECONOMIC - **S.C. CONAGRA S.A.**	1,115	1,074	1,400	1,196
AGENTUL ECONOMIC - **DIANA FOREST FIL** transformat in **S.C.BARLINEK S.A.**	4,342	4,160	2,508	3,670
AGENTUL ECONOMIC - **S.C. FRESHTEX TEXTILE FINISING S.R.L.**	1,071			1,071
AGENTUL ECONOMIC - ***S.C. INVEST CO***	654	673	943	757
AGENTUL ECONOMIC - **S.C. PAMBAC S.A.**	6,636	5,858	5,048	5,847
AGENTUL ECONOMIC - **S.C. POBAC S.A.**	16,066			16,066
AGENTUL ECONOMIC - **S.C. PROMODE S.A.**	834	642		738
AGENTUL ECONOMIC - **S.C. PROLABAC S.A.**	No data for the years 2006 – 2009, not existing anymore?			
AGENTUL ECONOMIC - **S.C. ROMBET S.A.**		2,372	2,129	2,250
AGENTUL ECONOMIC - **SELGROS CASH & CARRY**	582	554	599	578
AGENTUL ECONOMIC - **S.C. SONOMA S.R.L.**		1,536	2,233	1,884
AGENTUL ECONOMIC - **SPITALUL JUDETEAN**	38,131	25,223	18,427	27,260
AGENTUL ECONOMIC - **SPITALUL DE PNEUMOFTIZIOLOGIE**	2,751	1,376	1,271	1,800
AGENTUL ECONOMIC - **S.C. SUBEX S.A.**	4,364	3,926	3,374	3,888
AGENTUL ECONOMIC - **SNTFC - RTFC IASI - racordul 1**	12,000	18,000	21,600	17,200
AGENTUL ECONOMIC - **SNTFC - RTFC IASI - racordul 2**		2,000	2,400	2,200
AGENTUL ECONOMIC - **SNTFC - RTFC IASI - racordul 3**		4,000	4,800	4,400
AGENTUL ECONOMIC - **UMB REPARATII**	4,968	12,653	13,115	10,245

Table 10-47: WWTP Bacau, Industrial Flow Data

The industrial pollution loads have been determined in detail during the industrial survey. As shown in the Diagram below, the pollution loads were decreasing in the last years due to pre-treatment done by the dischargers. Reasonable surcharges have been made to account for future industrial developments.

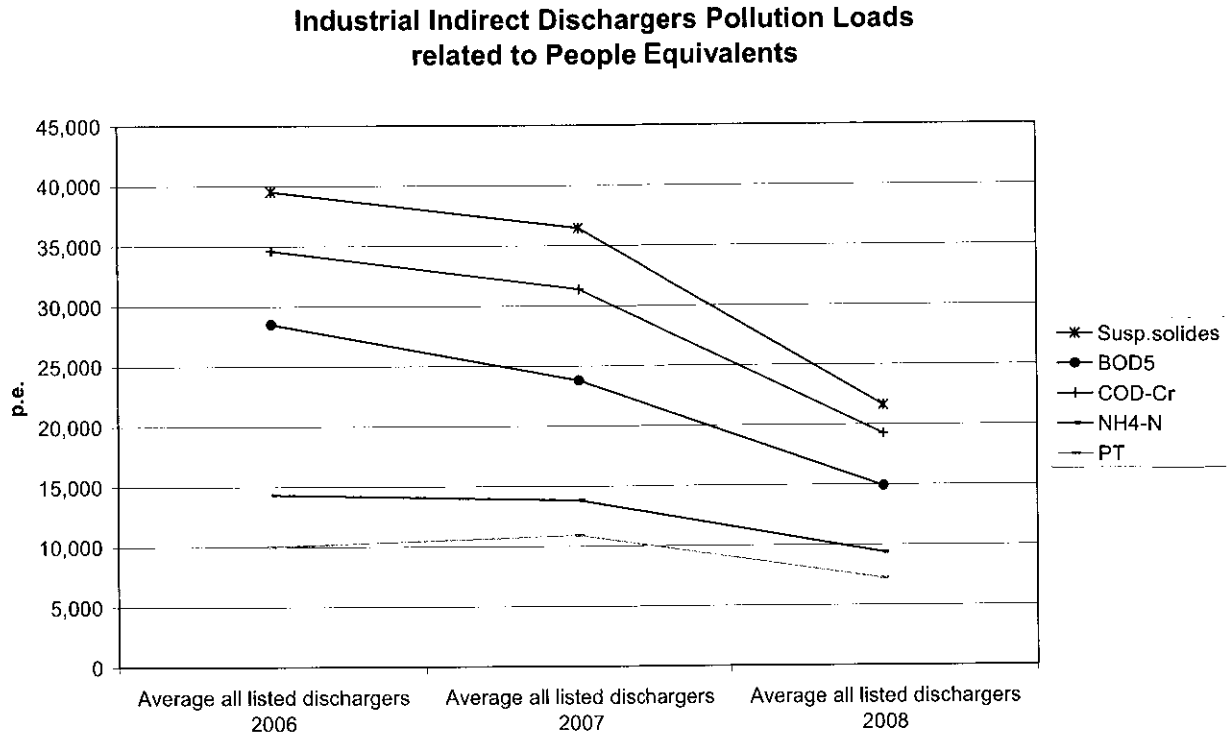

Figure 10-1: WWTP Bacau, Industrial Pollution Data monthly average

Industrial Pollution Loads			
Parameter	Industry Bacau City	Industry Others	Total
	kg/d	kg/d	kg/d
BOD_5	2,318	82	2,400
COD	4,637	163	4,800
SS	2,705	95	2,800
organic N	0	0	0
NH_4-N	425	15	440
NO_3-N	0	0	0
Total N	425	15	440
P	77	3	80

Table 10-48: WWTP Bacau, Industrial Pollution Data

Including industrial pollution loads the final design pollution loads will be as follows.

Design Pollution Loads				
BOD_5	210	mg/l	15,879	kg/d
COD	421	mg/l	31,759	kg/d
SS	245	mg/l	18,526	kg/d
organic N	0	mg/l	0	kg/d
NH_4-N	35	mg/l	2,646	kg/d
NO_3-N	4	mg/l	265	kg/d
Total N	39	mg/l	2,911	kg/d
P	7	mg/l	529	kg/d

Table 10-49: WWTP Bacau, Design Pollution Loads

Based on a specific BOD_5 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 10-50: WWTP Bacau, Effluent Standards

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

Proposed Wastewater Treatment Concept

The proposed wastewater treatment concept includes the following treatment steps that partly exist, are under construction or have to be refurbished or newly constructed.

The description of the existing waste water treatment considers the waste water treatment after finishing the ISPA Project extensions and refurbishment. This information is based on the Final Design Report of PWT Wasser und Abwassertechnik GmbH from January 18th, 2006 Revision 0.

Mechanical Treatment:

Influent Channel with Coarse Screen: The influent channel is equipped with a manually raked coarse screen. Large matter is retained and removed by the staff manually into a container.

Bypass Channel: The bypass channel to the river is equipped with a penstock. The top edge of the penstock gate will be equipped with an adjustable overflow weir, to discharge extreme peaks of storm water directly to the river. The bypass channel can be activated by manually opening of the penstock. In that case, the incoming sewage flows directly and untreated to the river.

Overflow Weir: The overflow weir to the storm water tanks limits the flow to the pre-treatment units.

Storm Water Tanks: The separated storm water flows in a channel to the four refurbished storm water tanks for intermediate storage. The tanks are flooded parallel. They are equipped with mixers to reduce sedimentation processes.

Storm Water Pump Station: The storm water is pumped back to the inlet of the WWTP

Inlet Flow Meter: The inlet flow channel will include a new flow meter (Parshall Flume or similar).

Screen Station: A screening building with two assembly lines of coarse and fine screens. The screening residuals will be washed, compressed and dumped into containers. Final disposal is the solid waste disposal site. The screening building includes the grit classifier for grit material and the blowers for the aerated grit and grease chamber.

Coarse Screens: 25 mm width

Fine Screens: 6 mm width

Septic Sludge Reception Area: A reception station for septic sludge is included.

Aerated Grit and Grease Chamber: After the screens the wastewater will flow into an aerated grit and grease chamber (two lines). Separated grit material will be classified in a grit classifier, dumped into containers and disposed of at a solid waste disposal site. The grease will be evacuated from the grease chambers with a suction vehicle and disposed of.

Flow Meter: The flow channel includes a flow meter (Parshall Flume or similar).

Primary Settling Tanks: The wastewater flows into a primary settling tank with a total volume of 4,970 m³. Primary sludge is pumped into a mechanical primary sludge thickener.

Intermediate Pumping Station: The intermediate pumping station with 3 pumps is equipped with frequency converters to adopt pump operation to minimum night flow conditions.

Biological Treatment:

Distribution Chamber: At the inlet of this chamber the raw pre-treated waste water flow is combined with the return sludge flow and distributed to the aeration tanks.

Activated Sludge Tanks: From the primary settling tanks, the wastewater flows into two lines (old and new) of activated sludge tanks with a total volume of approximately 38,360 m³. The activated sludge system includes anoxic zones (denitrification) and aerobic zones (nitrification). The anoxic zone will be equipped with submersible mixers. An internal recirculation system will be installed. The tanks are/will be aerated by a fine bubble aeration system; pressurized air is supplied by rotary piston blowers.

Phosphorus Precipitation: To comply with Phosphorus effluent standards, a chemical phosphorus precipitation station will be installed.

Secondary Settling Tanks: Activated sludge and treated wastewater are separated in 4 secondary settling tanks (total surface approx. 6,300 m², 3.50 m depth). Return sludge is returned to the activated sludge tanks (anaerobic zone); excess sludge will be pumped to the mechanical excess sludge thickening station.

Sludge Treatment:

Primary Sludge: Primary sludge is discharged to the mechanical primary sludge thickener where a final DS content of 6 % is achieved. From there the primary sludge is pumped to the anaerobic digesters.

Secondary Sludge: Secondary sludge will be pumped to the mechanical sludge dewatering station where a final DS content of 6 % is achieved. From there the secondary sludge will be pumped to the anaerobic digesters.

Anaerobic Digesters: The raw sludge (primary + secondary sludge) will be digested in a set of 5 digesters (approx. 1,500 m³ each). Total retention time is approximately 20 days.

Biogas Utilization: Biogas generated in the anaerobic digesters is stored in a tank (approx. 1.000 m³) and used in a cogeneration unit for the production of electrical and thermal energy. For backup a boiler station exists to provide thermal energy for digester heating.

Sludge Dewatering: The digested sludge is dewatered in sludge dewatering machines to a final DS content of approximately 35 %.

Sludge Storage Area: In order to support the selected sludge disposal path it is necessary to foresee a certain sludge storage capacity on the WWTP site. It is

envisaged to store the dewatered sludge on an area within the treatment site with the following capacity:

Storage Area: 6,750 m²

Storage Time: 6 Months

Miscellaneous and Equipment: Laboratory equipment and rehabilitation of laboratory building, Truck for sludge transport (container vehicle), Hydro cleaner for wastewater network (combined flushing / suction vehicle), Auto drains for wastewater network (suction vehicle), observation wells for groundwater monitoring.

Discharge Point: The existing discharge point to Bistrita River will not be altered. The Stereo coordinates are:

X: 649236.16

Y: 560906.40

Required Site Area: The existing plant site is sufficient for the proposed treatment concept. No extension of the current plant boundaries is necessary.

10.2.2.2 Agglomeration Comanesti-Moinesti

Due to the fact that Comanesti is not eligible for CF because it refused to join the IDA and the ROC, the following descriptions, figures and performance indicators only refer to Moinesti and Gazarie as part of the agglomeration Comanesti-Moinesti.

10.2.2.2.1 Wastewater Network (Moinesti, Gazarie)

The extension of the wastewater collection system has been established together with Apa Prim. The sewers were sized taking into account the existing population and the population in the area which will be connected to this network in the future years.

To increase the connection rate from 67 % to at least 90 % within this project, 21.639 km of sewer extensions and 4 pumping stations are to be added to the existing wastewater collection system.

The following table lists the extensions to the wastewater collection system in Moinesti.

Street Name	Length [m]	Diameter	Material
Str. M. Eminescu	1,570	250	PVC
Str. M. Eminescu	715	250	PVC
Str. M. Eminescu		250	PVC
Str. Ecoului	244	250	PVC
Str. Orizontului	457	250	PVC
Str. Pacurari	636	250	PVC
Str. Zaganescu	1,165	250	PVC
Str. Lucacesti	2,059	250	PVC
Str. Atelierelor	1,221	250	PVC
Str. Progresului	620	250	PVC
Str. Lunca	1,360	250	PVC
Str. A.I.Cuza	3,153	250	PVC
Str. A.I.Cuza	750	300	PVC
Str. Plopilor	508	250	PVC
Str. Nicolae Balcescu	251	250	PVC
Str. Pacii	1,195	250	PVC
Str. 1 Mai	2,721	250	PVC
Str.Kogalniceanu	329	250	PVC
Str. Bradului	507	250	PVC
Str. Magurii	420	250	PVC
Str. Bagdazar	665	250	PVC
Str. Luchian	568	250	PVC
Str. Horia	525	250	PVC
Total	21,639		

Table 10-51: WW Network Extensions Moinesti

The following Picture shows the proposed sewer network extensions for the Agglomeration Comanesti-Moinesti.

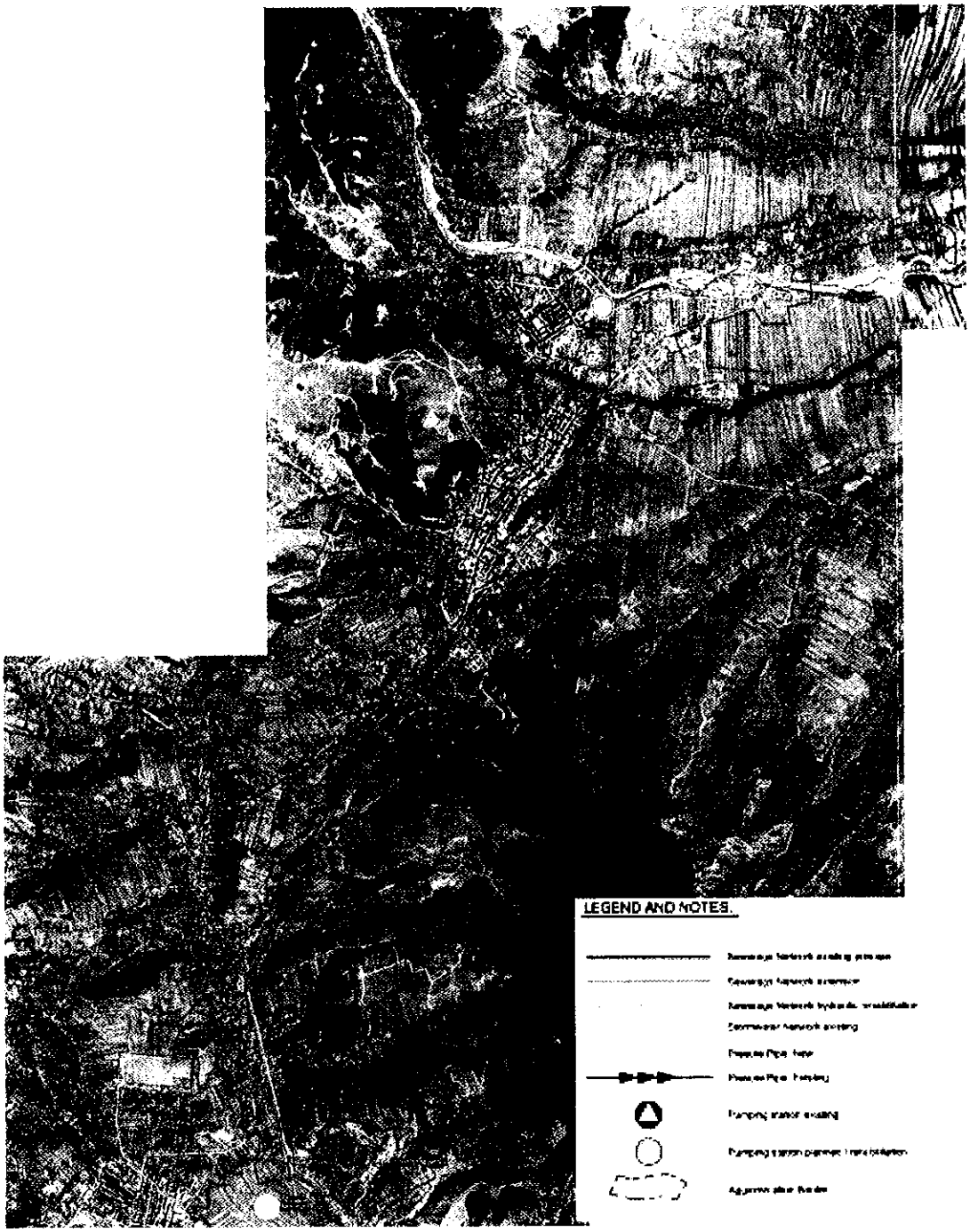

Figure 10-9: Proposed Sewer Extension Agglomeration Comanesti-Moinesti

10.2.2.2.2 Wastewater Pumping Stations (Moinesti, Gazarie)

To ensure that the wastewater will be properly discharged to the wastewater treatment plant from all parts of the agglomeration, 4 new wastewater pumping stations must be located within the wastewater collection .

Total No.	Pumping Station	Remarks	Design Capacity	Pressure Head	Pressure Line Diameter	Pressure Line Length
--	--	--	l/s	m	mm	m
1	PS1	New, Separate System, Secondary Network	4	2	100	350
2	PS2	New, Separate System, Secondary Network	4	2	100	760
3	PS3	New, Separate System, Secondary Network	4	2	100	-
4	PS4	New, Separate System, Principal Network	7	3	100	2,500

Table 10-52: New WW PS Moinesti

10.2.2.2.3 Wastewater Treatment Plant (Moinesti, Gazarie)

The agglomeration Comanesti-Moinesti is served by three plants.

WWTP Moinesti-North (existing) for the northern part consisting of Moinesti-North and Gazarie.

WWTP Moinesti-South (not existing yet), serving the southern part of Moinesti.

WWTP Comanesti, serving the rest of the agglomeration. This WWTP is not part of the CF project.

The existing WWTP is extended at the existing site, to utmost extent within the current site boundaries. The proposed treatment concept employs existing structures to a smaller extent.

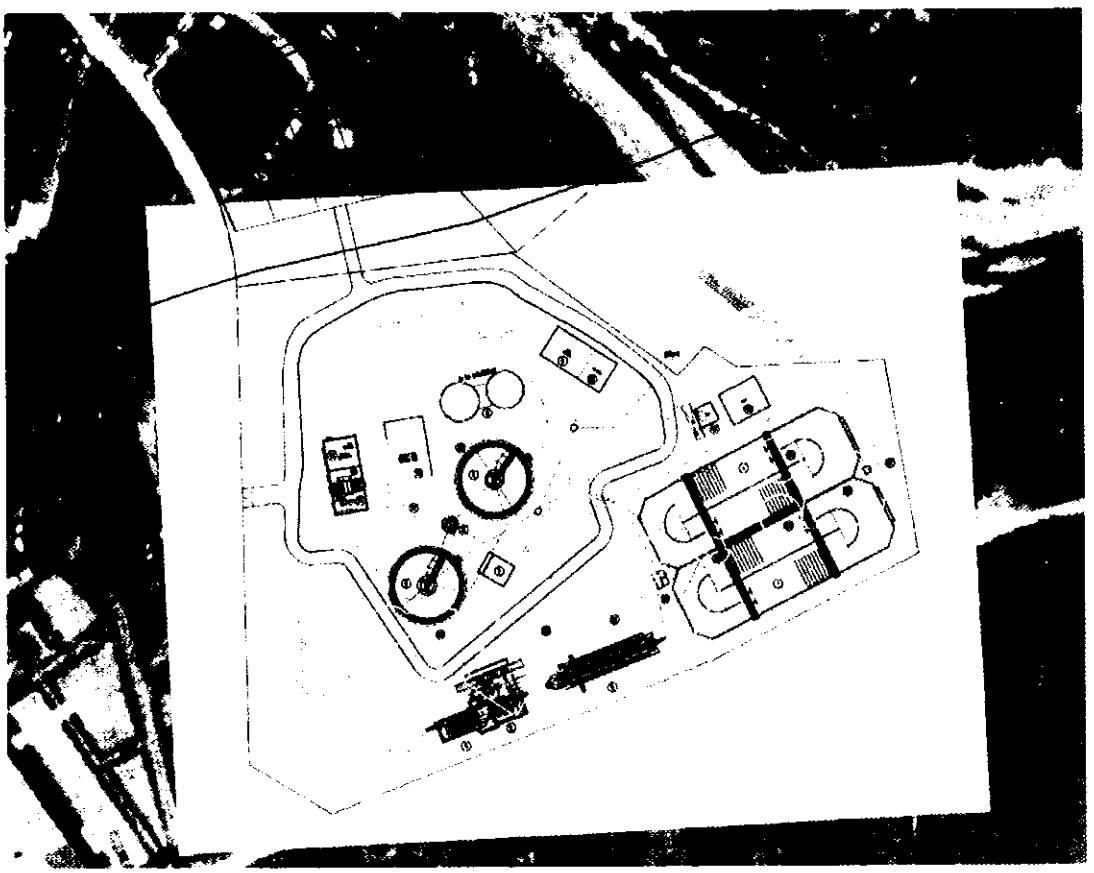

Figure 10-10: Layout plan WWTP Moinesti North

Basic Design Parameters Moinesti North

The basic design parameters concerning the calculation of flows and loads are presented in Chapter 8.3 of this Feasibility Study.

The following table shows the settlements of the agglomeration Moinesti North that will be connected to the WWTP.

Settlement	Total Capita	Compliance Phase 1	Compliance Phase 2	Compliance Phase 3	Area
		2015	2018	2037	
Moinesti North	17,396	17,396			Urban
Gazarie	1,148	1,148			Rural
Zemes	3,960		3,960		Rural
Total	**22,504**	**18,544**	**3,960**	**0**	
Cumulated Capita			**22,504**	**22,504**	
Percent		**82%**	**100%**	**100%**	

Table 10-53: WWTP Moinesti North, Connected Population

The resulting design flow data are presented in the following table.

Design Flow Data			
Daily Flow	$Q_{day,DW}$	6,174	m³/d
	$Q_{24,DW}$	257	m³/h
Maximum Dry Weather Flow	$Q_{max,DW}$	388	m³/h
		108	l/s
Maximum Design Flow	$Q_{max,Storm}$	666	m³/h
		185	l/s

Table 10-54: WWTP Moinesti North, Design Flow

The industrial pollution loads have been determined in detail during the industrial survey. In addition reasonable surcharges have been made to account for future industrial developments.

Industrial Pollution Loads	
Parameter	Industry Moinesti
	kg/d
BOD_5	180
COD	361
SS	210
organic N	0
NH_4-N	33
NO_3-N	0
Total N	33
P	60

Table 10-55: WWTP Moinesti North, Industrial Pollution Data

Based on a specific BOD_5 of 60 g/p.e./day the industrial pollution loads equal 3,000 p.e., approximately 12 % of the total plant capacity.

Including industrial pollution loads the final design pollution loads will be as follows.

Design Pollution Loads		
Parameter	**Loads**	**Concentration**
	kg/d	**mg/l**
BOD_5	1,531	242
COD	3,061	483
SS	1,786	282
organic N	0	0
NH_4-N	254	40
NO_3-N	27	4
Total N	281	44
P	105	17

Table 10-56: WWTP Moinesti North, Design Pollution Loads

Based on a specific BOD_5 of 60 g/p.e./day the plant has a size of 25,500 p.e.. The following discharge effluent parameters as set out in the Urban Wastewater Treatment Directive 91/271/EEC which has been implemented in the Romanian standard NTPA 001 – 011 apply for the WWTP Moinesti North.

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

Table 10-57: WWTP Moinesti North, Effluent Standards

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

Proposed Wastewater Treatment Concept Moinesti North

The basic layout of the WWTP is shown in the following drawings as annex to this Feasibility Study:

Flow Scheme Wastewater Treatment / BC-FS-WW-350-0

Flow Scheme Sludge Treatment / BC-FS-WW-351-0

Layout Plan / BC-FS-WW-352-0

The proposed wastewater treatment concept includes the following treatment steps that partly exist or have to be refurbished or newly constructed.

Mechanical Treatment:

Inlet Pumping Station: The wastewater inflow from the WWTP's drainage area will be pumped with an inlet pumping station.

Fine Screens: A screening building with two assembly lines of screens 10 mm width. The screening residuals will be washed, compressed and dumped into containers. Final disposal is the solid waste disposal site. The screening building will include the grit classifier for grit material and the blowers for the aerated grit and grease chamber.

Septic Sludge Reception Area: The screening building will include a reception station for septic sludge. Main parts are a fine screen, flow meter and buffer tank with pumps.

Aerated Grit and Grease Chamber: After the screens the wastewater will flow into an aerated grit and grease chamber (two lines). Separated grit material will be classified in a grit classifier, dumped into containers and disposed of at a solid waste disposal site. The grease will be evacuated from the grease chambers with a suction vehicle and disposed of.

Inlet Flow Meter: The inlet flow channel will include a new flow meter (Parshall Flume or similar).

Biological Treatment:

Activated Sludge Tanks: From the aerated grit and grease chamber the wastewater flows into the activated sludge tanks (2 lines). The activated sludge system includes aerobic zones (nitrification) and anoxic zones (denitrification). The tanks are aerated by a fine bubble aeration system, pressurized air is supplied by rotary piston blowers. The total sludge age is 25 days (extended aeration). As the result, the sludge is aerobically stabilized.

Phosphorus Precipitation: To comply with Phosphorus effluent standards, a chemical phosphorus precipitation station will be installed.

Secondary Settling Tanks: Activated sludge and treated wastewater are separated in 2 secondary settling tanks. Return sludge is returned to the activated sludge tanks, excess sludge will be pumped to gravity excess sludge thickeners.

Sludge Treatment:

Secondary Sludge: Secondary sludge will be discharged to the secondary sludge gravity thickener where a final DS content of approximately 2 – 3 % is achieved. From there the primary sludge is pumped to the sludge dewatering machines.

Sludge Dewatering: The stabilized sludge is dewatered in sludge dewatering machines (recessed plate filter presses) to a final DS content of approximately 35 %. The sludge from WWTP Moinesti-South will be transported to Moinesti-North and dewatered at Moinesti-North.

Sludge Storage Area: In order to support the selected sludge disposal path it is necessary to foresee a certain sludge storage capacity on the WWTP site. It is envisaged to store the dewatered sludge on an area within the treatment site with the following capacity:

Storage Area:	2,000	m²
Storage Time:	6	Months

Miscellaneous and Equipment: Laboratory equipment, Auto drain for wastewater network (suction vehicle), observation wells for groundwater monitoring.

Discharge Point: The existing discharge point to Tazlaul Sarat River will not be altered. The Stereo coordinates are:

X: 613492.86

Y: 557037.83

Required Site Area: The existing plant site is not sufficient for the proposed treatment concept. The total area demand of the extension of the Plant is ca. 0.5 ha.

Basic Design Parameters Moinesti South

The WWTP Moinesti South is located at the southern side of the agglomeration Moinesti and does not exist yet. The underlying basic design parameters concerning the calculation of flows and loads are presented in Chapter 8.3 of this Feasibility Study.

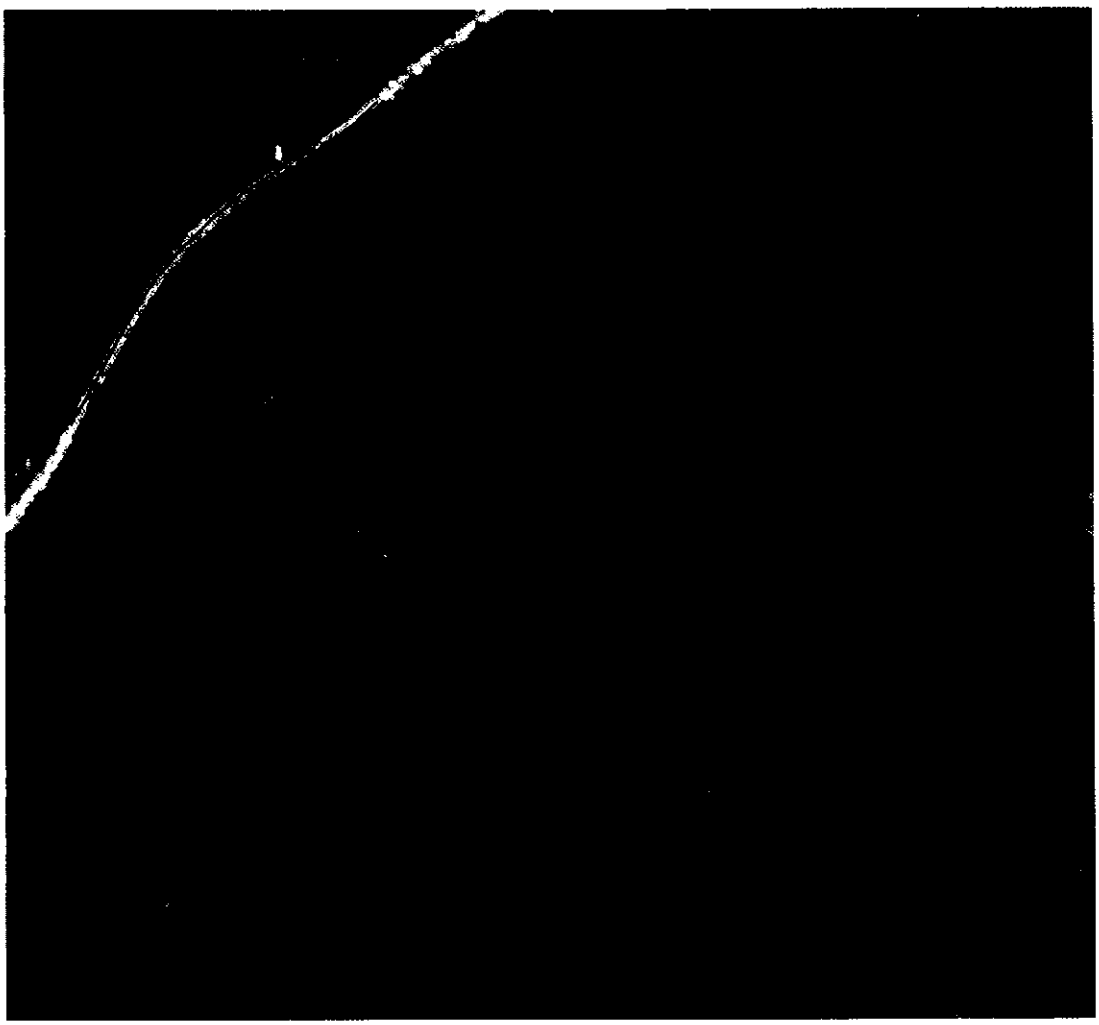

Figure 10-11: Layout plan WWTP Moinesti South

The following table shows the settlements of the agglomeration Moinesti South that will be connected to the WWTP.

Settlement	Total Capita	Compliance Phase 1	Compliance Phase 2	Compliance Phase 3	Area
		2015	2018	2037	
Moinesti South	5,400	5,400			Urban
Total	**5,400**	**5,400**	**0**	**0**	
Cumulated Capita			**5,400**	**5,400**	
Percent		**100%**	**100%**	**100%**	

Table 10-58: WWTP Moinesti South, Connected Population

The resulting design flow data are presented in the following table.

Design Flow Data			
Daily Flow	$Q_{day,DW}$	1,296	m³/d
	$Q_{24,DW}$	54	m³/h
Maximum Dry Weather Flow	$Q_{max,DW}$	86	m³/h
		24	l/s
Maximum Design Flow	$Q_{max,Storm}$	157	m³/h
		44	l/s

Table 10-59: WWTP Moinesti South, Design Flow

The industrial pollution loads have been determined in detail during the industrial survey. In addition reasonable surcharges have been made to account for future industrial developments.

Industrial Pollution Loads	
Parameter	**Industry Moinesti South**
	kg/d
BOD_5	49
COD	97
SS	57
organic N	0
NH_4-N	9
NO_3-N	0
Total N	9
P	16

Table 10-60: WWTP Moinesti South, Industrial Pollution Data

Based on a specific BOD_5 of 60 g/p.e./day the industrial pollution loads equal 800 p.e., approximately 13 % of the total plant capacity.

Including industrial pollution loads the final design pollution loads will be as follows.

Design Pollution Loads		
Parameter	**Loads**	**Concentration**
	kg/d	**mg/l**
BOD_5	373	279
COD	745	558
SS	435	325
organic N	0	0
NH_4-N	62	46
NO_3-N	6	5
Total N	68	51
P	27	20

Table 10-61: WWTP Moinesti South, Design Pollution Loads

Based on a specific BOD_5 of 60 g/p.e./day the plant has a size of 6,200 p.e.. Since the agglomeration Comanesti-Moinesti has more than 10,000 capita with two WWTP, tertiary treatment is necessary for both plants. The following discharge effluent parameters as set out in the Urban Wastewater Treatment Directive 91/271/EEC which has been implemented in the Romanian standard NTPA 001 – 011 apply for the WWTP Moinesti South.

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

Table 10-62: WWTP Moinesti South, Effluent Standards

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

Proposed Wastewater Treatment Concept Moinesti South

The basic layout of the WWTP is shown in the following drawings as annex to this Feasibility Study:

Flow Scheme Wastewater Treatment / BC-FS-WW-450-0

Flow Scheme Sludge Treatment / BC-FS-WW-451-0

Layout Plan / BC-FS-WW-452-0

The proposed wastewater treatment concept includes the following treatment steps that partly exist or have to be refurbished or newly constructed.

Mechanical Treatment:

Inlet Pumping Station: The wastewater inflow from the WWTP's drainage area will be pumped with an inlet pumping station.

Fine Screens: A screening building with a screen 10 mm width. The screening residuals will be dumped into containers. Final disposal is the solid waste disposal site. The screening building will include the blowers for the aerated grit and grease chamber.

Aerated Grit and Grease Chamber: After the screens the wastewater will flow into an aerated grit and grease chamber. Separated grit material will be dumped into containers and disposed of at a solid waste disposal site. The grease will be evacuated from the grease chambers with a suction vehicle and disposed of.

Inlet Flow Meter: The inlet flow channel will include a new flow meter (Parshall Flume or similar).

Biological Treatment:

Activated Sludge Tank: From the aerated grit and grease chamber the wastewater flows into the activated sludge tank. The activated sludge system includes aerobic zones (nitrification) and anoxic zones (denitrification). The tanks are aerated by a fine bubble aeration system, pressurized air is supplied by rotary piston blowers. The total sludge age is 25 days (extended aeration). As the result, the sludge is aerobically stabilized.

Phosphorus Precipitation: To comply with Phosphorus effluent standards, a chemical phosphorus precipitation station will be installed.

Secondary Settling Tanks: Activated sludge and treated wastewater are separated in a secondary settling tank. Return sludge is returned to the activated sludge tank, excess sludge will be pumped to a gravity excess sludge thickener.

Sludge Treatment:

Secondary Sludge: Secondary sludge will be discharged to the secondary sludge gravity thickener where a final DS content of approximately 2 – 3 % is achieved. From there the sludge is transported to the WWTP Moinesti-North.

Sludge Dewatering: The sludge will be transported to WWTP Moinesti-North where it is dewatered to a DS of 35 %.

Sludge Storage Area: No sludge storage area is required.

Miscellaneous and Equipment: Laboratory equipment, Auto drain for wastewater network (suction vehicle), observation wells for groundwater monitoring.

Discharge Point: The discharge point is located at the Fagul River. The Stereo coordinates are:

X: 612240.60

Y: 547951.20

Required Site Area: The total area demand of the new plant is ca. 1.0 ha.

It has to be ensured, that the subsoil is appropriate and not contaminated due to previous use.

10.2.2.3 Agglomeration Buhusi

10.2.2.3.1 Wastewater Network

The extension of the wastewater collection system has been established together with Directia de Gospodarire Comunala. The sewers were sized taking into account the existing population and the population in the area which will be connected to this network in the future years.

To increase the connection rate from 54 % to at least 90 % within this project, 20.1 km of sewer extensions and 11 pumping stations are to be added to the existing wastewater collection system.

The following table lists the extensions to the wastewater collection system in Buhusi.

Name of Street	Length [m]	Diameter	Material
Orbic	6,330	250	PVC
Libertății	4,600	250- 500	PVC
Bodeşti	3,025	250	PVC
Tineretului	881	250	PVC
Ghe. Doja	645	250	PVC
Marginea	590	250	PVC
Casa de Apă	2,930	250	PVC
Chebac	1,139	300	PVC
Total:	20,140		

Table 10-63: WW Network Extensions Buhusi

The following picture shows the proposed sewer network extensions for the Agglomeration Buhusi.

Figure 10-12: Proposed Sewer Extension Agglomeration Buhusi

10.2.2.3.2 Wastewater Pumping Stations

To ensure that the wastewater will be properly discharged to the wastewater treatment plant from all parts of the agglomeration, 11 new wastewater pumping stations must be located within the wastewater collection system (10 secondary network pumping stations, 1 principal network pumping station).

The following table presents the main characteristics:

Total No.	Pumping Station	Remarks	Design Capacity	Pressure Head	Pressure Line Diameter	Pressure Line Length
--	--	--	l/s	m	mm	m
1	PS1	New, Combined System, Secondary Network	1.18	11	100	809
2	PS2	New, Combined System, Secondary Network	3.78	16	100	200
3	PS3	New, Combined System, Secondary Network	9.65	18	100	218
4	PS4	New, Combined System, Secondary Network	1.00	5	100	80
5	PS5	New, Combined System, Secondary Network	1.00	5	100	100
6	PS6	New, Combined System, Secondary Network	1.00	5	100	282
7	PS7	New, Combined System, Secondary Network	25.50	7	200	236
8	PS8	New, Combined System, Secondary Network	5.02	9	100	180
9	PS9	New, Combined System, Secondary Network	3.85	21	100	120
10	PS10	New, Combined System, Secondary Network	3.98	15	100	608
11	PS11	New, Combined System, Principal Network	43.0	15	200	-

Table 10-64: New WW PS Buhusi

10.2.2.3.3 Wastewater Treatment Plant

The WWTP Buhusi is located in the middle of the agglomeration Buhusi. The whole agglomeration is served by one central plant. The existing WWTP will be abandoned. A new plant will be built on public property located eastern to the existing Plant.

Figure 10-13: Layout plan WWTP Buhusi

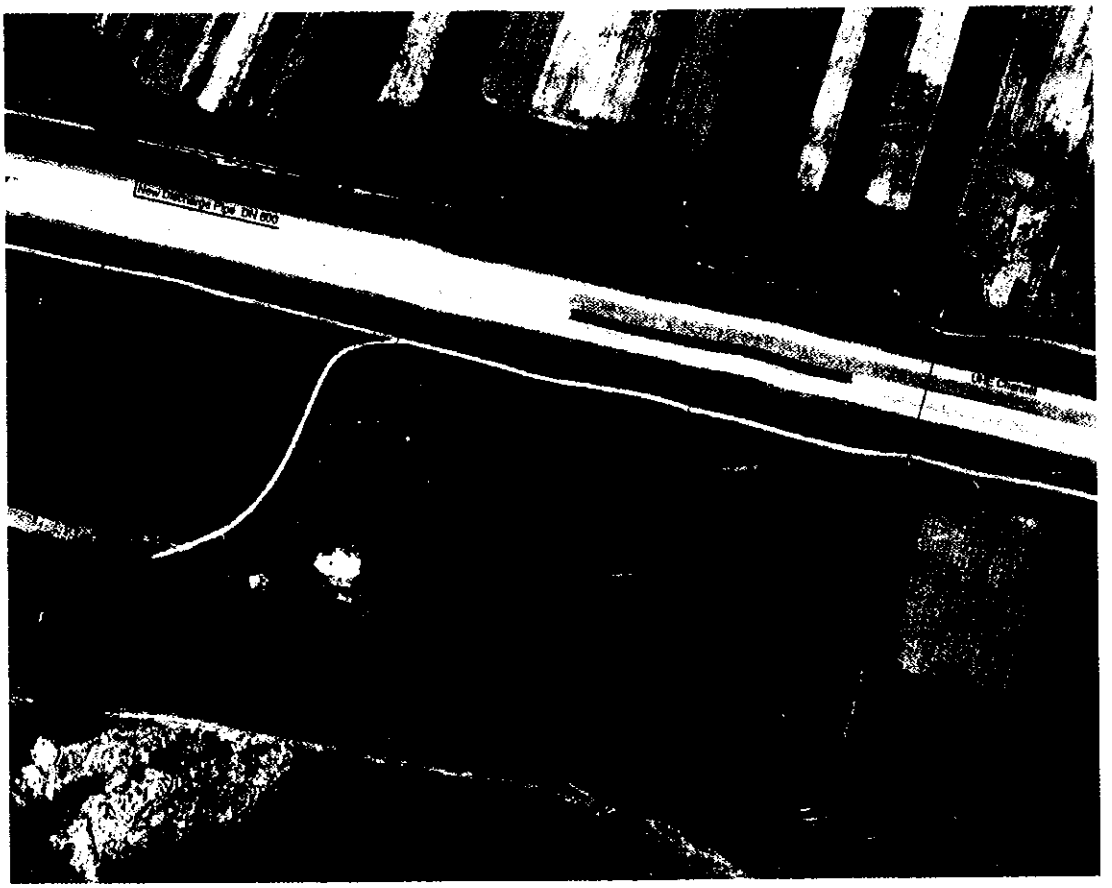

Figure 10-14: Discharge point WWTP Buhusi

Basic Design Parameters

The underlying basic design parameters concerning the calculation of flows and loads are presented in Chapter 8.3 of this Feasibility Study.

The following table shows the settlements of the agglomeration Buhusi that will be connected to the WWTP.

Settlement	Total Capita	Compliance Phase 1	Compliance Phase 2	Compliance Phase 3	Area
		2015	2018	2037	
Tardenii Mari	790		790		Rural
Valea Lui Ion	1,421		1,421		Rural
Blagesti	2,350		2,350		Rural
Buda	2,061		2,061		Rural
Racova	2,230		2,230		Rural
Buhusi	19,678	19,678			Urban
Total	**28,530**	**19,678**	**8,852**	**0**	
Cumulated Capita			**28,530**	**28,530**	

Table 10-65: WWTP Buhusi, Connected Population

The resulting design flow data are presented in the following table.

Design Flow Data			
Daily Flow	$Q_{day,DW}$	7,238	m³/d
	$Q_{24,DW}$	302	m³/h
Maximum Dry Weather Flow	$Q_{max,DW}$	464	m³/h
		129	l/s
Maximum Design Flow	$Q_{max,Storm}$	828	m³/h
		230	l/s

Table 10-66: WWTP Buhusi, Design Flow

Relevant industries which might produce a considerable amount of wastewater flow and load have been determined in details in the industrial survey conducted by the Consultant.

The industrial pollution loads have been determined in detail during the industrial survey. In addition reasonable surcharges have been made to account for future industrial developments.

Industrial Pollution Loads			
Parameter	Industry Buhusi	Industry Others	Total
	kg/d	kg/d	kg/d
BOD_5	161	217	378
COD	321	434	755
SS	187	253	441
organic N	0	0	0
NH_4-N	29	40	69
NO_3-N	0	0	0
Total N	29	40	69
P	5	7	13

Table 10-67: WWTP Buhusi, Industrial Pollution Data

Based on a specific BOD_5 of 60 g/p.e./day the industrial pollution loads equal 6,300 p.e., approximately 18 % of the total plant capacity.

Including industrial pollution loads the final design pollution loads will be as follows.

Design Pollution Loads		
Parameter	**Loads**	**Concentration**
	kg/d	**mg/l**
BOD_5	2,089	282
COD	4,179	563
SS	2,438	329
organic N	0	0
NH_4-N	349	47
NO_3-N	34	5
Total N	383	52
P	70	9

Table 10-68: WWTP Buhusi, Design Pollution Loads

Based on a specific BOD_5 of 60 g/p.e./day the plant has a size of 34,800 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 Buhusi.

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

Table 10-69: WWTP Buhusi, Effluent Standards

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

Proposed Wastewater Treatment Concept

The basic layout of the WWTP is shown in the following drawings as annex to this Feasibility Study:

Flow Scheme Wastewater Treatment / BC-FS-WW-550-0

Flow Scheme Sludge Treatment / BC-FS-WW-551-0

Layout Plan / BC-FS-WW-552-0

The proposed wastewater treatment concept includes the following treatment steps that partly exist or have to be refurbished or newly constructed.

Mechanical Treatment:

Inlet Pumping Station: The wastewater inflow from the WWTP's drainage area will be pumped with an inlet pumping station.

Fine Screens: A screening building with two assembly lines of screens 10 mm width. The screening residuals will be washed, compressed and dumped into

containers. Final disposal is the solid waste disposal site. The screening building will include the grit classifier for grit material and the blowers for the aerated grit and grease chamber.

Septic Sludge Reception Area: The screening building will include a reception station for septic sludge. Main parts are a fine screen, flow meter and buffer tank with pumps.

Aerated Grit and Grease Chamber: After the screens the wastewater will flow into an aerated grit and grease chamber (two lines). Separated grit material will be classified in a grit classifier, dumped into containers and disposed of at a solid waste disposal site. The grease will be evacuated from the grease chambers with a suction vehicle and disposed of.

Inlet Flow Meter: The inlet flow channel will include a new flow meter (Parshall Flume or similar).

Biological Treatment:

Activated Sludge Tanks: From the aerated grit and grease chamber the wastewater flows into the activated sludge tanks (2 lines). The activated sludge system includes aerobic zones (nitrification) and anoxic zones (denitrification). The tanks are aerated by a fine bubble aeration system, pressurized air is supplied by rotary piston blowers. The total sludge age is 25 days (extended aeration). As the result, the sludge is aerobically stabilized.

Phosphorus Precipitation: To comply with Phosphorus effluent standards, a chemical phosphorus precipitation station will be installed.

Secondary Settling Tanks: Activated sludge and treated wastewater are separated in 2 secondary settling tanks. Return sludge is returned to the activated sludge tanks, excess sludge will be pumped to gravity excess sludge thickeners.

Sludge Treatment:

Secondary Sludge: Secondary sludge will be discharged to the secondary sludge gravity thickener where a final DS content of approximately 2 – 3 % is achieved. From there the primary sludge is pumped to the sludge dewatering machines.

Sludge Dewatering: The stabilized sludge is dewatered in sludge dewatering machines (recessed plate filter presses) to a final DS content of approximately 35 %.

Sludge Storage Area: In order to support the selected sludge disposal path it is necessary to foresee a certain sludge storage capacity on the WWTP site. It is envisaged to store the dewatered sludge on an area within the treatment site with the following capacity:

Storage Area: 2,200 m²

Storage Time: 6 Months

Miscellaneous and Equipment: Laboratory equipment, Auto drain for wastewater network (suction vehicle), observation wells for groundwater monitoring.

Discharge Point: The new discharge point is located at the Bistrita River. The WWTP effluent will be connected with a new pipe, length 1.6 km, to the discharge point. The Stereo coordinates are:

X: 632224.94

Y: 578153.83

Required Site Area: The existing plant site is not sufficient for the proposed treatment concept. The Feasibility Study identified an area ca. (2.5 ha) located at the eastern side of the existing WWTP, on public property. Spoil from the construction of the Hydroelectric Canal was dumped at this site.

It has to be ensured, that the subsoil is able to take the load from the structures of the WWTP and not contaminated due to previous use.

10.2.2.4 Agglomeration Darmanesti

10.2.2.4.1 Wastewater Network

The extension of the wastewater collection system has been established together with Apa Serv Bacau. The sewers were sized taking into account the existing population and the population in the area which will be connected to this network in the future years.

To increase the connection rate to at least 90 % within this project, 50.4 km of sewer extensions and 14 pumping stations are to be added to the existing wastewater collection system.

The following table lists the extensions to the wastewater collection system in Darmanesti.

Street Name	Length [m]	Diameter	Material
Rafinariei	500	250	PVC
Chimiei 1	1450	250	PVC
Dumbravei	700	250	PVC
Energiei	4891	300	PVC
Taberei	150	250	PVC
Bratulesti	300	250	PVC
Crinului	350	300	PVC
Maguricei	200	250	PVC
Orizontului	1300	250	PVC
Valea Uzului	400	250	PVC
Muncii	1000	250	PVC
Stadionului	475	250	PVC
Victoriei	500	250	PVC
Alunului	650	250	PVC
Arinilor	350	250	PVC
Armoniei	350	250	PVC
Artarilor	200	250	PVC
Bradului	500	250	PVC
Bratulesti	1450	250	PVC
Buciumului	1150	250	PVC
Bujorului	650	250	PVC
Castanilor	500	250	PVC
Caprioarei	450	250	PVC
Chimiei 2	800	250	PVC
Ciresilor	225	250	PVC
Crangului	650	250	PVC
Fabricii	950	250	PVC
Fagului	125	250	PVC
Fierarilor	300	250	PVC
Finetelor	400	250	PVC
Florilor	350	250	PVC
Forestierului	630	250	PVC
Garofitei	150	250	PVC
Garii	550	250	PVC

Street Name	Length [m]	Diameter	Material
Ghioceilor	475	250	PVC
Lalelelor	100	250	PVC
Luncii	630	250	PVC
Maguricei	150	250	PVC
Minerilor	1700	250	PVC
Mioritei	500	250	PVC
Morii	65	250	PVC
Nemira	850	250	PVC
Nordului	160	250	PVC
Panselelor	200	250	PVC
Petrolistilor	475	250	PVC
Pinilor	200	250	PVC
Poiana	550	250	PVC
Popasului	350	250	PVC
Prieteniei	160	250	PVC
Primaverii	575	250	PVC
Rachitis	500	250	PVC
Salcamului	225	250	PVC
Stejarului	800	250	PVC
Sipotului	200	250	PVC
Teiului	725	250	PVC
Tineretului	350	250	PVC
Trandafirilor	100	250	PVC
Triajului	1582	250	PVC
Vadului	350	250	PVC
Valea Uzului	5100	250 - 300	PVC
Calea Trotusului	2455	250 - 400	PVC
Viorelelor	150	250	PVC
Visinilor	225	250	PVC
Zorilor	275	250	PVC
Darmaneasca			
Valea Malului	2201	250 - 300	PVC
Cismelelor	677	250	PVC
Livezi	641	250	PVC
Lapos			
Sat Lapos	3540	250	PVC
TOTAL	50832		

Table 10-70: WW Network Extensions Darmanesti

The following figure shows the proposed sewer network extensions for the Agglomeration Darmanesti.

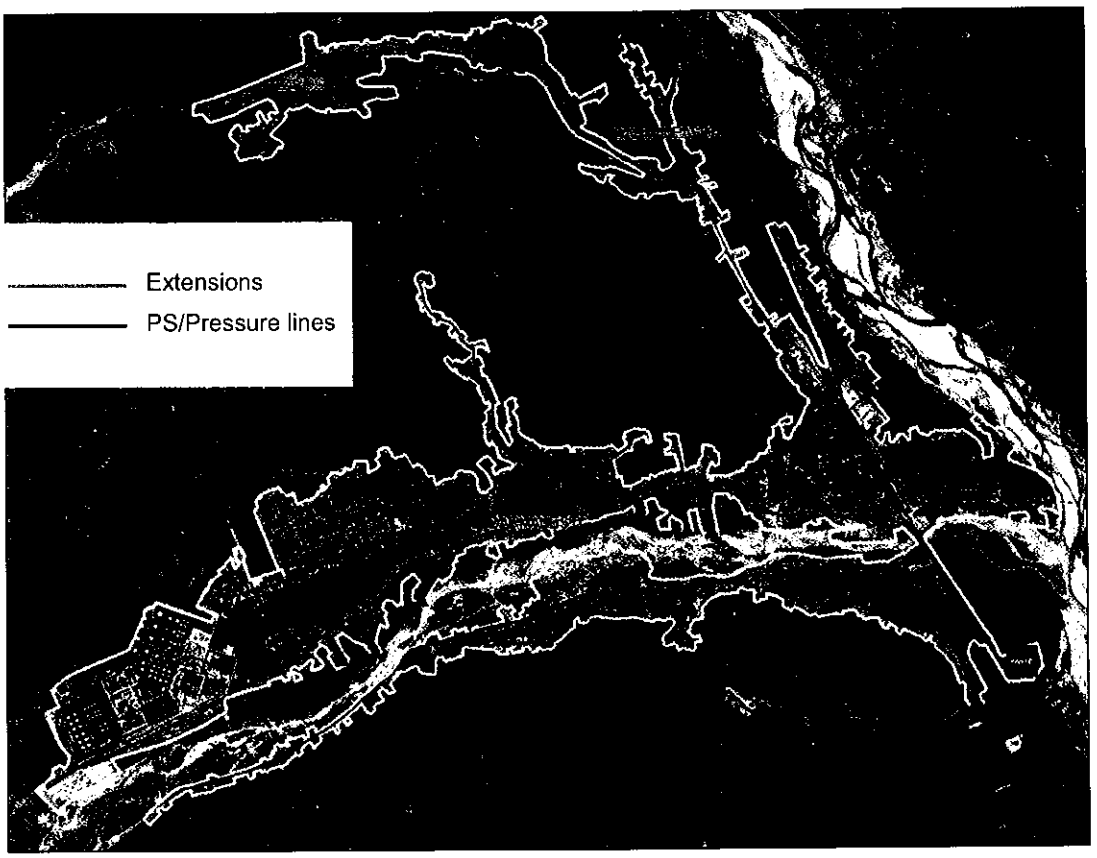

Figure 10-15: Proposed Sewer Extension Agglomeration Darmanesti

10.2.2.4.2 Wastewater Pumping Stations

To ensure that the wastewater will be properly discharged to the wastewater treatment plant from all parts of the agglomeration, 14 new wastewater pumping stations must be located within the wastewater collection system (secondary network pumping stations).

Total No.	Pumping Station	Remarks	Design Capacity	Pressure Head	Pressure Line Diameter	Pressure Line Length
--	--	--	l/s	m	mm	m
1	PS1	New, Combined System, Secondary Network	4	2	100	81
2	PS2	New, Combined System, Secondary Network	4	3	100	296
3	PS3	New, Combined System, Secondary Network	4	2	100	921
4	PS4	New, Combined System, Secondary Network	4	3	100	664
5	PS5	New, Combined System, Secondary Network	4	2	100	364
6	PS6	New, Combined System, Secondary Network	4	3	100	352
7	PS7	New, Combined System, Secondary Network	4	3	100	421
8	PS8	New, Combined System, Secondary Network	4	3	100	179
9	PS9	New, Combined System,	4	2	100	310

Total No.	Pumping Station	Remarks	Design Capacity	Pressure Head	Pressure Line Diameter	Pressure Line Length
--	--	--	l/s	m	mm	m
		Secondary Network				
10	PS10	New, Combined System, Secondary Network	4	3	100	409
11	PS11	New, Combined System, Secondary Network	4	2	100	395
12	PS12	New, Combined System, Secondary Network	4	3	100	246
13	PS13	New, Combined System, Secondary Network	4	3	100	
14	PS14	New, Combined System, Secondary Network	4	2	100	367

Table 10-71: New WW PS Darmanesti

10.2.2.4.3 Wastewater Treatment Plant

The existing WWTP of Darmanesti is located in the middle of the town and serves a block of flats with high population density. It has only mechanical treatment and is not sufficient for the whole town. Because of the size and the location of the WWTP, it is recommended to dismantle the old WWTP and build a new central WWTP in the south eastern part of Darmanesti where a site in public ownership is available.

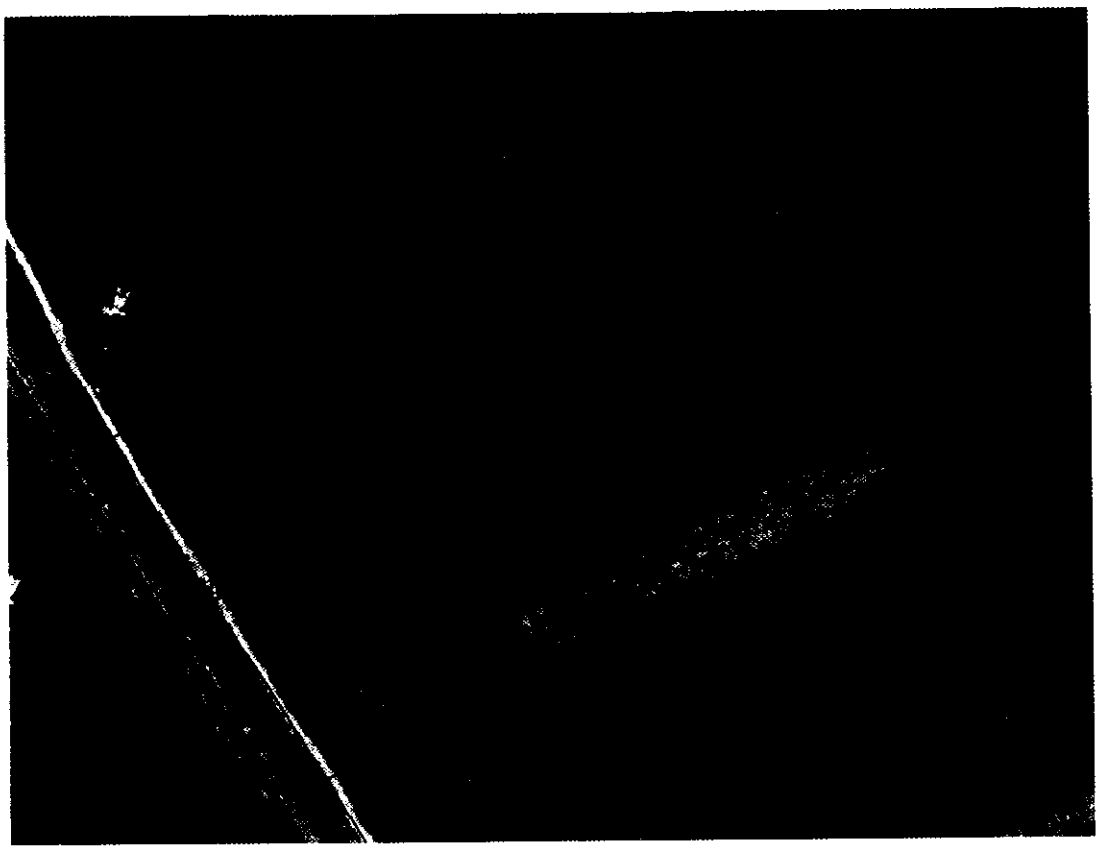

Figure 10-16: Layout plan WWTP Darmanesti

Basic Design Parameters

The underlying basic design parameters concerning the calculation of flows and loads are presented in Chapter 8.3 of this Feasibility Study.

The following table shows the settlements of the agglomeration Darmanesti that will be connected to the WWTP.

Settlement	Total Capita	Compliance Phase 1	Compliance Phase 2	Compliance Phase 3	Area
		2015	2018	2037	
Salatruc	864			864	Rural
Darmanesti	10,099	10,099			Urban
Lapos	1,067	1,067			Rural
Darmaneasca	362	362			Rural
Plopu	1,554			1,554	Rural
Pagubeni	424			424	Rural
Total	**14,370**	**11,528**	**0**	**2,842**	
Cumulated Capita			**11,528**	**14,370**	
Percent		**80%**	**80%**	**100%**	

Table 10-72: WWTP Darmanesti, Connected Population

The resulting design flow data are presented in the following table.

Design Flow Data			
Daily Flow	$Q_{day,DW}$	4,410	m³/d
	$Q_{24,DW}$	184	m³/h
Maximum Dry Weather Flow	$Q_{max,DW}$	266	m³/h
		74	l/s
Maximum Design Flow	$Q_{max,Storm}$	471	m³/h
		131	l/s

Table 10-73: WWTP Darmanesti, Design Flow

Relevant industries which might produce a considerable amount of wastewater flow and load have been determined in details in the industrial survey conducted by the Consultant.

The industrial pollution loads have been determined in detail during the industrial survey. In addition reasonable surcharges have been made to account for future industrial developments.

Industrial Pollution Loads			
Parameter	**Industry Darmanesti**	**Industry Darmaneasca**	**Total**
	kg/d	**kg/d**	**kg/d**
BOD_5	182	248	430
COD	364	496	859
SS	212	289	501
organic N	0	0	0
NH_4-N	33	45	79
NO_3-N	0	0	0
Total N	33	45	79
P	6	8	14

Table 10-74: WWTP Darmanesti, Industrial Pollution Data

Based on a specific BOD_5 of 60 g/p.e./day the industrial pollution loads equal 7,200 p.e., approximately 33 % of the total plant capacity.

Including industrial pollution loads the final design pollution loads will be as follows.

Design Pollution Loads		
Parameter	**Loads**	**Concentration**
	kg/d	**mg/l**
BOD_5	1,292	286
COD	2,584	572
SS	1,507	333
organic N	0	0
NH_4-N	220	49
NO_3-N	17	4
Total N	237	52
P	43	10

Table 10-75: WWTP Darmanesti, Design Pollution Loads

Based on a specific BOD_5 of 60 g/p.e./day the plant has a size of 21,500 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 Darmanesti.

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

Table 10-76: WWTP Darmanesti, Effluent Standards

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

Proposed Wastewater Treatment Concept

The basic layout of the WWTP is shown in the following drawings as annex to this Feasibility Study:

Flow Scheme Wastewater Treatment / BC-FS-WW-650-0

Flow Scheme Sludge Treatment / BC-FS-WW-651-0

Layout Plan / BC-FS-WW-651-0

The proposed wastewater treatment concept includes the following treatment steps that are newly constructed.

Mechanical Treatment:

Inlet Pumping Station: The wastewater inflow from the WWTP's drainage area will be pumped with an inlet pumping station.

Fine Screens: A screening building with two assembly lines of screens 10 mm width. The screening residuals will be washed, compressed and dumped into containers. Final disposal is the solid waste disposal site. The screening building will include the grit classifier for grit material and the blowers for the aerated grit and grease chamber.

Septic Sludge Reception Area: The screening building will include a reception station for septic sludge. Main parts are a fine screen, flow meter and buffer tank with pumps.

Aerated Grit and Grease Chamber: After the screens the wastewater will flow into an aerated grit and grease chamber (two lines). Separated grit material will be classified in a grit classifier, dumped into containers and disposed of at a solid waste

disposal site. The grease will be evacuated from the grease chambers with a suction vehicle and disposed of.

Inlet Flow Meter: The inlet flow channel will include a new flow meter (Parshall Flume or similar).

Biological Treatment:

Activated Sludge Tanks: From the aerated grit and grease chamber the wastewater flows into the activated sludge tanks (2 lines). The activated sludge system includes aerobic zones (nitrification) and anoxic zones (denitrification). The tanks are aerated by a fine bubble aeration system. Pressurized air is supplied by rotary piston blowers. The total sludge age is 25 days (extended aeration). As the result, the sludge is aerobically stabilized.

Phosphorus Precipitation: To comply with Phosphorus effluent standards, a chemical phosphorus precipitation station will be installed.

Secondary Settling Tanks: Activated sludge and treated wastewater are separated in 2 secondary settling tanks. Return sludge is returned to the activated sludge tanks, excess sludge will be pumped to gravity excess sludge thickeners.

Sludge Treatment:

Secondary Sludge: Secondary sludge will be discharged to the secondary sludge gravity thickener where a final DS content of approximately 2 – 3 % is achieved. From there the primary sludge is pumped to the sludge dewatering machines.

Sludge Dewatering: The stabilized sludge is dewatered in sludge dewatering machines (recessed plate filter presses) to a final DS content of approximately 35 %.

Sludge Storage Area: In order to support the selected sludge disposal path it is necessary to foresee a certain sludge storage capacity on the WWTP site. It is envisaged to store the dewatered sludge on an area within the treatment site with the following capacity:

Storage Area:	1,350	m^2
Storage Time:	6	Months

Miscellaneous and Equipment: Laboratory equipment, Auto drain for wastewater network (suction vehicle), observation wells for groundwater monitoring.

The existing WWTP will be dismantled.

Discharge Point: The discharge point will be located at the Trotus River. The Stereo coordinates are:

X: 616626.71

Y: 541120.10

Required Site Area: The total area demand of the new plant is ca. 2.5 ha. It has to be ensured, that the subsoil is appropriate and not contaminated due to previous use. The flood protection of the site has to be ensured either. A hydrological study was done for the proposed site. It observed that the proposed location for the WWTP is not subject to flooding events neither from Uz River, nor from Trotuş River.

10.2.2.5 Agglomeration Targu Ocna

10.2.2.5.1 Wastewater Network

The extension of the wastewater collection system has been established together with Consiliul Local Targu Ocna. The sewers were sized taking into account the existing population and the population in the area which will be connected to this network in the future years.

To increase the connection rate from 54 % to at least 90 % within this project, 24.1 km of sewer extensions and 9 pumping stations are to be added to the existing wastewater collection system.

The following table lists the extensions to the wastewater collection system in Targu Ocna.

Street Name	Length [m]	Diameter	Material
Viisoara	1,029	250	PVC
V. Alexandri	449	250	PVC
Petre Ispirescu	1,049	250	PVC
Garii	359	250	PVC
Verii	879	250	PVC
D. Cantemir	179	250	PVC
Decebal	209	250	PVC
P. Rares	229	250	PVC
Grandului	209	250	PVC
Salciilor	99	250	PVC
A. Vlaicu	318	250	PVC
Ion Creanga	201	250	PVC
Negru Voda	209	250	PVC
Cimitir	179	250	PVC
Florilor	199	250	PVC
Vultur	269	250	PVC
Iernii	329	250	PVC
Galean	2,249	250	PVC
A. Mureseanu	220	250	PVC
A. Vlahuta	249	250	PVC
Viitorului	289	250	PVC
Ion Catina	656	250	PVC
Caramidariei	357	250	PVC
Republicii	849	250	PVC
Salina	449	250	PVC
E. Grigorescu	249	250	PVC
Poet I. Gramada	469	250	PVC
Prinaverii	149	250	PVC
C. Negri	2,289	250-300	PVC
Oituz	339	250	PVC
Pompei	109	250	PVC
Slt. Comanescu	279	250	PVC
Visului	239	250	PVC
Ict. Sion	1,217	250	PVC
Cosna	179	250	PVC

Street Name	Length [m]	Diameter	Material
Tisesti	3,417	250-300	PVC
Aurora	408	250	PVC
Constantin Musat	287	250	PVC
Maria Rosita	376	250	PVC
Sat Valcele	2,411	250	PVC
Total:	24,120		

Table 10-77: WW Network Extensions Targu Ocna

The following figure shows the proposed sewer network extensions for the Agglomeration Targu Ocna.

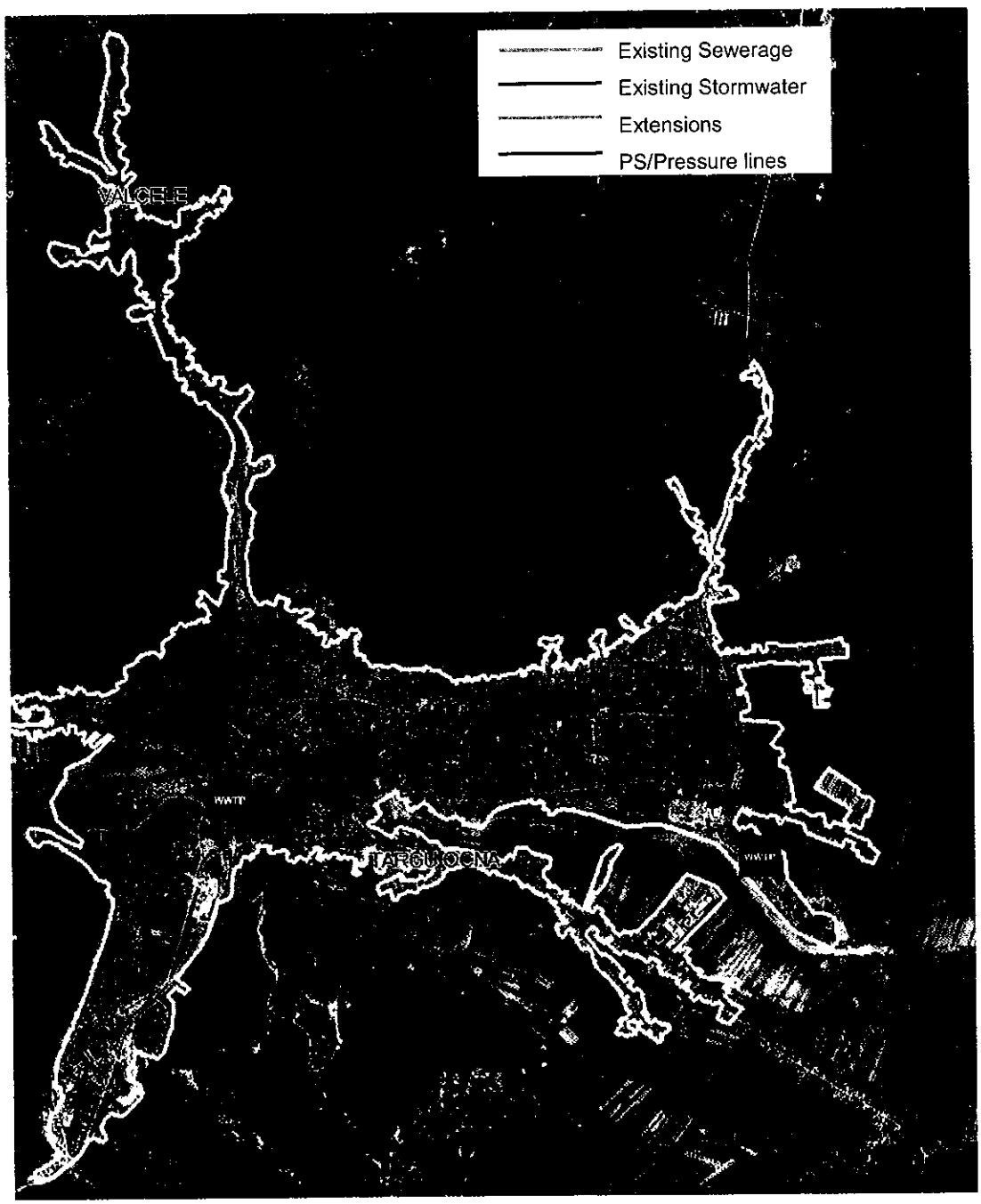

Figure 10-17: Proposed Sewer Extension Agglomeration Targu Ocna

10.2.2.5.2 Wastewater Pumping Stations

To ensure that the wastewater will be properly discharged to the wastewater treatment plant from all parts of the agglomeration, 9 new wastewater pumping stations must be located within the wastewater collection system.

Total No.	Pumping Station	Remarks	Design Capacity	Pressure Head	Pressure Line Diameter	Pressure Line Length
--	--	--	l/s	m	mm	m
1	PS1	New, Combined System, Secondary Network	4	2	100	81
2	PS2	New, Combined System, Secondary Network	4	3	100	296
3	PS3	New, Combined System, Secondary Network	4	2	100	921
4	PS4	New, Combined System, Secondary Network	4	3	100	664
5	PS5	New, Combined System, Secondary Network	4	2	100	364
6	PS6	New, Combined System, Secondary Network	4	3	100	352
7	PS7	New, Combined System, Secondary Network	4	3	100	421
8	PS8	New, Combined System, Secondary Network	4	3	100	179
9	PS9	New, Combined System, Secondary Network	4	2	100	310

Table 10-78: New WW PS Targu Ocna

10.2.2.5.3 Wastewater Treatment Plant

The existing waste water treatment plant is located in the eastern part of Targu Ocna. The capacity of the WWTP is insufficient and the site is endangered by flooding. So it is recommended to dismantle the old WWTP and build a new central WWTP within an area of higher flood protection. There is already a site available (ca. 1.2 ha) which is adjacent to the existing plant but higher situated. The available site is in public ownership.

Figure 10-18: Layout plan WWTP Targu Ocna

Basic Design Parameters

The underlying basic design parameters concerning the calculation of flows and loads are presented in Chapter 8.3 of this Feasibility Study.

The following table shows the settlements of the agglomeration Targu Ocna that will be connected to the WWTP.

Settlement	Total Capita	Compliance Phase 1	Compliance Phase 2	Compliance Phase 3	Area
		2015	2018	2037	
Targu Ocna	10,922	10,922			Urban
Valcele	1,217	1,217			Rural
Poieni	932			932	Rural
Bogata	1,217			1,217	Rural
Total	**14,288**	**12,139**	**0**	**2,149**	
Cumulated Capita			**12,139**	**14,288**	
Percent		**85%**	**85%**	**100%**	

Table 10-79: WWTP Targu Ocna, Connected Population

The resulting design flow data are presented in the following table.

Design Flow Data			
Daily Flow	$Q_{day,DW}$	3,304	m³/d
	$Q_{24,DW}$	138	m³/h
Maximum Dry Weather Flow	$Q_{max,DW}$	220	m³/h
		61	l/s
Maximum Design Flow	$Q_{max,Storm}$	395	m³/h
		110	l/s

Table 10-80: WWTP Targu Ocna, Design Flow

Relevant industries which might produce a considerable amount of wastewater flow and load have been determined in details in the industrial survey conducted by the Consultant.

The industrial pollution loads have been determined in detail during the industrial survey. In addition reasonable surcharges have been made to account for future industrial developments.

Industrial Pollution Loads	
Parameter	Industry Targu Ocna
	kg/d
BOD_5	98
COD	197
SS	115
organic N	0
NH_4-N	18
NO_3-N	0
Total N	18
P	3

Table 10-81: WWTP Targu Ocna, Industrial Pollution Data

Based on a specific BOD_5 of 60 g/p.e./day the industrial pollution loads equal 1,600 p.e., approximately 10 % of the total plant capacity.

Including industrial pollution loads the final design pollution loads will be as follows.

Design Pollution Loads		
Parameter	**Loads**	**Concentration**
	kg/d	**mg/l**
BOD_5	956	282
COD	1,911	563
SS	1,115	328
organic N	0	0
NH_4-N	158	47
NO_3-N	17	5
Total N	175	52
P	32	9

Table 10-82: WWTP Targu Ocna, Design Pollution Loads

Based on a specific BOD_5 of 60 g/p.e./day the plant has a size of 16,000 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 Targu Ocna.

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

Table 10-83: WWTP Targu Ocna, Effluent Standards

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

Proposed Wastewater Treatment Concept

The basic layout of the WWTP is shown in the following drawings as annex to this Feasibility Study:

Flow Scheme Wastewater Treatment / BC-FS-WW-750-0

Flow Scheme Sludge Treatment / BC-FS-WW-751-0

Layout Plan / BC-FS-WW-752-0

The proposed wastewater treatment concept includes the following treatment steps that are newly constructed.

Mechanical Treatment:

Inlet Pumping Station: The wastewater inflow from the WWTP's drainage area will be pumped with an inlet pumping station.

Fine Screens: A screening building with two lines of screens 10 mm width. The screening residuals will be dumped into containers. Final disposal is the solid waste

disposal site. The screening building will include the blowers for the aerated grit and grease chamber.

Septic Sludge Reception Area: The screening building will include a reception station for septic sludge. Main parts are a fine screen, flow meter and buffer tank with pumps.

Aerated Grit and Grease Chamber: After the screens the wastewater will flow into an aerated grit and grease chamber (two lines). Separated grit material will be classified in a grit classifier, dumped into containers and disposed of at a solid waste disposal site. The grease will be evacuated from the grease chambers with a suction vehicle and disposed of.

Inlet Flow Meter: The inlet flow channel will include a new flow meter (Parshall Flume or similar).

Biological Treatment:

Activated Sludge Tanks: From the aerated grit and grease chamber the wastewater flows into the activated sludge tanks (2 lines). The activated sludge system includes aerobic zones (nitrification) and anoxic zones (denitrification). The tanks are aerated by a fine bubble aeration system. Pressurized air is supplied by rotary piston blowers. The total sludge age is 25 days (extended aeration). As the result, the sludge is aerobically stabilized.

Phosphorus Precipitation: To comply with Phosphorus effluent standards, a chemical Phosphorus precipitation station will be installed.

Secondary Settling Tanks: Activated sludge and treated wastewater are separated in 2 secondary settling tanks. Return sludge is returned to the activated sludge tanks, excess sludge will be pumped to a gravity excess sludge thickener.

Sludge Treatment:

Secondary Sludge: Secondary sludge will be discharged to the secondary sludge gravity thickener where a final DS content of approximately 2 – 3 % is achieved. From there the primary sludge is pumped to the sludge dewatering machines.

Sludge Dewatering: The stabilized sludge is dewatered in sludge dewatering machines (recessed plate filter presses) to a final DS content of approximately 35 %.

Sludge Storage Area: In order to support the selected sludge disposal path it is necessary to foresee a certain sludge storage capacity on the WWTP site. It is envisaged to store the dewatered sludge on an area within the treatment site with the following capacity:

Storage Area:	1,050	m^2
Storage Time:	6	Months

Miscellaneous and Equipment: Laboratory equipment, Auto drain for wastewater network (suction vehicle), observation wells for groundwater monitoring.

The existing WWTP will be dismantled.

Discharge Point: The discharge point is located at the Trotus River. The Stereo coordinates are:

X: 625913.89

Y: 531658.76

Required Site Area: The total area demand of the new plant is ca. 1.2 ha.

10.3 Technical Assistance

The new founded ROC, CRAB SA - Compania Regionala de Apa Bacau SA, consists of the former operators :

- SC APA SERV SA Bacau
- SC Compania de Apa SA Bacau
- SC APA Prim S.R.L Moinesti
- Directia de Gospodarie Comunala Buhusi
- Serviciul Public de Gospodarie Comunala Targu Ocna

Apa Serv Bacau and thus the new founded ROC has experience in implementing internationally funded projects (like ISPA) and will be able to face new challenges in future when extending its services in the region.

The recommended Technical Assistance should help implementing the project in order to ensure putting in place a reliable system and effectively improve the water service.

Technical Assistance has been recommended within the Investment Plan (Master Plan Level). These accompanying measures are necessary for a smooth implementation of the projects and will include the following:

- TA for Preparation of Tender Documents for CF Priority II works
- TA for Project Management and Project publicity;
- TA for Supervision of implementation.

The Technical Assistance for **Tender Preparation CF II** should include the following:

- Performing of designs based on FS results and at the level of conceptual or detailed design depending on the type of contract defined in procurement plan (yellow book, red book)
- Preparation of Tender Documents and confidental cost estimates
- Support during Tendering and Evaluation

The Technical Assistance for **Project Management** should include the following:

- Support the Beneficiary in Project Implementation and Project Publicity;
- Support the Beneficiary in implementing an action plan for the protection of water sources;

- Support the Beneficiary in documenting the water supply networks and in developing hydraulic network models and carrying out calibration measurements;
- Support the Beneficiary in developing the sewer network documentation and hydraulic modelling;
- Support the Beneficiary in implementation of the Action Plan for Sludge Reuse;
- Support the Beneficiary in the procurement of equipment;
- Training in the field of new technologies, equipment and instruments

The Technical Assistance for **Site Supervision** should include the following:

- Quality surveillance of the construction works and technologies
- Inspection, control and coordination of the construction works and technologies
- Design inspection and coordination with progress schedule
- Inspection and coordination of the construction sequences with progress schedule
- Stage payment monitoring, Cost control
- Inspection completeness and quantity of the construction works
- Quality control and abidance of required construction methods
- Quality and quantity control of delivered materials on site
- Inspection of the materials storage and movement on site
- Inspection of process of required tests and measurements
- Safety supervision on site
- Environmental monitoring on site

10.4 Investment Costs

10.4.1 Agglomeration Bacau

A summary of proposed investments for Bacau Agglomeration is shown in the following table.

Description	Quantity	Unit	Total EUR
Network extensions			
Sewer DN 250 (depth 2,00 m Asphalt road) Margineni	3,494	m	654,465
Sewer DN 250 (depth 2,50 m Asphalt road) Bacau	17,125	m	2,940,107
Sewer DN 250 (depth 2,50 m Asphalt road) Letea Veche	4,096	m	829,403
Sewer DN 250 (depth 2,50 m w/o Asphalt) Bacau	8,400	m	1,260,000
Sewer DN 250 (depth 3,50 m Asphalt road) Hemeius	9,371	m	2,191,418
	42,486		**7,875,393**
Total Sewer Length	**42,486**	**m**	
House Connections			
House Connections	**1,060**	pcs.	1,059,652
			1,059,652
Manholes			
Depth 2,00 m	58	pcs.	59,739
Depth 2,50 m	494	pcs.	595,313
Depth 3,50 m	156	pcs.	236,753
			891,805
Total Manholes	**708**	**pcs.**	
Total Sewer Extension			**9,826,850**
Pumping Stations			
Secondary Network DN 250-300 Civil parts Bacau	5	pcs.	90,000
Secondary Network DN 250-300 E/M parts Bacau	5	pcs.	138,000
			228,000
Pressure lines			
Pressure line DN 100 Bacau	150	m	12,000
			12,000
WWTP			
Civil parts	1	lump sum	6,419,870
E/M parts	1	lump sum	6,675,500
			13,095,370
Total Agglomeration Bacau			**23,162,220**

Table 10-84: Wastewater Investment Agglomeration Bacau

Description	Investment [€]
Rehabilitation of WTP Carboaia	3,591,286
Total sum water supply part for CF in WSZ Bacau:	**3,591,286**

Table 10-85: Water Supply Investment (Cohesion Fund) Water supply zone Bacau

10.4.2 Agglomeration Comanesti-Moinesti

A summary of proposed investments for Comanesti-Moinesti (only Moinesti, Gazarie) Agglomeration is shown in the following table.

Description	Quantity	Unit	Total EUR
Network extensions			
Sewer DN 250 (depth 2,00 m Asphalt road)	11,233	m	1,933,941
Sewer DN 250 (depth 2,50 m Asphalt road)	5,230	m	979,820
Sewer DN 250 (depth 3,00 m Asphalt road)	4,426	m	900,806
Sewer DN 250 (depth 3,50 m Asphalt road)		m	0
	20,889		**3,814,566**
Sewer DN 300 (depth 3,00 m Asphalt road)	750	m	165,750
	750		**165,750**
House Connections			
House Connections	597	pcs.	597,225
			597,225
Manholes			
Depth 2,00 m	187	pcs.	192,833
Depth 2,50 m	87	pcs.	105,472
Depth 3,00 m	86	pcs.	119,911
			418,216
Total Manholes	**361**	**pcs.**	
Total Sewer Extension	**21,639**		**4,995,757**
Pumping Stations			
Secondary Network DN 250-300 Civil parts	2	pcs.	45,000
Secondary Network DN 250-300 E/M parts	2	pcs.	69,000
Principal Network Civil parts	1	pcs.	36,000
Principal Network E/M parts	1	pcs.	26,000
			176,000
Pressure lines			
Pressure line DN 100	3,610	m	288,800
			288,800
WWTP			
Moinesti-North Civil parts	1	lump sum	3,595,285
Moinesti-North E/M parts	1	lump sum	2,084,500
			5,679,785
Moinesti-South Civil parts	1	lump sum	1,296,385
Moinesti-South E/M parts	1	lump sum	984,129
			2,280,514
Total WWTP			**7,960,299**

Description	Quantity	Unit	Total EUR
Total Agglomeration Moinesti			**13,420,856**

Table 10-86: Wastewater Investment Agglomeration Comanesti-Moinesti

Description	Investment [€]
Network Extension	647,752
Total sum water supply part for CF in WSZ Moinesti:	**647,752**

Table 10-87: Water Supply Investment Water supply zone Comanesti-Moinesti

10.4.3 Agglomeration Buhusi

A summary of proposed investments for Buhusi Agglomeration is shown in the following.

Description	Quantity	Unit	Total EUR
Network extensions			
Sewer DN 250 (depth 2,00 m Asphalt road)	6,922	m	1,191,724
Sewer DN 250 (depth 2,50 m Asphalt road)	6,839	m	1,281,182
Sewer DN 250 (depth 3,00 m Asphalt road)	3,235	m	658,502
Sewer DN 250 (depth 3,50 m Asphalt road)	627	m	137,043
Sewer DN 250 (depth 4,00 m Asphalt road)	97	m	21,652
Sewer DN 250 (depth 4,50 m Asphalt road)	87	m	20,819
Sewer DN 250 (depth 5,50 m Asphalt road)	157	m	41,752
	17,963		**3,352,675**
Sewer DN 300 (depth 2,00 m Asphalt road)	228	m	43,156
Sewer DN 300 (depth 2,50 m Asphalt road)	775	m	159,547
Sewer DN 300 (depth 3,00 m Asphalt road)	133	m	29,393
	1,139		**233,316**
Sewer DN 350 (depth 3,50 m Asphalt road)	156	m	37,733
	156		**37,733**
Sewer DN 400 (depth 4,50 m Asphalt road)	301	m	82,891
Sewer DN 400 (depth 5,00 m Asphalt road)	71	m	20,573
	372		**103,464**
Sewer DN 500 (depth 3,00 m Asphalt road)	248	m	83,966
Sewer DN 500 (depth 4,00 m Asphalt road)	261	m	96,629
	510		**180,595**
House Connections			
House Connections	657	pcs.	657,060
			657,060
Combined Sewer Overflow (Industrial WWTP)			
CSO	1	lump sum	70,000
			70,000
Manholes			
Depth 2,00 m	119	pcs.	122,747
Depth 2,50 m	114	pcs.	138,184
Depth 3,00 m	59	pcs.	81,586
Depth 3,50 m	16	pcs.	24,581
Depth 4,00 m	6	pcs.	10,199
Depth 4,50 m	6	pcs.	12,249
Depth 5,00 m	1	pcs.	2,450
Depth 5,50 m	3	pcs.	5,877
			397,873
Total Manholes	**324**	**pcs.**	
Total Sewer Extension			**5,032,717**
Pumping Stations			
Secondary Network DN 250-300 Civil parts	10	pcs.	150,000
Secondary Network DN 250-300 E/M parts	10	pcs.	230,000

Description	Quantity	Unit	Total EUR
Principal Network Civil parts	1	pcs.	36,000
Principal Network E/M parts	1	pcs.	26,000
			442,000
Pressure lines			
Pressure line DN 100	2,840	m	227,200
WWTP			
Civil parts (incl. 1.6 km effluent pipe DN 600)	1	lump sum	4,864,590
E/M parts	1	lump sum	2,585,000
			7,449,590
Total Agglomeration Buhusi			**13,151,506**

Table 10-88: Wastewater Investment Agglomeration Buhusi

Description	Investment [€]
Network Extension	996,672
Total sum water supply part for CF in WSZ Buhushi:	**996,672**

Table 10-89: Water Supply Investment Water supply zone Buhushi

10.4.4 Agglomeration Darmanesti

A summary of proposed investments for Darmanesti Agglomeration is shown in the following.

Description	Quantity	Unit	Total EUR
Network extensions			
Sewer DN 250 (depth 2,00 m Asphalt road)	20,110	m	3,462,312
Sewer DN 250 (depth 2,50 m Asphalt road)	20,110	m	3,767,586
	40,221		**7,229,898**
Sewer DN 300 (depth 3,00 m Asphalt road)	9,232	m	2,040,329
Sewer DN 400 (depth 3,00 m Asphalt road)	918	m	211,149
Sewer DN 600 (depth 3,00 m Asphalt road)	461	m	128,711
	461		**128,711**
House Connections			
House Connections	2,067	pcs.	2,066,647
			2,066,647
Manholes			
Depth 2,00 m	335	pcs.	345,227
Depth 2,50 m	335	pcs.	405,558
Depth 3,00 m	177	pcs.	245,829
			996,614
Total Manholes	**847**	**pcs.**	
Total Sewer Extension			**12,673,348**
Pumping Stations			
Secondary Network DN 250-300 Civil parts	14	pcs.	210,000
Secondary Network DN 250-300 E/M parts	14	pcs.	322,000

Description	Quantity	Unit	Total EUR
			532,000
Pressure lines			
Pressure line DN 100	5,000	m	400,000
WWTP			
Darmanesti Civil parts	1	lump sum	3,034,035
Darmanesti E/M parts	1	lump sum	1,992,485
			5,026,520
Total Agglomeration Darmanesti			**18,631,868**

Table 10-90: Wastewater Investment Agglomeration Darmanesti

There are no investments for water supply defined for the agglomeration Darmanesti

10.4.5 Agglomeration Targu Ocna

A summary of proposed investments for Targu Ocna agglomeration is shown in the following.

Description	Quantity	Unit	Total EUR
Network extensions			
Sewer DN 250 (depth 2,50 m Asphalt road)	9,377	m	1,756,804
Sewer DN 250 (depth 3,00 m Asphalt road)	9,377	m	1,908,529
	18,755		**3,665,333**
Sewer DN 300 (depth 2,50 m Asphalt road)	2,000	m	412,000
Sewer DN 300 (depth 3,00 m Asphalt road)	3,365	m	743,759
	5,365		**1,155,759**
House Connections			
House Connections	1,005	pcs.	1,005,409
Manholes			
Depth 2,50 m	190	pcs.	229,443
Depth 3,00 m	212	pcs.	295,207
			524,650
Total Manholes	**402**	**pcs.**	
Total Sewer Extension			**6,351,150**
Pumping Stations			
Secondary Network DN 250-300 Civil parts	9	pcs.	135,000
Secondary Network DN 250-300 E/M parts	9	pcs.	207,000
			342,000
Pressure lines			
Pressure line DN 100	4,200	m	336,000
WWTP			
Targu Ocna Civil parts	1	lump sum	2,306,776
Targu Ocna E/M parts	1	lump sum	1,655,354

Description	Quantity	Unit	Total EUR
			3,962,130
Total Agglomeration Targu Ocna			**10,991,280**

Table 10-91: Wastewater Investment Agglomeration Targu Ocna

There are no investments for water supply defined for the agglomeration Targu Ocna.

10.4.6 Summary of Investment Costs

The investment costs of both water and wastewater are summarized below.

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-Mojnesti	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	**84,593**		**26,754**	**14,093**	**14,148**	**18,632**	**10,991**

WWPS Magura is financed by other funds
WS rehabilitation in Bacau is financed by other funds

OTHER FUNDS	3,825

WS rehabilitataion and WWPS Magura

Table 10-92: Sum of Investment Costs (main works exclusive contingencies, design, supervision; prices constant 2009)

10.5 Operation and Maintenance Costs

10.5.1 Operation and Maintenance Costs for Water Supply System

The following table contains operation and maintenance costs both before and after the implementation of the proposed works for all WSZs which are supplied by the WTP Caraboaia :

Cost Item	Before Project	After Project	Savings [€/y]	% of reduction
Energy	1,039,696	673,279	366,416	35%
Chemicals/Materials	460,270	363,904	96,366	21%
Staff	3,297,376	3,108,207	189,169	5.74%
Maintenance	263,102	321,806	-58,704	-22%
Others	3,754,668	3,395,643	359,025	10%
TOTAL	**8,815,111**	**7,862,839**	**952,272**	**11%**

Table 10-93: Operation & Maintenance Costs for all WSZs supplied by WTP Caraboaia

Note: There are no WS investments from CF in water supply zone Darmanesti and Targu Ocna

The following table contains operation and maintenance costs both before and after the implementation of the proposed works in WSZ Buhusi

Cost Item	Before Project	After Project	Savings [€/y]	% of reduction
Energy	81,908	99,391	-17,483	-21%
Chemicals/Materials	4,875	7,897	-3,022	-62%
Staff	135,839	129,348	6,491	4.78%
Maintenance	493	19,469	-18,976	-3846%
Others	37,886	35,152	2,734	7%
TOTAL	**261,002**	**291,258**	**-30,256**	**-12%**

Table 10-94: Operation & Maintenance Costs for WSZ Buhusi

10.5.2 Operation and Maintenance Costs for Wastewater System

Agglomeration Bacau

The following table contains the operation and maintenance costs both before and after the implementation of the proposed works.

Cost Item	Cost before project [€/year]	Cost after project[€/year]
Energy	246,742	402,906
Chemicals/Materials	164,210	579,004
Staff	1,438,749	1,172,813
Maintenance	89,692	467,792
Others	669,625	1,425,063
TOTAL	**2,609,018**	**4,047,579**

Table 10-95: O&M Costs for Wastewater Agglomeration Bacau

Agglomeration Comanesti-Moinesti

The following table contains the operation and maintenance costs both before and after the implementation of the proposed works (only Moinesti, Gazarie).

Cost Item	Cost before project [€/year]	Cost after project [€/year]
Energy	9,901	64,739
Chemicals/Materials	542	77,313
Staff	78,067	61,798
Maintenance	165	235,285
Others	41,544	73,463
TOTAL	**130,219**	**512,599**

Table 10-96: O&M Costs for Wastewater Agglomeration Comanesti-Moinest

Agglomeration Buhusi

The following table contains the operation and maintenance costs both before and after the implementation of the proposed works.

Cost Item	Cost before project [€/year]	Cost after project [€/year]
Energy	18,617	20,786
Chemicals/Materials	5,000	49,332
Staff	112,678	89,567
Maintenance	33	227,984
Others	9,619	39,039
TOTAL	**145,948**	**426,708**

Table 10-97: O&M Costs for Wastewater Agglomeration Buhusi

Agglomeration Darmanesti

The following table contains the operation and maintenance costs both before and after the implementation of the proposed works.

Cost Item	Cost before project [€/year]	Cost after project [€/year]
Energy	0	17,026
Chemicals/Materials	0	27,628
Staff	0	39,728
Maintenance	0	269,917
Others	0	24,215
TOTAL	**0**	**378,514**

Table 10-98: O&M Costs for Wastewater Agglomeration Darmanesti

Agglomeration Targu Ocna

The following table contains the operation and maintenance costs both before and after the implementation of the proposed works.

Cost Item	Cost before project [€/year]	Cost after project [€/year]
Energy	1,654	28,732
Chemicals/Materials	2,305	29,955
Staff	24,771	24,613
Maintenance	2,750	173,236
Others	8,375	24,968
TOTAL	**39,856**	**281,503**

Table 10-99: O&M Costs for Wastewater Agglomeration Targu Ocna

10.5.2.1 Summary of Operation and Maintenance Costs

The O&M costs of both water and wastewater are summarized below.

Cost Item	Water Supply	Wastewater
Total O&M costs before Project	9,076,113	2,925,040 €
Total O&M costs after Project	8,154,097	5,646,903 €
Difference in O&M costs between before and after Project	922,016	-2,721,863 €
O&M cost decrease due to efficiency improvement	922,016	-
O&M cost increase due to increase of service level		-2,721,863 €

Table 10-100: Operation & Maintenance Cost – separation of change of O&M costs

CHAPTER 11

RESULTS OF FINANCIAL AND ECONOMIC ANALYSIS

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11 RESULTS OF FINANCIAL AND ECONOMIC ANALYSIS

The purpose of the summary is to provide a general overview of the approach and methodology applied and to highlight the main conclusions of the analysis. In order to offer a general overview of the project, the summary contains information also from other reports such as Institutional Analysis Report and Report on Technical Feasibility Study. For further details regarding these issues, the reader should study the respective annexes to the Cohesion Fund Application.

11.1 Project area and beneficiaries

The project is located in Bacau County, in the North - Eastern region of Romania, having a total surface of 6.621 km². The project considers investments for the following agglomerations (population in 2008):

- Bacau with a total population of 197,013 inhabitants;
- Moinesti with a total population of 23,902 inhabitants;
- Buhusi with a population of 19,644 inhabitants;
- Darmanesti with a population of 11,508 inhabitants;
- Targu Ocna with a population of 12,118 inhabitants.

The beneficiary of the Project is the regional operator (ROC) from Bacau County, SC Compania Regionala de Apa Bacau SA.

11.2 Project objectives

The general objective of the project is to provide a local strategy for the development of the water and wastewater sector in order to comply with the general targets negotiated by Romania in the accession and post-accession framework.

The main objectives of the project are:

- To ensure compliance with the national and EU legislation within the transition periods agreed between Romania and EU for environmental sector:
    - Objective 1 – Implementation of the EU Directive 91/271/CEE (transposed into national legislation by NTPA 011/2002) regarding collection and treatment of the urban wastewater within the county of Bacau and to avoid discharge of untreated urban wastewater into natural body rivers;
    - Objective 2 – Compliance with EU Directive 98/83/EC on the quality of water intended for human consumption transposed into national legislation by the Law 458/2002 on drinking water quality amended by Law 311/2004;

- To ensure an optimal utilization of the EU funds;
- To assist the project promoters in developing local capacity for future project development;
- To define a long term phased investment program.

The project is targeting the rehabilitation and extension of existing water and wastewater infrastructure in order to achieve the fulfillment of the objectives of the Priority Axis 1.

The project objectives are presented in more details in the Report on Technical Feasibility Study.

11.3 Project description and costs

The project consists of the rehabilitation and extension of the water supply and sewerage systems in Bacau County. The project consists of a mix of investment component for each urban area which is described in details in the Report on Technical Feasibility Study.

The investment costs are separately estimated and stated for each agglomeration. The estimated investment costs contain primarily the Project investment cost to be implemented during the period 2010 to 2013 (part of the Long Term investment plan) and in addition replacement cost and additional investment cost as required up to the design horizon 2039.

In order to select the most appropriate options for each investment component a detailed option analysis was conducted. Several specific options have been considered for each location of the works. Where, more detailed option analysis was required, this was performed using investment and operating costs analyses (including a financial analysis of options).

The estimate of the project investment cost actually to be spent at the time of implementation has to take into account the anticipated price increases (inflation) according to the macroeconomic scenario.

[illegible]						
Water activity	6,513,434	-	65,134	2,540,239	2,605,373	1,302,687
Wastewater activity	98,773,807	-	987,738	38,521,785	39,509,523	19,754,761
Total	**105,287,240**	**-**	**1,052,872**	**41,062,024**	**42,114,896**	**21,057,448**
[illegible]						
Water activity	7,296,996	-	69,210	2,785,577	2,936,998	1,505,211
Wastewater activity	110,656,240	-	1,049,549	42,242,237	44,538,482	22,825,972
Total	**117,953,237**	**-**	**1,118,759**	**45,027,814**	**47,475,480**	**24,331,183**
[illegible]						

Table 11-1: Investment costs in constant and current prices (amounts in Euro)

The breakdown of the investment costs per agglomerations in current prices is presented in the following table:

[illegible]							
Bacau	Mill. EUR current	**36.941**	-	0.350	14.102	14.869	7.620
Moinesti	Mill. EUR current	**19.543**	-	0.185	7.460	7.866	4.031
Buhusi	Mill. EUR current	**19.668**	-	0.187	7.508	7.916	4.057
Darmanesti	Mill. EUR current	**26.345**	-	0.250	10.057	10.604	5.434
Targu Ocna	Mill. EUR current	**15.457**	-	0.147	5.900	6.221	3.188
Total	Mill. EUR current	**117.953**	**-**	**1.119**	**45.028**	**47.475**	**24.331**

Table 11-2: Investment costs breakdown per agglomerations (in million Euro current prices)

11.4 Financial analysis

The objective of the Financial Analysis (FA) is to assess the financial viability and sustainability of the Project over the entire project lifetime.

In general terms the FA takes into account all relevant data and information made available from the various sources and especially the reports, financial statements and production / service data provided by the regional operator for the years 2008 and 2009. It takes further into account the socio-economic data and background information presented in the Master Plan Report and the technical concepts, demand projections and cost estimates, as detailed in the respective chapters of the Feasibility Study.

According to EU standards of the CBA, and thus also the financial analysis has to use the "incremental method": that means, the project is evaluated on the basis of the differences between the scenario "with the project" and an alternative scenario "without the project". For the "with project" scenario cost and revenues considered must be those of a scenario of efficient operation. For the "without project" scenario cost and revenues considered are those of a "business as usual" without any major new investments or replacements.

The main assumptions used for the financial analysis considering the "Without Project Scenario" and the "With Project Scenario" are presented in the following table:

Criteria	Without Project Scenario	With Project Scenario
Water Supply:		
Connection rates	Connection rates are kept constant at the level of 2009.	Starting with the base year 2010, the connection rates to water supply and sewerage networks increase in line with the network extension measures of the project; the level of connected reached by the "population in the agglomeration area" by the year 2014 remains on this level from 2014 onwards.
Metering rates	The metering rates remain constant for all localities to the level recorded in 2009 for residential and non-residential consumers. This assumption reflects the urgent necessity of the operators to introduce consumption based billing as an effective measure to reduce their commercial losses. The metering process will be financed by the ROC.	The metering rates increase for all localities to over 90% in 2014 for residential and non-residential consumers. This assumption reflects the urgent necessity of the operators to introduce consumption based billing as an effective measure to reduce their commercial losses. The metering process will be financed by the ROC.
Specific water consumption (residential)	Starting with the actually billed per capita consumption for 2009 (based on data provided by the company), specific billed water consumption is assumed to decrease in the first stage as result of price increases (elasticity with tariffs) and then increases as result of individual wealth (elasticity with individual wealth).	Starting with the actually billed per capita consumption for 2009 (based on data provided by the company), specific billed water consumption is assumed to decrease in the first stage as result of price increases (elasticity with tariffs) and then increases as result of individual wealth (elasticity with individual wealth).
Specific water consumption (non-residential)	The number of connections remains constant at the level of 2009 while the individual water consumption is slightly increasing. (minimum economic growth)	The non-domestic water consumption is slightly increasing (minimum economic growth).
Physical water losses (network and other losses)	Due to lack of network rehabilitation, physical water losses are expected slightly decrease due to parallel investments.	Due to project implementation the level of losses are expected to decrease. In cases of lack of network rehabilitation, physical water losses are expected slightly decrease due to parallel investments.
Wastewater:	.	
Infiltration into sewers	Due to lack of network rehabilitation, the infiltration levels are expected to increase in the following years.	Due to project implementation the level of infiltrations are expected to decrease.
Fixed costs items:		
Total Maintenance	During the previous years, due to lack of financial resources, the maintenance	During the previous years, due to lack of financial resources, the maintenance costs

Criteria	Without Project Scenario	With Project Scenario
(Consider water and wastewater separately or together)	costs recorded by the operator are at low level. Due to further deterioration of the system, the maintenance costs are considered to increase in the following years. The assumptions used are presented in the Chapter - Projection of Operation Cost for "Without Project Case".	recorded by the operator are at low level. After the completion of the investments the maintenance costs related to the new investments are set at a normative level of 1% of main works, respectively 3% of plant and machinery.
Staff Cost	In the following years the number of staff is considered to remain constant; the salaries are assumed to increase in real term by a cumulated factor of 3.30 for the period 2010-2039.	After the project investment will become operational, the number of personnel is individually estimated according to the requirements of the new systems. The salaries are assumed to increase in real term by a cumulated factor of 3.30 for the period 2010-2039.
Administration Cost *(Consider water and wastewater separately or together)*	Administrative costs are based on the data as provided for the base year 2009. For the period 2010 to 2039 administration costs are assumed to increase in real term in line with the assumed real terms increases of material costs.	Administrative costs are based on the data as provided for the base year 2009; for the period 2010 up to finalization of investment implementation, the administration costs are assumed to increase in real terms according to the real increase factor of material costs. After completion of the investment measures the administrative costs are adjusted based on the requirements for each agglomeration.
Variable cost items:		
Energy Cost Water Supply	Cost of electricity is based on the data provided by the company for the year 2009 and projected proportionally to water production; it is increased accordingly in real terms.	Until completion of the investments, cost of electricity is based on the data provided by the company for the year 2009 and projected proportionally to water production; it is increased accordingly in real terms After completion of the investments the energy costs are estimated based on the technological changes, level of leakages, and are projected proportionally to water production; they are increased accordingly in real terms
Energy cost wastewater	Cost of electricity is based on the data provided by the company for the year 2009 and projected proportionally to wastewater quantities; it is increased accordingly in real terms.	Until completion of the investments, cost of electricity is based on the data provided by the company for the year 2009 and projected proportionally to wastewater quantities; it is increased accordingly in real terms. After completion of the investments the energy costs are estimated based on the technological changes, the level of losses and the level of infiltrations; and are projected proportionally to wastewater quantities; they are increased accordingly in real terms
Consumables:		
Water Supply	Cost of materials, chemicals, etc. is based on the data provided by the company for the year 2009 and projected proportionally to water production; it is increased in real terms by a cumulated factor of 1.38 for the period 2010-2039.	Until completion of the investments, cost of materials, chemicals, etc. is based on the data provided by the company for the year 2009, projected proportionally to water production and being increased accordingly in real terms. After the completion of the investment measures the level of material costs is estimated based on the technological changes and level of leakages, being projected proportionally to water production and increased in real terms by a

Criteria	Without Project Scenario	With Project Scenario
		cumulated factor of 1.38 for the period 2010-2039.
Wastewater Treatment	Cost of materials, chemicals, etc. is based on the data provided by the company for the year 2009 and projected proportionally to wastewater quantities; it is increased accordingly in real terms.	Until completion of the investments, cost of materials, chemicals, etc. is based on the data provided by the company for the year 2009, projected proportionally to water production and being increased accordingly in real terms. After the completion of the investment measures the level of material costs is estimated based on the technological changes and level of infiltration, being projected proportionally to wastewater generation and increased accordingly in real terms.
Sludge Disposal		
Sludge disposal wastewater	Presently there are no sludge disposal costs. It is therefore assumed that disposal practices will remain the same for the period 2010-2014. From 2014 onwards the sludge disposal costs were calculated considering the sludge generated quantity for each agglomeration and the unit costs of disposal.	Presently there are no sludge disposal costs. It is therefore assumed that disposal practices will remain the same for the period 2010-2014. From 2014 onwards, the cost of sludge disposal is estimated based on unit cost, projected proportionally to sludge generation; it is increased accordingly in real terms. The unit costs used are calculated based on the different option for sludge disposal for each agglomeration.
Apele Romane (AR) Charges:		
Water Supply	Cost of raw water is based on the data provided by the company for the year 2009 and projected proportionally to water production; it is increased accordingly in real terms	Until completion of the investments, cost of raw water is based on the data provided by the company for the year 2009 and projected proportionally to water production; it is increased accordingly in real terms. After completion of the investments cost of raw water is estimated, based on unit cost, the technological changes, level of leakages; and is projected proportionally to water production; it is increased accordingly in real terms.
Penalties		
Wastewater	The penalties are calculated based on the volumes of wastewater discharged and fees applied.	No penalties for discharging non compliant treated wastewater are applied for this scenario given that the treated wastewater at the end of the project implementation will comply with the provisions of the legislation in force.

Table 11-3: Assumptions for "with" and "without project scenario"

The project related cash flow over the evaluation period 2010 to 2039 comprises:

- Investment cost of EUR 117,953 million (current prices) as presented in CBA Report - Annex 1-3; Replacement cost for E&M equipment (after 15 years of utilization) of EUR 22,7 million (in constant prices) as presented in CBA-Report - Annex 1-3;
- Incremental O&M cost (water supply and waste water services) as presented in CBA-Report - Annex 1-4;
- Incremental revenues (water supply and wastewater services) as presented in CBA-Report - Annex 1-5;
- Incremental working capital as presented in CBA-Report - Annex 1-5.

The level of the financing gap calculated with a discount rate of 5% is **91.15%.**

According to the Operational Sectoral Program, the financing mix for financing the "financing gap" can have the following structure of financing sources:

- EU Grant for the priority axis: 85%;
- State Budget Contribution: 10-13%;
- Local Budget Contribution: 2-5%.

For setting the level of Local Budgets contribution, the following issues have been taken into account:

- The economic situation and development of Bacau County is below to the national average;
- The smaller municipalities have limited own revenues, most of their revenues being linked to the transfers from central and county budgets.

Considering these issues it is obvious that the financing revenues at local budget level are limited. Due to this reason the level of Local Budgets contribution is set to the minimum level of 2% from the financing gap and the contribution from the state budget consequently to a level of 13% from the financing gap.

The detailed results of the analysis are presented in Annex 1-7.

Taking into account the detailed analysis from the previous chapter, the Consultants propose the following financing scheme for the project (as percentage of total eligible costs):

- EU Grant: 77.48%;
- State Budget subsidy: 11.85%;
- Local Budgets contribution: 1.82%;
- Loan contracted by the ROC: 8.85%.

The financing plan for the eligible cost is presented in the following table:

Eligible expenditures	EUR current	**(117,953,237)**	-	(1,118,759)	(45,027,814)	(47,475,480)	(24,331,183)
EU Grant	EUR current	**91,391,567**	-	866,828	34,888,084	36,784,565	18,852,090
State Budget Contribution	EUR current	**13,977,534**	-	132,574	5,335,825	5,625,875	2,883,261
Local Budget Contribution	EUR current	**2,150,390**	-	20,396	820,896	865,519	443,579
ROC Loan	EUR current	**10,433,746**	-	98,962	3,983,009	4,199,521	2,152,255

Table 11-4: Financing plan for eligible cost –EUR (current prices)

For the local contribution part the only available option is the contribution by all local authorities involved into the project.

The following table presents the contribution of each local authority to the amount of EUR 2.150 million.

Local authorities contribution		**Total**	**2009**	**2010**	**2011**	**2012**	**2013**
Bacau	**EUR current**	458,385	0	4,348	174,985	184,497	94,555
Margineni	**EUR current**	31,944	0	303	12,194	12,857	6,589
Hemeius	**EUR current**	71,191	0	675	27,177	28,654	14,685
Letea Veche	**EUR current**	25,191	0	239	9,616	10,139	5,196
Consiliul Judetean	**EUR current**	86,762	0	823	33,121	34,921	17,897
Buhusi	**EUR current**	358,561	0	3,401	136,878	144,319	73,963
Moinesti	**EUR current**	356,277	0	3,379	136,006	143,399	73,492
Darmanesti	**EUR current**	480,292	0	4,555	183,348	193,315	99,074
Tg. Ocna	**EUR current**	281,787	0	2,673	107,570	113,417	58,126
Total	**EUR current**	**2,150,390**	**0**	**20,396**	**820,896**	**865,519**	**443,579**

Table 11-5: Financing plan for local contribution – Million EUR (current prices)

The financial NPV and the Financial Rates of Return with and without community assistance are as follows:

Before community assistance		**After community assistance**			
NPV/C	**FRR/C**	**FNPV/C**	**FRR/C**	**FNPV/K**	**FRR/K**
(88,623,923)	-5.38%	(13,816,434)	0.2%	(11,448,837)	-0.66%

Table 11-6: Financial NPV and Rates of Return

The affordability analysis presents the following conclusions:

- The average affordability ratios for average Decile 1 household is 5.2% in 2014; decreasing gradually to a level of 3.2% at the end of the evaluation period.
- For the main urban area (Bacau Municipality), the affordability ratio of the lowest decile (Decile 1) is 5.4% in 2014, decreasing gradually to a level of 3.3% at the end of the evaluation period.
- The tariff strategy was designed to reach the maximum affordable limits in the year 2014. After this period, the affordability limit is decreasing slowly due to the following reasons:
    - the investments included in the Cohesion Funds Application represents only a limited part of the total investments included in the master plan and the ROC will have to do also other investments in the area (the financing of this investments cannot be identified in this moment, this is why these amounts are not considered in the analysis). The master plan mentions the following levels of investment that need to be implemented in Bacau County in the following years (in the following years it is expected that the Bacau ROC will take over the operation in all localities from the County):
        - For the period 2014-2018: 458 million Euro;
        - For the period 2014-2038: 997 million Euro.

    The above mentioned levels of investments were compared with the potential additional revenues that could be generated if the affordability level for the Decile 1 would have been kept at 4% for the entire period of analysis. The results are the following (comparing the net present values of revenues and investment costs):

        - The additional revenues represents 2.8% of the total investment needs for the period 2014-2038;
        - The additional revenues represents 4.9% of the total investment needs for the period 2014-2018.

    The above results show that the potential additional revenues generated can cover only a limited part of the investment needs, showing the need for grant also for the financing of the future investments.

    Considering that the additional investments will be performed mainly in rural areas (with lower cost efficiency), the above approach takes into consideration the application of the solidarity principle (the revenues generated in the "richer" area will be used to finance or co-finance investments in "poorer" areas).

        - The water bill is increasing slower than the average household revenues because the households needs will become more sophisticated and the basic needs (like water and wastewater) will receive a lower percentage from the household revenues. As a general figure, the average household bill will increase, as an affordability ceiling will slowly decrease.

- The maximum affordability ratio for average income households reached in 2014, is between 1.0% - 2.4%, having an average level of 2.4% (the smaller cities have lower consumption).

Even if at first sight the tariff increases seem high the local authorities committed themselves to implement this tariff increases in order to assure a sound development of the ROC in the following years and assure quality services. The management team of the ROC is aware that the tariff increases will put a high pressure on the customers but they are confident that, considering the good collection mechanism in place, they can assure a high collection rate.

The following tariffs and increase of tariffs (in real terms) have been included in the delegation contract which was signed in the second semester of 2009. In order to assure a sustainable development of the operator and reasonable levels of affordability ratio the tariff strategy has been approved by a Local Council Decision.

Tariff unification strategy	**Actual Tariffs**	**2011**	**2012**	**2013**	**2014**
Bacau					
Water	2.62	0.0%	0.0%	5.0%	8.2%
Wastewater	1.00	30.0%	0.0%	25.0%	35.0%
Moinesti					
Water	2.57	0.0%	0.0%	7.0%	8.2%
Wastewater	0.77	24.0%	0.0%	45.0%	58.5%
Buhusi					
Water	2.62	0.0%	0.0%	5.0%	8.2%
Wastewater	0.75	24.0%	0.0%	40.0%	68.5%
Darmanesti					
Water	1.06	49.0%	0.0%	33.0%	41.7%
Wastewater	0.43	67.0%	0.0%	70.0%	79.7%
Targu Ocna					
Water	2.05	9.26%	0.0%	10.0%	20.8%
Wastewater	0.87	16.0%	0.0%	35.0%	61.0%
Traian					
Water	1.66	19.3%	0.0%	20.0%	25.3%
Wastewater	-	-	0.0%	0.0%	0.0%
Filipesti					
Water	1.66	19.3%	0.0%	20.0%	25.3%
Wastewater	-	-	0.0%	0.0%	0.0%
Magiresti					
Water	1.66	19.3%	0.0%	20.0%	25.3%
Wastewater	-	-	0.0%	0.0%	0.0%
Ardeoani					
Water	1.80	15.0%	0.0%	15.5%	24.5%

Tariff unification strategy	Actual Tariffs	2011	2012	2013	2014
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Poduri					
Water	1.61	20.5%	0.0%	22.0%	25.8%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Tatarasti					
Water	1.71	17.5%	0.0%	20.0%	23.4%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Prajesti					
Water	1.61	20.5%	0.0%	22.0%	25.8%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Faraoani					
Water	1.62	20.4%	0.0%	22.0%	25.1%
Wastewater	0.65	34.0%	0.0%	45.0%	73.7%
Buciumi					
Water	1.59	21.4%	0.0%	22.0%	26.4%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Casin					
Water	1.94	11.3%	0.0%	15.0%	19.8%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Hemeiusi					
Water	4.07	-13.4%	0.0%	-11.9%	-4.2%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Margineni					
Water	3.42	-8.2%	0.0%	-7.3%	2.3%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Magura					
Water	1.30	24.6%	0.0%	30.0%	41.4%
Wastewater	-	0.0%	0.0%	0.0%	0.0%
Stefan cel Mare					
Water	1.53	23.5%	0.0%	21.0%	30.2%
Wastewater	-	0.0%	0.0%	0.0%	0.0%

Table 11-7: Tariff strategy

The detailed tariffs evolutions are presented in Annex 1.5 of volume IV CBA.

11.5 Economic analysis

In order to prove that the project is advantageous to the society of the country the Consultant has performed a detailed economic analysis.

The economic analysis is based on the following assumptions:

- The period for the economic evaluation is 2010 to 2039;
- The base year for evaluation is 2009;
- All cost and benefit figures are stated in constant prices;
- Discount rate used for calculation of NPV is 5.5%.

The cost components considered in the economic evaluation are:

- Project investment cost;
- Replacement cost;
- Project OM&A cost.
- CO2 emissions.

The summarizations of the individual benefits are presented in the following table (according to the JASPERS CBA Guide for Romania).

Project Benefits			
Type	**Base for calculation**	**Monetary value**	**Comments**
Access to drinking water	Nr. Of households in project service area	148 Euro/household/year (2008 value)	
Improvement of water bodies (use value)	Nr. Of people living in the project service area	20.4 Euro/person/year (2008 value)	
Improvement of water bodies (non use value)	Nr. Of households in project service area	0.004 – 0.011 Euro/household/year/KM river	
Cost savings to customers – private well	Nr. Of households newly connected	315 Euro/household/year	
Cost savings to customers – sewage disposal	Nr. Of households newly connected	348 Euro/household/year	
Cost savings to operator – water abstraction	Incremental water savings (in m_3)	Water abstraction fee (Apele Romane)	
Cost savings to operator – energy consumption	CO_2 emission savings (in tonnes)	From 25 Euro/tonne in 2010 to 45 Euro/tonne in 2030	

Table 11-8: Project unitary benefits according to CBA Guide

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.

The detailed calculations are presented in the Sheet "Economic Analysis" of the Financial Model (Annex 1-9).

11.6 Sensitivity and risk analysis

In order to validate the assumption used and to identify the most sensitive variables, a detailed sensitivity analysis is performed in three parts:

- Analysis (1) shows the effects of variation in key parameters on the "financing mix";
- Analysis (2) shows the effects of variation in key parameters on the "financial results";
- Analysis (3) shows the effects of variation in key parameters on the "economic results".

The following table shows the sensitive variables for the results of the financial analysis:

[illegible]	[illegible] variation	[illegible] variation	[illegible]
Project investment cost (increase of 1%)	-1.13%	-0.44%	Yes
Project investment cost (decrease of 1%)	1.13%	0.44%	Yes
O&M costs (increase of 1%)	-2.82%	-7.84%	Yes
O&M costs (decrease of 1%)	2.82%	7.59%	Yes
Revenues development (increase of 1%)	2.97%	8.39%	Yes
Revenues development (decrease of 1%)	-2.97%	-8.72%	Yes

Table 11-9: Sensitive variables – financial analysis

We considered a variable as being sensitive if 1% of its variation leads to at least 1% variation in the financial result indicator.

The following table shows the sensitive variables for the results of the economic analysis:

Variation in investment costs (increase of 1%)	-0.91%	-1.56%	Yes	Yes
Variation in investment costs (decrease of 1%)	0.90%	1.59%	Yes	Yes
Variation in CO2 emissions (increase of 1%)	-0.002%	-0.002%	No	No
Variation in CO2 emissions (decrease of 1%)	0.002%	0.002%	No	No
Variation of access to drinking water benefit (increase of 1%)	0.73%	0.40%	Yes	Yes
Variation of access to drinking water benefit (decrease of 1%)	-0.73%	-0.40%	Yes	Yes
Variation of improvement of water bodies (use value) (increase of 1%)	0.52%	0.24%	Yes	No
Variation of improvement of water bodies (use value) (decrease of 1%)	-0.52%	-0.24%	Yes	No
Variation in improvement of water bodies (non use value) (increase of 1%)	0.00%	0.00%	No	No
Variation in improvement of water bodies (non use value) (decrease of 1%)	0.00%	0.00%	No	No
Variation in cost saving to customers - private well (increase of 1%)	0.00%	0.00%	No	No
Variation in cost saving to customers - private well (decrease of 1%)	0.00%	0.00%	No	No
Variation in cost saving to customers - sewage disposal (increase of 1%)	0.33%	0.23%	Yes	No
Variation in cost saving to customers - sewage disposal (decrease of 1%)	-0.33%	-0.23%	Yes	No
Variation in cost saving to operator water abstraction (increase of 1%)	0.0000%	0.0000%	No	No
Variation in cost saving to operator water abstraction (decrease of 1%)	0.0000%	0.0000%	No	No
Variation in cost saving to operator - energy consumption (increase of 1%)	0.0055%	0.0042%	No	No
Variation in cost saving to operator - energy consumption (decrease of 1%)	-0.0055%	-0.0042%	No	No
Variation in operating costs (increase of 1%)	-0.92%	-0.79%	Yes	Yes
Variation in operating costs (decrease of 1%)	0.92%	0.79%	Yes	Yes

Table 11-10: Sensitive variables – economic analysis

We considered a variable as being sensitive if 1% of its variation leads to at least 0.3% variation in the economic result indicator.

A detailed risk analysis is performed for the selected sensitive variables; it is conducted at 2 levels:

- For financial analysis parameters;
- For economic analysis parameters.

Both risk analyses are carried out for a number of scenarios and anticipated probability distributions for each scenario. The variables tested are:

- FNPV/C and FNPV/K for the financial analysis;
- ENPV and ERR for the economic analysis.

The results / statistical parameters of the risk analyses are presented in the following two tables.

Base case	(88,623,923)	(11,448,837)
Mean	(92,802,207)	(14,382,344)
Standard deviation	26,740,886	12,429,387
Norm. cum. distribution	0.562	0.593
Std. norm. cum. distribution	0.713	0.724

Table 11-11: Statistical parameters for the risk analysis - financial analysis

Base case	18.9%	201,398,317
Mean	18.9%	200,015,017
Standard deviation	0.82%	13,341,670
Norm. cum. distribution	0.544	0.541
Std. norm. cum. distribution	0.707	0.706

Table 11-12: Statistical parameters for the risk analysis - economic analysis

The risk analysis indicates that there is no serious risk for a successful implementation and operation of the Project Measure.

CHAPTER 12

RESULTS OF INSTITUTIONAL ANALYSIS

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12 RESULTS OF INSTITUTIONAL ANALYSIS

12.1 General Overview

The purpose of this Institutional Analysis is to present the existing institutional arrangements in Bacau County required for an appropriate operation and maintenance of water and waste water system in the project area and based on the SOP requirements.

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

The proposed project area is covering the Bacau County including municipalities, towns and communes all members of IDA.

12.2 Regionalization Process

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.

The Regionalization process in Bacau County was a very difficult one due to the specific situation within this County. The implementation of all the institutional requirements in Bacau County was finalized in November 2010.

Unfortunately the political decision makers decided only in the second part of last year (2009) about the necessity to create a Regional Operator in Bacau County. During this period a set of decisions were made at the level of County Council Bacau, Local Council Bacau and other LCs from different municipalities, towns and communes.

This Institutional arrangement represented the first phase of a complex process to create and strengthen the capacity of the regional operators in the water and wastewater field, in order to provide public services at the quality level required by EU Directives. The legislation in force at that moment was amended during the last years in order to fulfil with the SOP Environment requirements and the necessary institutional arrangements (which are in progress to be completed in Bacau County), comprising:

- The Intercommunity Development Association (IDA);
- The Regional Operating Company (ROC);
- The Delegation Contract (DMSC) between IDA and ROC.

Based on the new legislation in force, in Bacau County the main steps to adapt the existing institutional arrangements in order to fulfil the SOP requirements were finalized in November 2010. In this respect the IDA was established having 85 members where the ROC is and/or will operate, the Incorporation Act of the ROC was approved with each Local Council as shareholder of the ROC in order to be approved and registered with the Chamber of Commerce and the Delegation Contract (DMSC) between IDA and ROC was signed in November 2010. It is important to mention that based on the legislation in force, the IDA is mandated by each municipality member of IDA to administrate on their name the public assets part of the water and wastewater system within the County.

The Operator SC Compania Regionala Apa Bacau SA benefits of a relevant experience in managing complex investment projects based on the background of one of the two companies from the merger process: SC Compania Apa Bacau SA.

SC Compania Regionala Apa Bacau SA is implementing an ISPA Project, programme proving the capability and having the proper staff to deal with the challenges brought by the implementation of a large scale Cohesion Funded. The existing PIU staff developed during the last years the necessary knowledge and skills to be able to cope with the major responsibilities involved by the implementation of the Cohesion Fund investments. They are well trained and they have the skills and knowledge for a successful implementation of the project.

The PIU for Cohesion fund was created in October 2010 and is currently formed of 3 persons. The PIU for cohesion funds took over the experience of the PIU for ISPA. The process of PIU consolidation as structure, procedures manual and jobs description is the subject of a TA for Project Management, the first phase of the implementation of the CFA.

The existing managerial capabilities together with the previous experience already mentioned are the key success factors for a sound implementation of the Cohesion Fund Application.

12.3 Conclusion

Based on the existing capabilities and strong previous experience proved by the Company's staff in managing complex investments projects together with the local commitment to fulfil all SOP Environment requirements in the next quarter, it is considered that the institutional arrangements in Bacau County will be adequate to ensure a sound implementation of the proposed investment project and a sustainable development of the Regional Operator (SC Compania Regionala Apa – Bacau SA).

CHAPTER 13

RESULTS OF ENVIRONMENTAL IMPACT ASSESSMENT

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13 ENVIRONMENTAL IMPACT ASSESSMENT

This chapter shows the results of the **Environmental Impact Assessment (EIA)** procedure.

13.1 Summary of findings

Following the EIA legislation, as well as the requirements of the Regional Environmental Protection Agency (REPA) Bacau, the Environmental Expert of the Consultant elaborated the Technical Memoir for each agglomeration of Bacau County: Bacau, Moinesti, Darmanesti, Buhusi and Targu Ocna.

According with the requests of the legislation in force regarding the approval of the Environmental Impact Assessment Procedure and releasing of the environmental agreement, a Notification and than a Technical Memoir was elaborated for each agglomeration. Therefore, the Technical Memoirs contain:

- General data about the investment project, as: name, location, designer, beneficiary, period of the proposed works.
- Specific information regarding the opportunity of the proposed investments, as well as the scope of the project, main objectives, the importance of the project and the public utility.
- Description of the project: in order to present an entire picture of the necessity of the proposed investments, a summary description of the current situation regarding the water and waste water systems of the agglomeration was done, pointed out also the critical problems existing for each component of the systems. After this presentation, a detailed description of the proposed investments was done.
- An entire chapter, detailed on each environmental component is dedicated to the potential pollutant sources and the environmental protection. A detailed description of the potential pollution sources and the assessment of the impact of the described pollutants on the environmental components (water, air, soil and subsoil, noise and vibration, as well as the protection of flora and fauna, human settlements and other public historical or architectural monuments, etc.) covers both phases of the project, the construction (execution) phase and the operating & maintenance phase. The Technical Memoir assesses also the impact of the project on the landscape and on the socio-economical environment.
  The methods and recommendations to avoid or mitigate the impact, proposed by the consultant to be included into the tender documentations are also described.
- Separate chapter is dedicated to the waste and chemicals management, and measures for minimizing the impact, covering also both phases of the project.
- Other two separate chapters are dedicated, first regarding to the measures to be taken for the rehabilitation/restoration of the locations affected by the works to the end of the construction phase and the second chapter, to the measures to be taken

for monitoring the quality of the environment components during both, construction and operation phases.

- The plans, maps, technological flow schemes are presented as Annexes into the final part of each Technical Memoir, drawings.
- An Environmental Impact Assessment was carry out for **Bacau** Agglomeration, prepared under the requests of the legislation in force.

13.2 General conclusions

The general conclusions for all agglomerations are summarized below for the expected impact during the **construction phase** and during the **operation of the facilities**:

- **Impacts on the surface water bodies and groundwater.** Following the legal norms regarding the works in construction field, the works that will be done for the rehabilitation and extension of the water supply and wastewater networks, as well as the other more complex works for rehabilitation/extention/new construction of Wastewater Treatment Plants (WWTPs) or Water Treatment Plant (WTP) will have a minimum impact, only temporary on the groundwater and surface water bodies, during the construction phase.
- During the operation phase, comparing with the current situation, the implementation of the project will bring a positive impact on the quality of surface waters (down of discharge point into the river) and groundwater, due to the proposed investments covering the rehabilitation and extension of the water and sewage systems, including the extension/rehabilitation/new construction of the WWTPs or WTP.
- **Emissions into the atmosphere** will occur during both, construction phase as well as during operation of implemented measures. Emissions expected during the operation of the plants and facilities will remain below accepted thresholds. The air quality status will be kept at a good level, in compliance with the existing regulations, in the conditions of proper use and administration of the materials and equipments for construction/rehabilitation/extension of the treatment facilities, drinking water supply network and sewerage system. .

  The necessary minimum distances are respected to avoid unacceptable noise and odour emissions.
- **Impacts on biodiversity** – The construction/rehabilitation/extension works, generally will confine to existing roads and will remain limited to existing locations and other legally designated areas. Following the precautions imposed by national norms, the impact of construction or rehabilitation works on flora and fauna is minimized. During the operation period, the impact on flora and fauna will be positive because the treatment of wastewater will improve the effluent quality compared with the existing situation. The proposed investments for 5 agglomerations (Bacau, Moinesti, Darmanesti, Buhusi and Targu Ocna) will be done outside of any protected areas. Nature 2000 Declarations of the REPA Bacau were released for the agglomerations. The documentations were analyzed by experts of Biodiversity

Department of REPA Bacau; visits of the areas were done together with the specialists of REPA. Into Bacau Environmental Agreement, as well as into the NSDs for the other 4 agglomerations, REPA underlined that, comparing with the existing situation, there will be a positive impact, taking into consideration the measures imposed to the constructor during the construction phase and also the technical solutions used. Similar measures, but addressed to the operator in case of any intervention were imposed for the operation phase.

- **Impact on soil and subsoil –** Working under the legal conditions regarding the construction/rehabilitation/extension works, the potential impact on soil and subsoil was estimated as being only temporary and minimum. Comparing with the actual situation, on a long term, after the implementation of the project, due to the rehabilitation and extension of the water and sewage systems, a positive effect on soil and subsoil was estimated. Extension of the networks under an integrated water/wastewater management concept will bring a positive impact on the quality of soil and subsoil, avoiding the pollution of these environment components.
- **Impacts on human health** – During the construction period, human health will not be affected negatively, because the air and water quality will remain within the legal parameters. The contract documents and the supervision of the works will impose legal norms and regulations on the contractor in this respect. On a long term, during the operation & maintenance period, the impact on human health will be positive because the quality of drinking water will be improved and the comfort of the population will rise due to the connexion to the sewage systems. Benefic impacts will have also the treatment of used water into the rehabilitated /extended /new WWTPs.
- **Noises and odours** – Noise and odour that are related to emissions of **construction machines** will be limited to a maximum extent. The contractor has to undertake all necessary effort to reduce the nuisance potential during the rehabilitation or extension of networks and the rehabilitation of the WWTPs and WTP. Controlling the expected emission of noise and odour during the operation phase of the WWTPs will require maintaining regular operational routines.

Other temporary impact of minor importance is expected during construction period and subsequent operation:

- **Aesthetic** – The common aesthetic limitations are expected during construction phase, such as dirty roads. The concerned roads however will be reinstated on a regular basis during construction time.
- **Operational risk management at facilities –** During construction period, the Contractor is obliged by the Tender Specifications and the Contract to respect the operational risk management plan. During the operation period, the Regional Operating Company will be in charge of the operational risk management.
- **Disturbances during construction** – Apart from the expected impact during operation impacts of different character are expected during the construction phase: the networks will be placed underneath the roads in trenches and will result in

disturbance of regular traffic. This will be the case in centre parts of urban areas only. Rehabilitation of treatment facilities will result in occasional emission of dust, noise or other nuisance as described above, but will remain of temporary character and limited locally.

The proposed WWTPs are sufficiently remote to avoid the urban areas from being exposed to unacceptable levels of nuisance.

Mitigation measures will still be necessary to minimize the plant emissions during construction and operation. These measures are both, conceptual means, which assure reliably low levels of emissions and operational means because they oblige the operator to adopt certain measures related to operational routines:

- **Odour control:** The odour emissions are caused by the exhaust air released from the various treatment units such as clarifiers, pump sumps, sludge holding tanks etc. The most critical treatment units are the inflow section, the screens, the grit removal and deposit, the entire sludge line. The units must be operated according to operation manual; covers and doors must remain closed, ventilation and other odour removing appurtenances must be maintained adequately.
- **Noise control:** Noise is produced by the mechanical equipment required for the various treatment steps such as blowers, pumps and pneumatic systems. The specification of the Tender Dossiers will contain restrictions for maximum noise levels at the fence of the WWTP/WTP at daytimes as well as in the night. Beside this, there will be a restriction that no mechanical equipment shall be installed outside but within machinery building. The final acceptance tests will involve noise control tests to verify acceptable thresholds.
- **Wastewater discharges** – During the construction period, the effluent quality will not exceed the existing situation of the quality status.
- A substantial and sustainable positive impact on environment and health is expected after the finalization of the works, when the quality of the discharged wastewater will be kept under the values of NTPA 011-001.
- The quality of surface rivers, where the treated waste water from the waste water treatment plants of will be discharged, will be considerably improved taking into account the the tertiary treatment proposed for all WWTPs.

The Environmental Impact Assessment Procedure was followed for all 5 agglomerations according with the requirements of the EIA Directive and Romanian legislation, regarding each step of the procedure and public information/announcements. No comments and observations from the public were received during the legal period of time after this period.

13.3 Negative screening decisions and Environmental Agreement

All components of the project, for all agglomerations are covered by Annex II of the Council Directive 85/337/EEC.

An Environmental Impact Assessment has been carried out for **Bacau** Agglomeration as the Technical Review Committee REPA Bacau took the Decision.

The Negative Screening Decisions issued by REPA Bacau for the other 4 agglomerations (Moinesti, Darmanesti, Buhusi and Targu Ocna), as well as the decision of carrying out an Environmental Impact Assessment for Bacau agglomeration were taken on the basis of the selection criteria from Annexe III of the EIA Directive including the characteristics of the project, location and the impact on the environment components.

Technical Review Committee held in REPA Bacau took the decisions for each agglomeration having in view the following considerations:

- The quality of the treated waste waters discharged by the Waste Water Treatment Plant into the river body (will be according with the norms NTPA 011-001. Comparing with the actual situation, when generally, the waste water is discharged into the rivers un-treated or insufficient treated, the impact for environment will be positive after the implementation of the proposed measures of the project.

- The measures proposed by the project will improve the drinking water quality and will raise water supply cover rate, having a benefit impact to the population health.

- The impact of the proposed measures will be insignificant. The potential disturbance will be minimum and only for a very short period of time, during construction phase.

- The proposed project will use only limited areas of land, the rehabilitation and extension works of water and waste water networks being done along the streets and into the existing locations of WTP and WWTP, or using new locations on greenfields far from residential areas or protected areas.

- The proposed project will use natural resources –water- and will not generate pollutants for water and other environment components.

- The proposed project will generate certain quantities of waste during the construction phase, as well as during the operating phase; the waste generated will be will be managed in a sound manner, according with the legal norms during both phases - construction and operating phase.

- The proposed project will not have an ecological accident risk.

- For all agglomerations the works will be done in compliance with the imposed measures for protection of the biodiversity. According with the Declaration

of the responsible authority for the Nature 2000 protected areas (REPA Bacau), the proposed project will not affect the protected areas, being far enough from such protected areas.

The Environmental Agreement for Bacau, the Negative Screening Decisions of the Technical Review Committee REPA Bacau for the other 4 agglomerations were released as is listed below:

- **Bacau** – Environmental Agreement no.8 dated on 25.11.2010 released by REPA Bacau
- **Moinesti** – Decision no.176 dated on 25.11.2010 released by REPA Bacau
- **Darmanesti** - Decision no.179 dated on 25.11.2010 released by REPA Bacau
- **Buhusi** - Decision no.178 dated on 25.11.2010 released by REPA Bacau
- **Targu Ocna** - Decision no.177 dated on 25.11.2010 released by REPA Bacau

13.4 Declarations Natura 2000

The Declarations Natura 2000 were released by the competent authority responsible with monitoring of the Natura 2000 sites in Bacau County, respectively REPA Bacau, as is listed below:

- **Bacau** – Natura 2000 Declaration no.8 dated on 03.12.2010 released by REPA Bacau;
- **Moinesti** – Natura 2000 Declaration no.10 dated on 03.12.2010 released by REPA Bacau;
- **Darmanesti** - Natura 2000 Declaration no.11 dated on 03.12.2010 released by REPA Bacau;
- **Buhusi** - Natura 2000 Declaration no.9 dated on 03.12.2010 released by REPA Bacau;
- **Targu Ocna** - Natura 2000 Declaration no.7 dated on 03.12.2010 released by REPA Bacau.

CHAPTER 14

PROCUREMENT STRATEGY AND IMPLEMENTATION PLAN

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14 PROCUREMENT STRATEGY AND IMPLEMENTATION PLAN

14.1 Introduction

The intention of this Chapter is to outline the strategy considered optimum for procurement and implementation of the Cohesion Funded works that have been agreed with the MoE and Counties in the Master Plan core investments, and that were subsequently evaluated in the Feasibility Studies.

The strategies outlined below are designed to address current business direction within the Water & Wastewater industries Europe-wide, and identify specific areas and actions to enable best facilitation of procurement and implementation for the Project into the Tender Documentation stage.

14.1.1 General

Romania joined with the European Union in January 2007, and under the terms of the Accession Treaty Romania has the right to apply for funding for development. Part of that development we are dealing with here: Water and Wastewater infrastructure, which the EU considers a priority. With reference to applicable European and Romanian investments into Water and Wastewater infrastructure can be applied for under European Union Cohesion Funding.

As the Project proceeds through the Cohesion Fund applications the strategy for Procurement and Implementation is envisaged as follows:

The strategy proposed by the Consultant is to elaborate the tender documents for the water supply and sewer networks according to the FIDIC Red Book and the tender documents for the drinking water and wastewater treatment plants according to the FIDIC Yellow Book, thus following the line of the TOR.

For all treatment plant components it will definitely be more suitable to issue a design-build type of contract (i.e. FIDIC Yellow Book) since it allows the Contractors to use their creativity and particular equipment which will in turn certainly lead to attractive prices.

As a matter of principle competitive international bidding shall be envisioned. The contract value would have to be attractive to receive competitive bids.

Apart from purely economic considerations, it is important to define contract packages in such a way, that clear contract limits are maintained and that the non-performance of one Contractor does not negatively influence another ongoing Contract.

Local construction companies should also be offered the opportunity to participate, which would foster the local industry. A decision could thus be taken to separate pipe delivery and pipe laying in different procurement packages.

The pipes for the transmission mains and the distribution lines are standard material and can more or less be bought off the shelf. The same is true for the entire material used for house connections, valves and other armatures.

It shall furthermore be discussed, whether or not it would make sense to issue contracts covering both, works for distribution and sewer lines, since certainly many of these lines would run in the same locations. This in turn would help to properly allocate liabilities during the works execution, in particular when it comes to surface reinstatement works.

The erection / refurbishment of pumping stations, Water Treatment Plants (WTPs) or WWTPs may form another contract package since here a heavy equipment delivery component is involved and the works could only decently be performed by specialized contractors.

Design Build contracts (FIDIC Yellow Book) have the advantage that all suppliers will be united under the leadership of one "General Contractor", thus eliminating useless efforts to coordinate several different contractors. A second advantage is the direct allocation of liabilities for faulty works and/or equipment. The advantage of a construction type of contract (FIDIC Red Book) is that quantities can be monitored allowing a stringent budget control.

As has - in brief - been outlined above, implementation strategies and policies play an important role in the project cycle and will have to be discussed intensively since – apart from a proper design – the success of a project depends on an intelligent and suitable purchasing strategy.

The Procurement Plan will in detail be elaborated considering the previously described risks, which can be minimised if appropriate contracting strategies are adopted.

This Procurement Plan which will have to be approved by the MEF, shall govern the tendering procedures, as well as deadlines and staff requirements needed for a meaningful evaluation of the offers received.

Project components should be grouped as best suits execution, - while at the same time observing Romanian Procurement rules and the requirements of the EU including transparency & impartiality.

Competition for contracts to be open to organizations based in the EU and eligible countries.

Full transparency and impartiality is required at all stages of the tender process as mandated in Romanian National and European legislative requirements; and should comply with Romanian and International standards of specifications, forms of contract and selection criteria.

Development of documentation will also include for required standards in both specifications and forms of contract, and also in qualification of Contractors.

Addressed in this Chapter and appended Annexes are the specific Projects outlined in the Master Plan and Feasibility Study for Bacau County, and also the type of Contract necessary for procurement and implementation, which could fall into the following categories:

- Design / Build - under FIDIC Yellow or partial under FIDIC Red.
- Build – under FIDIC Red.
- Supply of equipment / materials
- Supply, install & commission of equipment
- Service Contract

As we can see from the above, the types of contract will be varied and will also need to address assistance to the Local Beneficiaries and PIU's, not only in formation and evaluation of contracts, but also in supervision of the contracts.

14.1.2 Definitions

Implementation

In the context of this Chapter 14, Implementation means the progressive methodology used to identify content and type of procurement packages and supplementary documentation necessary to execute the Cohesion Funded works proposed in the core investments of the Master Plans / Feasibility Studies ,- and agreed with the MEF and the Local beneficiaries.

Procurement

Procurement is the acquisition of goods and/or services at the best possible total cost of ownership, in the right quality and quantity, at the right time, in the right place and from the right source for the direct benefit or use of the Project and the Local beneficiaries.

Procurement Plan

Organises the components of the works to be executed into packages for tender.

The procurement strategy

Defines the form of tender procedures and contracts to be used to ensure best business interests of the Beneficiaries and compliance with tender & contract procedures referenced in national and European legislation.

14.1.3 Legislation

Procurement for works will be done in accordance with relevant National & EU directives and laws. Special reference is given to the following in outline, with additional reference given in Annex 12-3.

- Romanian Law no. 337/2006
- Emergency Ordinance no. 34/2006.
- Romanian Law no. 925/2006;
- European Council Directive 2004/17/EC.
- European Council directive 2004/18/EC.
- Regulation 1874/2004/EC amending Directives 2004/17/EC and 2004/18/EC.
- Decision 2005/15/EC.
- European Council Regulation (EC) No 1083/2006.
- European Council Directive 92/50/EEC.
- European Council Directive 93/36/EEC.
- European Council Directive 93/37/EEC.
- European Council Directive 97/52/EC.
- European Council Directive 93/38/EEC.

Plus additional Laws and regulations as given in the Terms of Reference as outlined in the ToR Section 4.2.14 and as referenced in Annex 12-3.

14.1.4 Procurement Process

The table below summarizes the procurement process consistent with the legislation described in 14.1.3.

	Step	Operation
1.	Annual Program of Public Procurement. (See Annex 12.2)	Works and services required. Value of Contracts obtaining competitive proposals; Bid procedures Outline of content of invitation to bid documentation. Selection of procedures

		Financing options. Schedule preparation Publication of information notices as required.
2.	Development of tender Documentation.	Development of technical Specifications and Scope of works. Development of Contract form, content and wording. Development of qualification & selection criteria. Development of the awarding procedure Development of Bid analysis risk assessment Development of awarding documentation. Development of participation and avoidance of conflict of interest rules. Development of project execution procedures and controls. Development of common selection Criteria (financial / technical / experience) Development of participation guarantees. Development of procurement data sheets Development of standard documentation for bid returns. As required notification to Romanian Government
3.	Preparation of contract documentation.	Finalisation of the contract documentation.
4.	Tender Invitation.	Tender notice and tender deadline publication. Provision of Tender Pack to interested parties. Tender pack will include proposed Contract documentation. Respond to clarification requests and extension of tender deadline. Pre-tender information and clarification meetings with Tenderers as deemed necessary by the local authority.
5.	Return of Tenders	Receipt of tenders Official opening of tenders Tender evaluation. Confirmation of tendering procedures criteria. Evaluation of performance guarantees As necessary clarifications meetings with tenderers.

6.	Contract award	Notification to successful tenderer Pre-contract clarification meetings with successful tenderer (Principal Contractor). Contract signing. Notice of award publication. Notifications to Romanian Gov as required.
7.	Contract implementation	Monitoring of Contract and Schedule. Progressive project hand-over from Principal Contractor to Local Authority.
8.	Contract completion.	Project completion certificate issued by the Local Authority (Owner), final payment and cancellation of Bank guarantees and performance Bonds.
9.	Contract analysis & conclusions.	Measures as necessary

Table 14-1: Procurement Process

14.2 Procurement Strategy

14.2.1 Criteria for Grouping of Tenders

- The procurement required (Works / Services / Supply etc.) will determine the tender type.
- Type of Contract will be determined by content, necessary experience and capability of Contractor and value.
- Factors such as time-frame or need to utilize existing frameworks or manufacturers could determine if a negotiated procedure should be used.
- Tender packages are not to be manipulated.
- To aid local authorities to minimise administrative costs, larger value tenders as far as practical are encouraged.
- Although longer in procedure than the open method of tendering, restricted tenders, as practiced in Romania, can result in a more focused return of tenders in that non-compliant tenders will tend to be screened out. It should be considered when using this form of procedure that more difficult works would probably benefit from open procedure to ensure maximum returns.
- Indication of use of ether FIDIC Yellow or Red book for proposed Contracts will be given to and discussed with the Local Authorities by the Consultant.
- Maximum use of FIDIC Yellow form of Contract is recommended where possible to preclude conflicts of responsibilities between Contractors and Consultants.

- In general the Yellow Book should apply to the more complex DWTPs and WWTPs and the Red Book to distribution networks; with smaller facilities – such as small pump station absorbed into the design requirements of the Contractor – under Red Book.
- It could be necessary in the case of dissimilar works, to divide the work into smaller packages that are similar. In such a case, they could be offered to specialist contractors. Of note here should be the capacity & expense of and to the ROC's for supervision of smaller packages.
- If a tender is formulated that requires work to be executed on water and wastewater care should be taken that the tenderers have capability and experience to execute works. For example, it could be expected that if water and wastewater pipes could be laid in the same trench then they could be combined in a tender, but if combining for instance work to be done on water and wastewater treatment plants, then care should be taken that the tenderers have capability and experience to execute works on these differing technologies. It should also be remembered that larger tender packages, whilst offering economies of scale for both the tenderer and Local Authority, also encumber risks to the project in the case of failure of the contractor.
- Also to be considered in formulation of and expected timing of execution of a contract, will be the time taken to obtain permits and approvals.
- It would best suit the purposes of the tender procedure for common selection criteria (financial / technical / experience) to be developed to facilitate both expedition and clarity of the tender procedure.
- Design the procurement strategy in light of the expected market reply: as far as possible, group simple and identical contracts (i.e. network extension / rehabilitations) to foster competition (and avoid local agreements).
- Market conditions should also be considered when issuing invitations to tender – in that an excess of tenders available could cause prices to rise.

14.2.2 Potential use of Romanian Construction Companies

Use of Romanian construction companies, although offering possibilities for the development of the Romanian Water and Wastewater infrastructure, if it could be shown there were companies with the financing and experience available to meet the criteria that is necessarily part of the tendering procedure.

14.2.3 Proposed Procurement Strategy

It is recommended that for works and supply contracts, that the open procedure of tendering be used. The Consultant will provide the Terms of Reference for service contract, which could be restricted contract but the procedure and timing for their enactment will be decided by the Local authority & MEF.

Training Periods

For the planned investments a high number of tenders and contracts are to be administered by the Final Beneficiary, i.e. the Project Implementation Unit (PIU) at the Regional Operating Company (ROC), which will be furthermore, established as the responsible Contracting Authority (with assistance from the MEF).

Within the frame of some institutional strengthening the required infrastructure for administration of the contracts shall be established. Administrative, technical and commercial capacities shall be considered, in accordance to the planned set-up.

On the administrative & commercial level particular capacities with legislative background (Romanian & European Procurement Law's), knowledge and experience in FIDIC contract management as well as billing and accounting capabilities for budged management are required.

Development of technical capacities will depend on the fact how much the PIU will be involved in future design & tendering of the Red Book tenders (Works Contracts).

Personal planning and assistance for institutional set-up of the PIU shall be subject to Technical Assistance for institutional strengthening and management consulting.

A period of at least 5 months, prior to awarding of the first contracts, should be considered as a minimum period, whereas subject and content of such should be defined by the new TA Consultant.

14.3 Proposed Tenders (specific for County)

The size, type and number of contracts, along with a proposed implementation schedule for the investments in Bacau County is included in Annex 12.2 which forms part of this document, and has the following information.

The next table presents an overview of the agreed tender packages (also refer to Annex 12.1).

Contract Type	No	Title	Investment (incl. Contingency)	FIDIC Contract		Tendering Procedure	Earliest Start of Works	Description
Work contract	WC 1	WWTP Bacau	14,149,547 €			international restricted	Dec-2010	Tertiary Treatment Step WWTP Bacau City
			TOTAL					
			14,149,547 €					
Work contract	WC 2	WW-Networks Buhusi and Moinesti	5,709,964 €			international restricted	Apr-2011	Extension Wastewater Network Moinesti including pressure lines
			190,168 €					WW Pumping Stations Moinesti
			5,683,340 €					Extension Wastewater Network Buhusi including pressure lines
			477,581 €					WW Pumping Stations Buhushi
			TOTAL					
			12,061,053 €					
Work contract	WC 3	WS-Networks Buhusi and Moinesti, Rehabilitation WS AC parts in Bacau, WW networks in Bacau, Darmanesti and Targu Ocna	699,896 €			international restricted	Apr-2011	Extension Water Supply Network Moinesti
			1,076,904 €					Extension Water Supply Network Buhusi
			4,091,534 €					Rehabilitation AC - parts in Bacau City (financed by 'Other Funds')
			10,630,877 €					Extension Wastewater Network Bacau including pressure lines
			287,413 €					WW Pumping Stations Bacau (WWPS Magura financed by other funds)
			14,125,752 €					Extension Wastewater Network Darmanesti including pressure lines
			574,826 €					WW Pumping Stations Darmanesti
			7,225,466 €					Extension Wastewater Network Targu Ocna including pressure lines
			369,531 €					WW Pumping Stations Targu Ocna
			TOTAL					
			39,082,199 €					
Work contract	WC 4	Rehabilitation WTP Caraboaia	3,880,385 €			international restricted	May-2011	Rehabilitation WTP Caraboaia
			TOTAL					
			3,880,385 €					
Work contract	WC 5	WWTPs Moinesti and Buhusi	2,464,095 €			international restricted	May-2011	New WWTP Moinesti South
			6,137,008 €					Rehabilitation WWTP Moinesti North
			8,049,281 €					Rehabilitation WWTP Buhusi
			TOTAL					
			16,650,384 €					
Work contract	WC 6	New WWTP Darmanesti and Rehabilitation WWTP Targu Ocna	5,431,155 €			international restricted	May-2011	New WWTP Darmanesti
			4,281,081 €					Rehabilitation WWTP Targu Ocna
			TOTAL					
			9,712,236 €					
Service contracts	SC 7	Technical Assistance	2,133,583 €	white		international restricted	Dec-2010	Design and Engineering incl. Tender CFII
			1,578,852 €	white				Technical Assistance - Project Management
			3,911,569 €	white				Technical Assistance - Supervision
			TOTAL					
			7,624,004 €					
			TOTAL				water supply	
		CF + Other Funds	**103,159,809 €**				wastewater	
		Other Funds	4,132,593 €					
		CF	**99,027,216 €**					

Table 14-2: Work packages for Cohesion Fund in Bacau County

14.4 Proposed Procurement and Implementation Plan

Combination of the factors discussed above in this chapter combined with additional factors outlined below, and specific to the tender process, result in the proposed Procurement and implementation plan. The Plan, which will have segments specific to a County, will be generic in format for all Counties in the Project not only to maintain requirements verification and transparency, but also to comply with Romanian, EU and International Laws, regulations and Standards.

Areas that will be addressed during preparation, tendering and award of Contracts will include:

- Overall procurement plan for all contracts;
- Specific and detailed procurement plan for each contract;
- Overall implementation schedule for all contracts;
- Specific and detailed implementation schedule for each contract;
- Summary milestone table.

The procurement plan itself includes:

- Contract code/name;
- Date of Procurement Information Notice (PIN);
- Date of submission of tender documents by Consultants to MEF;
- Approval of tender documents by MEF and ROC;
- Date of contract participation notice;
- Preparation of proposals by selected bidders;
- Evaluation of proposals;
- Approval of evaluation report by MEF and ROC;
- Notification of award;
- Contract signature.

The implementation schedule includes:

- Contract/activity name;
- Duration of task;
- Start date;
- End date;
- Gantt chart with duration of activities.

The milestone table includes

- Contract/activity name;
- Start date;
- End date.

14.5 Documents required for project implementation

The list of permits or authorizations required for project implementation before starting construction is provided in G.D. No. 28/ 9.01.2008, and includes:

- Urban Planning Certificate;
- UPC extension for Construction/Demolition Authorization;
- Suppliers permits for connections to or for work in the areas of public water supply, sewage, gas, power, telephone, rail, road systems.
- Address allocation certificate;
- Documentation for Cadastral map numbers and Land Real Estate registration;
- Environment permit;
- Fire Permits.

Copies of available permits at this stage are attached in Annex 1 of the FS.

14.6 Assumptions and Risks

Assumptions

The following assumptions can be made in order to avoid the risks related to delay or failure of a project:

With the intent of avoiding risks related either Project delay or failure, the following assumptions pertaining to the procurement and implementation processes should be made by the contracting authorities:

All ROC's (and PIU's within the ROC's), as required by the TA Contract and necessary for full implementation of County Projects awarded, are in place, in full operation, fully staffed with the required competent personnel and fully funded.

At every point, the ROC will offer full help and assistance to the Contractor as required within the terms of the contract to ensure the successful and timely completion of the contract by the Contractor, and effective co-operation and interaction between all parties involved in the project.

That all Approvals for Cohesion Funding are in place, and timely for disbursement to ensure the progression of the contract.

That funds from EU and local funding will be disbursed as required by the contract conditions.

Tender documents will be prepared competently as outlined in this documentation and as required by Romanian and EU Laws and Regulations.

That due diligence has been exercised by the owner of the Project in tender evaluation; to include financial / technical / experience of proposed Contractor and the commercial risks already pertaining to the proposed Contractor.

That documentation as outlined in section 14.5 of this document, and other documentation and approvals as may be necessary for Romanian or EU Authorities is in place.

That the documentation that pertains to the Contract is complete and appropriate for intended use.

Award in due time of the Service Contract for Supervision of the works proposed by this project.

That award of contract has been made and that execution of the works required under the Contract can start in due time to agree with contract schedules.

That no other contract is proposed either by the owner, the County, the Government or private organisations that could impede the work or the timing of the works proposed under the contract to be awarded.

That free access is available to the Contractor to all sites and installations that pertain to the proposed works under the contract.

That the ROC will ensure County co-operation with the necessary movement of equipment and supplies along roads and rights of way both public and private within the County as will facilitate the needs of the project.

That Service Contract for technical assistance, supervision and any other need to facilitate the contract – and such contract fulfilling all requirements as outlined in this document and by Romanian and EU law and regulations - will awarded for the contract.

That Service Contract when awarded has the full support and assistance of the ROC's to enable the Contractor to effectively discharge obligations to the contract.

That no significant changes will take place in the scope, word and intent of the contract – during the time frame of the contract - caused by change of local or national government within Romania

That no significant changes will take place in the scope, word and intent of the contract – during the time frame of the contract - caused by lack of support or provision of information of and by local authorities.

That no significant changes will take place in the scope, word and intent of the contract – during the time frame of the contract, - caused by lack of support or provision of information of and by the Romanian Government.

That all performances and mobilisation by the Contractor will be in place and onsite for the contract start date.

That the works will be completed to the time, quality and budget requirements of the contract.

Risks

Risks to the successful execution of the project, are as follows:

- Availability or timely availability of funding.
- Changes in Romanian Law.
- Lack of co-operation between Local Authorities and the central Government.
- Lack of cooperation between municipalities and Operators within the County.
- Lack of cooperation between local authorities and ROC.
- Non-performance of the ROC / PIU.
- Late commencement of the works.
- Non-performance of Contractors.
- Delays to contract due to 'force majeure'.
- Delay due to archaeological sites.

14.7 Conclusions and Recommendations

The guidelines for the Feasibility Study request a summary of the Chapter above to include:

- Contract code/name;
- Type of contract;
- Short description of works;
- Estimated Contract Value;
- Provisional date of Tender Launch.

That information can be found for all of the defined 6 work contract packages and 1 service contract package in Annexes 12.1 and 12.2 of this document.

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. The 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 14-3: Overview Procurement Packages (sums constant)

Distribution of CF - Investments incl. contingencies in Bacau County [€]

YEAR	2010	2011	2012	2013		TOTAL
WC-No.						
1	990,468	7,074,774	6,084,305	-		**14,149,547**
2	-	3,513,075	4,891,196	3,656,782		**12,061,053**
3	-	15,130,648	12,614,090	7,204,868		**34,949,606**
4	-	1,940,192	1,940,192	-		**3,880,385**
5	-	5,364,730	7,955,578	3,330,077		**16,650,384**
6	-	2,913,671	2,913,671	3,884,894		**9,712,236**
						-
TOTAL	**990,468**	**35,937,089**	**36,399,033**	**18,076,621**		**91,403,212**

Table 14-4: Gantt Chart

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).

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