Ministry of Environment and Sustainable Development
Managing Authority for SOP Environment

GUIDELINES FOR FEASIBILITY STUDIES FOR WATER AND WASTEWATER PROJECTS

TITLE
OF INVESTMENT PROJECT
(E.G. MODERNISATION AND EXTENSION OF THE WATER AND WASTEWATER INFRASTRUCTURE IN ARGES COUNTY)

NOTE: DO NOT REFER TO TA PROJECT TITLE!

Volume I: Feasibility Study Report
Volume II: Annexes Feasibility Study
Volume III: Drawings
Volume IV: Financial and Economic Assessment – Cost Benefit Analysis (CBA)
Volume V: Institutional Analysis
Volume VI: Environmental Impact Assessment (EIA)

ANNEXES TO THIS GUIDE:

ANNEX 1: PERFORMANCE INDICATORS TEMPLATE

ANNEX 2: COST BREAKDOWN TEMPLATE

ANNEX 3: UNIT COST TABLE TEMPLATE

VOLUME I: FEASIBILITY STUDY REPORT

TABLE of CONTENTS

1. SUMMARY

To BE ADDED

Maximum number of pages: 10

2. GENERAL DATA

Present general data necessary to understand the project context.

2.1 Introduction to the Feasibility Study (max. 1 page)

- Reference to the TA context - reference to Romania as new MS and the need to comply with EU standards, Accession Treaty commitments in the field of environment, scope of TA to prepare a project (or a number of projects) as part of the project pipeline for SOP Environment initiated by Romanian authorities
- Explain the structure of the FS report

2.2 Project Area

- Present the location of the project, the concerned county and agglomerations, population –total project beneficiary population (out of total county population), and breakdown per agglomerations (population and p.e.) (2-3 paragraphs only)
- Provide an overview map to indicate the project area (general map of Romania indicating the project area and a more detailed map of the project county/area)

3. PROJECT BACKGROUND

Present in a concise manner the background of the project considering:

- The results of the Master Plan;
- Objectives and targets defined in the accession treaty, national development plans and sector plans (SOP ENV) as well as county targets defined in the MP;
- A short summary of the natural features, socio-economic and institutional framework.

3.1 Strategic national documents and objectives relevant for the project (1-2 pages)

- Summarize national objectives in line with **Accession Treaty** – include relevant chapters of Accession Treaty and outline compliance dates; mention that **National Implementation Plans** for compliance with the water and wastewater relevant acquis have been prepared by the relevant national authorities
- Reference to the **SOP Environment**, national strategic document that represents the basis for selection of environmental sector operations co-financed from Structural Funds in the period 2007-2013; prepared on the basis of the National Development Plan and National Strategic Reference Framework of Romania and in line with the Accession Treaty and the relevant national sectoral plans for environment (e.g. sectoral National Implementation Plans for compliance with water Directives as relevant for this project); Outline SOP Environment objectives and strategy
- Reference to the Master Plans prepared with the view to prioritize long term investment needs at regional/county level in line with national strategic documents in the water sector (in particular, National Implementation Plans for compliance with the water sector acquis and SOP Environment)

3.2 Results of the Master Plan (no more than 3-4 pages text excluding maps)

Summarise the **results** of the MP focusing on:

- Reference to the upstream MP document as basis for this project selection
- Reference to the MP **horizon time** (30 years), to the MP dynamic feature (to be updated regularly)
- Reference to the twofold scope of the MP (ask MESD if needed)
- Summarize the ***results of the analysis*** of the current situation at county level linked to the need to comply with the water and wastewater obligations of the Accession Treaty; highlight the main ***deficiencies*** and the ***needs*** to be addressed in order to bring the current situation to a point of compliance with the obligations. The presentation must be in specific terms – quantitative (no. of inhabitants in urban and rural area, no. and size of agglomerations defined in line with the relevant wastewater Directive, number and size of main infrastructure components, services provided, coverage rate, etc.), qualitative (environmental impact, conditions of available equipment for water management, status of infrastructure in terms of legal compliance – reference to Accession Treaty and Water Directives parameters, etc.) and investments needed for compliance (as list of main actions and major investment packages). *Note that **quantification** of the current situation and needs and the needs is the key word!*
- Include maps or refer to relevant maps in the Annexes to help understanding of the current situation (one for water, one for wastewater recommended)
- Briefly present the ***forecasts*** of socio-economic trends relevant to the county, including population, water demand, wastewater flows and loads, etc. and list the main ***assumptions*** (including affordability considerations); the projections and assumptions must be clear and comprehensible. Table format is preferable.
- State the ***national objectives*** and ***county targets*** relevant to the MP
- Present the ***results of the options analysis*** prepared at MP level; note that only relevant strategic options should be included here (e.g. one WWTP vs 2 WWTP to ensure adequate treatment in agglomerations; or centralised vs. local systems for compliance with the aquis in the rural area etc.)
- A summary of the ***county's strategy*** for the water and wastewater infrastructure development; simply list the main strategic directions as clear as possible, along with the period, the responsible, the results expected, as appropriate.
- Mention the ***phases*** of the MP investments linked with the ***total amounts*** needed: **i)** for the MP horizon time (30 years), **ii)** by 2018 – deadline for compliance with the aquis, **iii)** by 2015 for the first phase (short term priorities that may include investments financed by SOP and by other financing programmes) and **iv)** for the SOP project (if differs from iii);
- Indicate clearly the ***main criteria*** used for prioritisation and selection (for this topic, one can review the MESD presentations and instructions); indicate that the selected SOP agglomerations and investments, once identified as priorities, have been subject to a series of consultations with the relevant local authorities and agencies as well as with the relevant departments of the MESD (water department and MA)
- Briefly describe the ***Short Term Investment Programme*** (STIP) proposed for SOP financing – the agglomerations covered, the beneficiary population, the main actions and package investments, the main results expected upon the implementation (aggregated tables as indicated in MP Guidelines should be attached)
- Include ***maps*** or refer to relevant maps in the Annexes to help understanding the SOP project components (one for water, one for wastewater recommended)

3.3 Natural Features in the project area (*no particular requirement for the no. of pages as long as it is concise and specific*)

Briefly describe the natural features in the project area including (main elements included in the MP Guidelines - Chapter 2.3):

- Environment
- Climate
- Landscape and topography
- Geology and hydrogeology
- Ecology and sensitive areas (refer also to any Natura 2000 sites where relevant)

3.4 Socio-economic Assessment (*no particular requirement for the no. of pages as long as it is concise and specific*)

Summarise the socio-economic assessment (main elements already prepared available in the MP) with focus on:

- Current and future development of population
- Current and future development of Economic and main industrial activities (non-domestic water consumers and pollutants)
- Other relevant elements – GDP, household income, etc.

  Note: i) Common tables to reflect past, current and forecasted figures are recommended, for easy reference; ii) Refer to official statistics as much as available; challenge the data if different documents present different data; additional surveys and investigations should be performed where needed.

3.5 Institutional and Legal Framework

Present the general legal and administrative framework as well as the institutional set-up of the Romanian water sector.

3.5.1 Legislative Framework linked to environment – water sector (one page recommended)

- Briefly refer to the European legislation on *environment* and possibly refer to key elements relevant for this project (water and wastewater Directives, ref. to WFD, ref. to agricultural use of sludge, etc.)

  Note: Description of the detailed provisions of the Directives is not needed
- Briefly present the relevant Romanian laws that transpose the relevant Directives mentioned above

  Note: presentation of long lists of laws is not needed. Mention only the relevant laws and norms and comment on the correspondence of the Romanian laws with the related directives. If considered appropriate, a list of such Romanian laws and norms could be included in an Annex but not in the main text of the FS.
- Briefly present the relevant Romanian legislation on *public services* in the water sector (reference to Law 51 and the related legislation in particular)

3.5.2 General Administrative Framework (no more than one page)

Briefly describe the administrative framework in Romania at the national, county, and municipal levels relevant for the water sector, with reference to their role and responsibilities

- Environmental institutions
- Public water services

3.5.3 Regional Policy - Institutional Setup in the Romanian Water Sector

- Briefly describe the Regionalization Strategy in the Water Sector (1-2 pages)

Note: This section should refer to the national policy on regionalisation of water services (the rationale, the principles, the main provisions). Ask the MESD for easy reference summary, if needed, although this is available on MESD website. A detailed assessment of the institutional set up for this project is to be presented further in Chapter 12.

4. ANALYSIS OF CURRENT SITUATION AND PROJECTIONS

The analysis of the current situation and projection of future development shall focus on the following key elements:

- Present the current situation and projections of water resources and water demand in order to assess the current water scarcity and future availability (water balance);
- Assess current and possible future pollution of water resources as key constraint to sustain water resources development;
- Assess the existing water supply and wastewater infrastructure in order to define the main deficiencies as a justification for the investment project;

The assessment shall be based on sufficient and reliable data. Field investigations and measurements are key elements of the assessment and are of the utmost importance for the next steps. Field measurements will in particular be important to assess water quality, water losses, infiltration water, wastewater load and hydraulic wastewater flow, and for any other field in which the data provided are insufficient or deemed unreliable or inconsistent.

Abstract

4.1 General Data on Water System

Provide sufficient information for each agglomeration and summarize for all agglomerations:

- Water quantity and water quality
- Current water consumption and development of water demand
- Assessment of current water losses
- Current and future wastewater flow and load including infiltration water
- Information on the recipient water and the impact of water pollution on downstream water users
- Level of service for all water and wastewater agglomerations
- Additional base data relevant for assessing the feasibility of the investment measures such as land availability, geotechnical studies, and other relevant basic studies

Key Note: Presentation of the relevant information in a concise manner by using quantified data is of particular importance. With this aim, a series of summary tables are presented in the following pages for easy reference and orientation by the TA consultants.

4.1.1 Water Resources

4.1.1.1 General

Provide an overview of current water resources in the project area (ensure coherence with chapter 2.7. of the MP)

4.1.1.2 Agglomeration x

4.1.1.2.1 Water Quantity

Briefly describe current water resources available for water supply quantifying:

- Development of yearly water production for the past five years (split-up in water resources)
- Monthly variation of water production
- Replenishment of natural resources
- Deficit of water and constraints (water shortages)
- Tendency for availability of water resources (i.e., lowering water table)

Identify and quantify potential additional water resources for future development.

4.1.1.2.2 Water Quality

Briefly describe current water quality of existing and potential water resources:

- Briefly describe current water quality monitoring system and comment on reliability of data below
- Summarise statistics on water quality analysis (development in the past years if available) in a table
- For each raw water source (indicator, unit, concentration measured, max. admissible value), provide table with water quality analysis
- Provide table with water quality analysis after treating raw water (indicator, unit, concentration measured, max. admissible value)
- Provide table with statistics on water quality analysis measured in the distribution system (i.e. consumer tap)
- Particularly focus on water quality parameters in the accession treaty and other parameters with high risk for non-compliance (pesticides, nitrates, ammonia, etc.)
- Describe current protection zones (deficiencies)
- Assess reason for inadequate water quality (geogenic, anthropogenic – industry, agriculture, sewer system, etc.)
- Conclude on compliance with Drinking Water Standards (EC DWD and Romanian Law 458/2002) and clearly indicate in a table the respective compliance dates to be respected for the non-compliant parameters.

4.1.1.3 Agglomerations y

4.1.1.4 Agglomeration z and so on - same structure as for 4.1.1.2.

4.1.2 Water Pollution

Provide an overview of current status and trends for development of water pollution in the County by summarizing Chapter 2.8 of the MP.

- Major pollution sources
- Impact of wastewater discharge

Provide more specific information on pollution load for each agglomeration concerned.

4.1.3 Current Water Consumption and Water Demand Projection

4.1.3.1 Current water consumption

Provide an overview of current water consumption for all agglomerations concerned by summarizing chapter 2.9 of the MP and consider the following:

- Quantify current water consumption and development in the past 3-5 years for each agglomeration by using existing data and own measurements
- Carry out measurements (with portable ultrasonic flow meter) at representative consumer types (metered/un-metered, apartment blocks, individual households, etc.) and verify actual consumer readings with measurements
- Break down consumption by category of consumers (domestic, non-domestic).

Table: Current water consumption

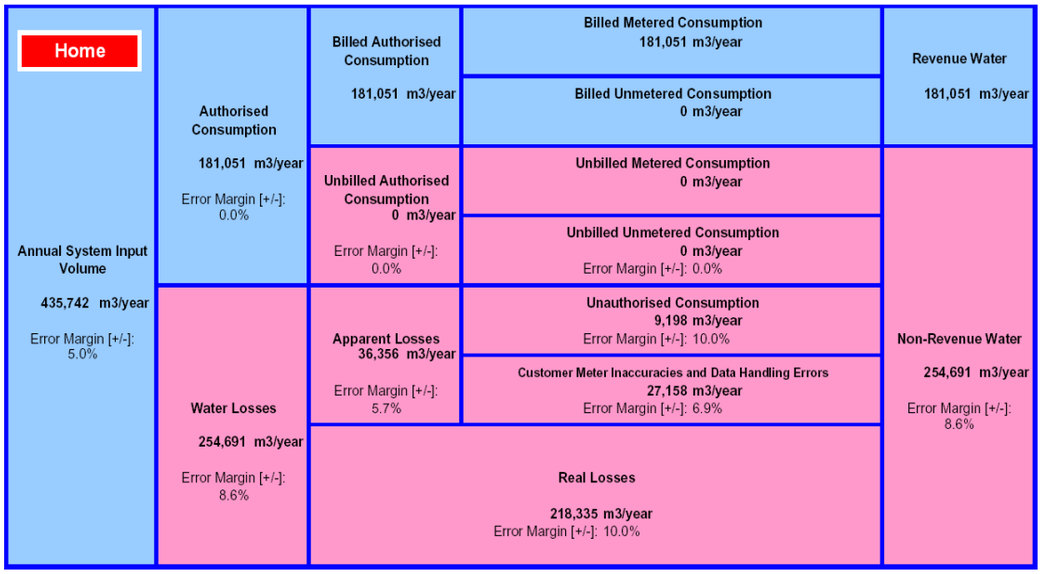
Water Demand	Units	Agglomeration x	Agglomeration y
Domestic Water Consumption	10^6*m^3/y.		
Non-Domestic Water Consumption	10^6*m^3/y.		
Total Water Consumption (Domestic + Non-Domestic)	10^6*m^3/y.		
Specific Domestic Consumption	lcd		
Specific Total Water Consumption	lcd		

4.1.3.2 Water Losses

(1) Estimate current water losses as follows:

- Apply IWA methodology to determine the current water balance (see example below) and indicate data accuracy (error margin)
- Estimate components of the water balance based on existing data, field measurements, and expert's estimates for each agglomeration
- If no loss measurements are available, estimate real (physical) water losses by (i) night flow measurements and/or (ii) physical condition of the network/pipe failures (iii) estimate of apparent losses
- Calculate/estimate technological losses in the treatment plant
- Calculate Infrastructure leakage indexes (ILI) and losses in liters/connection/day (or m^3/km of pipe per day)
- Conclude on the current losses indicating the importance for network rehabilitation (classification as per IWA)

Table: Example for Water Balance (IWA standard)



(2) Set realistic targets for development of future water losses considering:

- Future investment measures (priority measures and long term investments)
- Improvement of water loss reduction practices of the ROC

(3) Provide data for the water loss indicator table given below:

Note: setting water loss targets will be necessary to calculate design water flows. As the proposed investment measures (network rehabilitation) will determine the future water losses, setting water loss targets is an iterative process.

Table: Water Losses Indicators

Item	Indicator	Unit	Current Losses	Target Losses
	Total system input (raw water input)	m^3/d		
	Total non-revenue water (IWA standard: Total system input - total water sold)	m^3/d		
	Percent of non-revenue water	%		
	Real water losses (physical losses) in the network (excluding technical losses in the WTP)	m^3/d		
	Percent of real water losses (physical losses) in the network (excluding technical losses in the WTP)	%		

	Real water losses per number of connections (at average system pressure of 30 -40 m)	Liters/conn./day		
	Infrastructure Leakage Index (ILI as defined by IWA)*	-		

** Assumption: pressure 35 m; Lp=0*

Note: The above indicators and other specific indicators are particularly required by the European Commission (through official communication)

4.1.3.3 Water Demand Projection

(1) Provide a summary table with projection of future water demand components for all agglomerations as given in the table below:

Table: Summary of future water demand for the year …

Water Demand	Units	Agglomeration x	Agglomeration y
Population	Number		
Specific Water Demand – Domestic	Lcd		
Domestic Water Demand	m^3/year		
Non Domestic Water Demand	m^3/year		
Total Water Demand (Domestic + Non-Domestic)	**m^3/year**		
Real Water Losses	m^3/year		
Total Water Demand incl. Water Losses	**m^3/year**		

(2) Prepare for each agglomeration a summary table with projection of future water demand components as given in the table below:

Table: Projection of future water demand for agglomeration x

Water Demand	Units	2007	2010	2015	2020	2025	2037
Population	10^6*Number						
Specific Water Demand – Domestic	lcd						
Domestic Water Demand	10^6*m^3/y.						
Non Domestic Water Demand	10^6*m^3/y.						
Total Water Demand	**10^6*m^3/y.**						
Real Water Losses	10^6*m^3/y.						
Total Water Demand incl. Water Losses	**10^6*m^3/y.**						

(3) Prepare a summary table for design water demand/flow as given in the table below:

The design water demand is to be calculated based on the Romanian Standard SR 1343-1:2006 “Calculation of drinking water supply quantities in urban and rural sites” taking into consideration the design parameters given in Chapter 8 of this Guidance and the respective flow-coefficients defined in the Romanian Standard mentioned above.

Table: Summary of the design[1] water demand:

Water Demand	Units	Agglomeration x	Agglomeration y
Average daily flow	m^3/day		
Maximum daily flow: Qmax, day	m^3/day		
Maximum hourly flow Qmax, hour	m^3/hour		
Average yearly flow	m³/year		
Design year	Year		

More detailed tables for calculating design demand for each agglomeration are to be attached to the FS as appropriate.

4.1.4 Wastewater Flows and Loads

- Present detailed methodology for calculation in the annexes
- Present summary of results in the chapters below

4.1.4.1 Domestic Wastewater

Wastewater Flow and Load:

- Calculate current average and maximum wastewater flow for domestic customers in m³/day (m³/hour) and P.E.
- Prepare scenario for development of domestic wastewater flow until the end of the planning horizon.
- Present results of wastewater flow measurements (detailed presentation in annex) in both dry weather period and wet weather (including peak flows).
- For (partially) combined wastewater networks, indicate measures foreseen to buffer rainwater inflow (i.e. rainwater overflow basins); the measure should be supported by an option analysis, taking into account the environmental impact of subsequent discharges. As far as necessary and applicable, use dynamic sewer modelling for calculating rainwater overflow basins and indicate clearly overflow discharge quantity and frequency of overflow. Ensure that there is no overflow into the recipient water during dry weather flow
- For separate systems, propose measures to avoid „illegal/wrong" connections (rainwater into sewer) in particular for main sewers in the future. The Action Plan for the ROC should include training in techniques for detecting „illegal/wrong" connections and provide appropriate equipment.

4.1.4.2 Non-domestic Wastewater

- Provide a table with all non-domestic (commercial/industrial) customers currently discharging wastewater into the sewerage network indicating wastewater flow in m³/day
- Prepare scenario for industrial development until the end of the planning horizon
- Prepare table with projected wastewater flow for non-domestic wastewater
- Present results of wastewater flow measurements (detailed presentation in annex).

4.1.4.3 Infiltration water

[1] design horizon 2037 (maximum demand during the planning horizon; note: for decreasing demand the design year is the year after completion date)

- Describe measurements to identify current infiltration rate into the sewer network
- Present results of wastewater flow measurements (detailed presentation in annex).
  - Carry out the measurement campaign for infiltration water during the dry and wet weather periods. Carry out also peak flow measurements during storm water periods.
  - Define infiltration rates based on appropriate assessment methods (i.e. day-night fluctuations, dilution of parameters such as TSS, BOD_5, P or N, etc.).
  - The result of the measurement campaign should provide data on the current volume of infiltration water (average volume per year) and the infiltration rate, the yearly fluctuation, the location of the highest/lowest infiltration rates in the network, the main reasons for high infiltration rates.
- Develop a projection of infiltration volume and infiltration rate for scenarios (i) without project and (ii) with project, considering the length of sewer network replaced by the project measure and the reduction of water losses in the distribution network (indirect effect on infiltration).
- Infiltration rates for new or renovated sewer sections should be close to 0% during dry weather flow (after commissioning of works water tightness should be certified). However, a certain (small) percentage for infiltration water might still be reasonable in the assumption on wastewater flow.
- Provide indicators on the efficiency of the proposed rehabilitation measures (investment costs in € per quantity of infiltration water reduced => see unit cost table below). This should provide the Managing Authority with some benchmark to assess the opportunity of the beneficiary's request.

4.1.4.4 Summary Hydraulic Wastewater Flow and Load

Present the current and projected hydraulic wastewater flow (supported by measurement campaign to be annexed to the FS).

Note: setting water flow targets will be necessary to calculate design wastewater flows. As the proposed investment measures (sewer network rehabilitation) will influence the future quantity of water infiltrating into the sewer network, setting wastewater flow targets is an iterative process.

(1) Provide a summary table with projection of future wastewater flow components for all agglomerations as in the table below:

Table: Summary of future wastewater flow for the year

Category of Wastewater Flow	Units	Agglomeration x	Agglomeration y
Domestic Consumers	m^3/year		
Industry	m^3/year		
Commerce and Public Service	m^3/year		
Total Wastewater Flow (Domestic + Non-Domestic)	**m^3/year**		
Infiltration in the Sewer Network	m^3/year		
Total Wastewater Flow including infiltration water	**m^3/year**		

(2) Prepare a summary table for design wastewater flow as in the table below:

Table: Summary of the design[2] wastewater flow:

Wastewater Flow Design Parameter	Units	Agglomeration x	Agglomeration y
Average daily flow	m^3/day		
Maximum daily flow: Qmax, day	m^3/day		
Maximum hourly flow Qmax, hour	m^3/hour		
Average yearly flow	m^3/year		
Design year	Year		

More detailed tables for calculating design wastewater flow for each agglomeration are to be attached to the FS.

(3) Use the following indicators to summarise wastewater flow data (before and target after project implementation)

Table: Summary indicators – Hydraulic Wastewater Flow

Item* (indicative numbering)	Indicator	Unit	Agglomeration x[3]	
			Current situation	Target
3.2.1	Total wastewater volume collected (average wastewater flow)	m^3/d		
3.2.1.1	Wastewater volume collected from domestic customers	m^3/d		
3.2.1.2	Wastewater volume collected from industry	m^3/d		
3.2.1.3	Wastewater volume collected from commerce and public service entities	m^3/d		
3.2.1.4	Wastewater volume from infiltration into the wastewater network	m^3/d		
3.2.1.5	Percent of wastewater volume collected from domestic customers	% of 3.2.1		
3.2.1.6	Percent of wastewater volume collected from industry	% of 3.2.1		
3.2.1.7	Percent of wastewater volume collected from commerce and public service entities	% of 3.2.1		
3.2.1.8	Sewer Infiltration rate: Volume of infiltration water into the wastewater network / total wastewater volume collected	% of 3.2.1		

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table to be included in Annex 1. The item numbers in the table above are identical to the item numbers in the table in the Excel sheet version.

(4) For storm water flow from separated sewer systems, present data according to the following table and add other relevant data (before and target after project implementation):

[3] Add column for each agglomeration

Table: Summary indicators – Storm water Flow

Item* (indicative numbering)	Indicator	Unit	Agglomeration x[4]	
			Current situation	Target
3.3.1	Total volume of storm water (from separated sewer system)	m^3/d		
3.3.1.3	Percent of storm water discharging to WWTP	% of 3.3.1		
3.3.1.4	Percent of storm water discharging to receiving waters without treatment	% of 3.3.1		
3.3.2	Peak factor for storm drainage flow (Q24 max)	-		

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1. The item numbers in the table above are identical to the item numbers in the table in the Excel sheet version.

Table: Current and projected Wastewater Load

Item* (indicative numbering)	Indicator	Unit	Agglomeration x	
			Current situation	Target
3.4.1	Total Biological load (BOD5)	kg BOD/d		
3.4.1.4	Percent from domestic customers	% of 3.4.1		
3.4.1.5	Percent from industry	% of 3.4.1		
3.4.1.6	Percent from commerce and public service entities	% of 3.4.1		
3.4.2.1	BOD5 concentration	mg/l		
3.4.2.2	COD concentration	mg/l		
3.4.2.3	Suspended solids	mg/l		
3.4.2.4	Total Nitrogen concentration	mg/l		
3.4.2.5	Total Phosphorus concentration	mg/l		

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1. The item numbers in the table above are identical to the item numbers in the table in the Excel sheet version.

4.1.5 Water Cycle Balance

Prepare a water balance for the entire water cycle (water and wastewater) including:

- Water production (surface water and groundwater)
- Water distribution (consumption + losses)
  - Water consumption (domestic and non-domestic)
  - Water losses (apparent losses and real losses)
- Wastewater collection
  - Domestic
  - Non-domestic (commercial, industrial)
  - Percolation (infiltration/exfiltration from/to groundwater + infiltration from water losses in the water supply network)
- Inflow to WWTP

An example is in the below table.

[4] Add column for each agglomeration

Example of Water Balance (2007, 2013, 2037)

Note – 2013 or the year of SOP project completion

Water Balance Components	2007		2013		2037	
	[m^3/d]	%	[m^3/d]	%	[m^3/d]	%
Water Production						
- Ground water	25 693	38%	28 389	74%	17 409	70%
- Surface Water	41 140	62%	10 192	26%	7 617	30%
Sub-total Production	**66 833**	**100%**	**38 581**	**100%**	**25 025**	**100%**
Water Distribution						
Water Losses* **	53 717	80%	22 219	58%	4 900	20%
Water Supply						
- Domestic	8 480	13%	11 460	30%	14 121	56%
- Industrial	4 636	7%	4 902	13%	6 004	24%
Sub-total Water Supply	13 116	20%	16 362	42%	20 125	80%
Sub-total Distribution	**66 833**	**100%**	**38 581**	**100%**	**25 025**	**100%**
Wastewater Collection						
- Domestic	7 632	15%	10 314	41%	12 709	43%
- Commercial	1 800	4%	1 900	8%	1 900	7%
- Industrial	2 179	4%	2 304	9%	2 700	9%
- Infiltration*	38 760	77%	10 497	42%	11 911	41%
Inflow WWTP:	**50 371**	**100%**	**25 015**	**100%**	**29 220**	**100%**

* *from water losses in the water distribution network and infiltration from groundwater into the sewer network*

4.1.6 Recipient Water

Present for each agglomeration) the following information:

- General description of the recipient and its drainage area (name, location, river coarse, etc.)
- Provide a map showing up-stream and downstream (i) water users (municipal and industrial or agricultural water users) as well as (ii) discharge points of other polluters (industrial, non-treated wastewater directly discharging from sewer network, etc.)
- Current water quality data (classification of river water quality “status of river”)
- Discharge volume of recipient water (seasonal flow variation)
- Dilution of wastewater (ratio of wastewater discharge / recipient water flow

4.1.7 Impact of Wastewater Discharge on Downstream Users

Based on the results of the “Recipient Water” chapter, assess:

- Risk for downstream water quality degradation (i.e. eutrophication). In case of high risk for degradation (i.e., retention lake with reduced flow and high risk for eutrophication), assess alternative solutions for discharge points (see option analysis)
- Projected impact of wastewater measures on water quality of recipient (improvement of water quality status)

4.1.8 Level of Service

Present the current level of service for water supply applying the following indicators and draw conclusions:

Table: Level of Service Indicators for Water Supply and Wastewater

Item **(indicative numbering)**	Indicator	Unit	Agglomeration x[5]
Water Supply			
2.1	**Level of water supply service coverage**		
2.1.1	Total population in service area concerned (water supply zone)	capita	
2.1.2	Service Coverage: Percent of population connected to water supply system (2.1.3/2.1.1)	% of 2.1.1	
2.1.3	Population served (population connected to/served by a central water supply system through house/yard connections, public tap)	capita	
2.3	**Water consumption/demand***		
2.3.6	Specific domestic water consumptions	lcd	
2.3.9	Depressed consumption (insufficient quantity available)	yes/no	
2.6	**Supply security and system failures**		
2.6.2	Supply interruptions due to system failures per length of network per year	number/km/year	
2.6.5	Hours of water supply per day	Number of hours	
2.9	**Water Quality**		
2.9.2	Population supplied with drinking water quality compliance with EC Drinking Water Directive 98/83/EC and transition treaty chapter 22	number	
2.9.3	Percent of population supplied with drinking water quality compliance with EC Drinking Water Directive 98/83/EC and transition treaty chapter 22	% of 2.1.1	
Wastewater			
3.1.1	Total population in agglomeration concerned	Capita	
3.1.2	Service coverage: Percent of population connected to wastewater network	% of 3.1.1	
3.1.3	Population connected to a wastewater network	Capita	
3.1.12	Percent of population connected to a WWTP compliant with EU UWWTD 91/271/EEC Article 4 (5)	% of 3.1.1	

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1. The item numbers in the table above are identical to the item numbers in the table of the Excel sheet version.

4.1.9 Land occupation and legal status

Describe status of land availability for the proposed infrastructure (current property of land; constraints for construction and future extension, acquisition of additional land (if any), risks for implementation.

4.1.10 Summary of Geotechnical Studies

Briefly summarise geotechnical investigations including:

- Underground condition along construction areas
- Seismic zones
- Assessment of risks due to unfavourable geotechnical conditions

[5] Add column for each agglomeration

4.1.11 Other Relevant Base Data

Briefly summarise other studies and investigations including:

- Hydrological data for assessment of flood risk
- Precipitation data
- Etc.

Detailed studies are to be presented in the Annex.

4.2 Existing Water Supply Infrastructure

For each agglomeration, assess the existing water supply infrastructure and present the results as follows:

- Give an overview of water and wastewater infrastructure for each agglomeration (i.e. maps with infrastructure)
- Describe and quantify the current water supply and wastewater system components
- Conclude on the key deficiencies for each system component and provide a summary for all agglomerations
- Briefly describe and quantify operation and maintenance efficiency for all system components

4.2.1 Agglomeration x

4.2.1.1 Location of Existing Infrastructure

- Describe the location of the concerned agglomeration
- Provide an overview map (A4 or max. A3) of the water supply agglomeration indicating the existing infrastructure:
  - Detailed boundary of the agglomeration (defined in MESD's methodology)
  - Current and future settlement area (urban development plan or other investigations)
  - Administrative borders and general features (rivers, main roads, etc.)
  - Existing water intake / well fields
  - Existing pipe mains and important pumping stations
  - Existing water supply network
  - Existing treatment plants

  Additionally: wastewater discharge point(s) of municipal wastewater treatment plants or industrial polluters.

4.2.1.2 Description of Current Infrastructure

4.2.1.2.1 General

(1) Briefly describe and quantify current water supply system (from intake to consumers):

- Water Abstraction
- Pumping Stations
- Water Treatment Plants
- Water Transmission Mains

- Water Distribution Network

(2) Present an overview map (A4) showing location and key data of the current water infrastructure for the agglomeration. Additionally, indicate the location of the WWTP and other relevant elements (rivers, main roads, if possible topography, etc.).

4.2.1.2.2 Water Abstraction

(1) Briefly describe and quantify current endowment for raw water abstraction (from intake to treatment) indicating location/altitude, main parameters, current condition, for:

- Water protection zones (zone 1 and zone 2)
- Water reservoirs and dams
- Surface water intakes
- Wells and raw water pumping stations
- Others endowments

(2) Conclude on key deficiencies

4.2.1.2.3 Pumping Stations

(1) Briefly describe and quantify current endowment for pumping stations (for freshwater pumping stations) indicating location, main parameters, current physical condition and efficiency:

- Civil structures
- Electromechanical equipment (efficiency, risk for failures, etc.)
- Automation system (SCADA system)

(2) Conclude on key deficiencies

An example is given below:

- *Costs for repair of pumps increased substantially (x % during past y years) as pumps are highly depreciated*
- *Access to spare parts is not anymore assured (supply security)*
- *High costs for operation of the system due to over-dimensioning of the existing pumps and outworn pumps*
- *Civil structures are outworn and need capital renovation*
- *The existing SCADA system is old and does not provide comprehensive information to operate the system efficiently.*

4.2.1.2.4 Water Treatment Plants

(1) Briefly describe and quantify current endowment for treatment plants (for all steps of the treatment process) indicating location, main parameters, current physical condition and efficiency, for:

- Civil structures
- Electromechanical equipment (efficiency, risk for failures, etc.)
- Automation system (SCADA system)

Describe efficiency of current treatment system by presenting input water quality and output water quality for critical parameters.

Describe the current sludge discharge (backwash water from Drinking Water Treatment Plant).

(2) Conclude on key deficiencies

4.2.1.2.5 Water Transmission Mains

(1) Briefly describe and quantify current endowment for transmission mains indicating location, main parameters (length, diameter, material), current physical condition, for:

- Conduit
- Civil structures (bridge crossings, etc.)
- Armatures (gate valves, etc.)

Quantify as much as possible the water losses in the transmission main and the development of pipe failures during the past i.e. five years (supply security).

(2) Conclude on key deficiencies

4.2.1.2.6 Water Distribution Network and Reservoirs

(1) Briefly describe and quantify current endowment for the distribution system indicating location, main parameters (length, diameter, material), current physical condition, for the following elements:

- Pipe network and armatures (see example below)
- Reservoirs
- House connections and metering

Example Table: Material and length of pipes in the Water Supply Network

Material	**Diameter [mm]**		**Length**	**Length**
	from	to	[km]	[%]
Asbestos Cement	60	150	72.0	48%
	200	300	36.0	24%
	400	546	12.0	8%
Sub-total AC			**120.0**	**80%**
Steel	60	277	3.2	2%
	325	426	6.7	4%
	530	720	9.1	6%
Sub-total Steel			**19.0**	**13%**
Cast Iron	**125**		**2.0**	**1%**
Polyethylene (PE)	110	200	4.7	3%
	225	250	4.3	3%
Sub-total PE			**9.0**	**6%**
TOTAL Length			**150.0**	**100%**

Describe efficiency of the current distribution system by assessing the main reasons for the water losses quantified in Chapter 2.2.4 above. Describe the data used and measurements done to estimate the water losses. Critically comment on the quality of data (data provided by operator, consultants' estimate, consultants' own measurements, etc.).

Prioritise necessity for network renovation for different network zones and/or pipe materials (based on information provided by the operator, water loss data and data on pipe failures). For this reason, try to allocate water losses to zones and/or pipe materials (see table below).

Example Table: Distribution of water losses in network

Material of Pipes	L	Before rehabilitation		
	[km]	[m³/year]	%	[m³/km*year]
"New" PE pipes				
AC old	**120**	**14 536 606**	**95%**	**121 138**
- High zone	65	10 075 000	66%	155 000
- Middle zone	55	4 956 282	32%	90 114
Other material	**30**	**270 408**	**2%**	**9 014**
- High zone	2	30 000	0.2%	15 000
- Middle zone	28	240 408	2%	8 586
Total	**150**	**15 301 690**	**100%**	**102 011**

(2) Conclude on key deficiencies

Example:

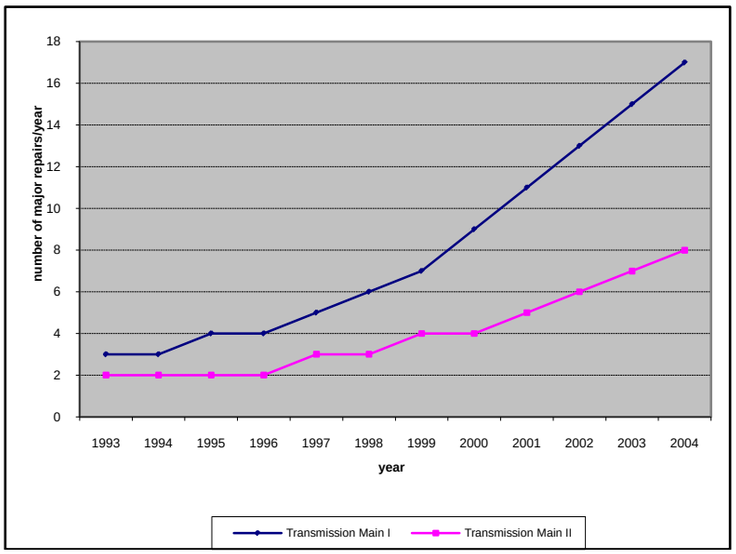
- *Outworn rubber gaskets of AC pipes causing frequent pipe breaks and high water losses.*
- *Low network pressure due to insufficient pipe diameters*
- *Galvanized steel pipes with small diameters (3/4" to 11/2") are heavily corroded and cause frequent failures and deteriorating water quality.*

4.2.1.3 Operation and Maintenance

(1) Briefly describe and quantify operation and maintenance efficiency for all of the above mentioned components of the water supply system as follows:

- Water quality monitoring and preventions for accidental pollution
- Monitoring and maintenance of protection zones
- Operation & Maintenance costs (energy, chemicals, staff, material) for all components
- Pipe failures (development during past i.e. 5 years) and supply security
- Water loss reduction practices and operating efficiency

Example Figure: Development of pipe breaks in the Transmission main I+II (1993-2004)



Example Table: Energy Consumption and Energy Efficiency in year x

Pumping Station	Production	Energy consumption	Energy Costs	Energy Coefficient	
	[m³*1000/year]	kWh*1000/year	€*1000/year	kWh/m³	€/m³
1 n					
TOTAL					

(2) Conclude on key deficiencies with regard to Operation & Maintenance

4.2.1.4 Main Deficiencies in Water Supply System

Summarise conclusions of Chapter given above (Description of existing infrastructure and Operation and Maintenance) in the following tables:

Table: Summary of main deficiencies in water supply system

Item	Components	Main deficiency*
1	Water abstraction	-
2	Pumping stations	-
3	Water treatment	-
4	Transmission main	-
5	Distribution network	-

**Describe the deficiencies as specifically as possible and quantify as far as possible.*

Summarise compliance with DWD 98/83/EC and other relevant directives.

4.2.2 Agglomeration y, z and so on…

4.3 Existing Wastewater Infrastructure

Assess for each agglomeration the existing wastewater infrastructure and present the results as described in Chapter 5.2. above.

4.3.1 Agglomeration x

4.3.1.1 Location of Current and Proposed Infrastructure

- Describe the location of the concerned agglomeration
- Provide an overview map (A4 or max. A3) of the agglomeration showing the existing and proposed infrastructure. The map should clearly show:
  - Detailed boundaries of the agglomerations (defined as per MESD's methodology)
  - Current and future settlement areas (from urban development plan or other investigations)
  - Administrative borders and general features (rivers, main roads, etc.)
  - Existing and proposed mains collectors and important pumping stations
  - Existing and proposed wastewater network
  - Existing and proposed wastewater treatment plants

  Additionally: location of water intake or well-field

4.3.1.2 Description of Current Infrastructure

4.3.1.2.1 Wastewater Network

- Describe wastewater main collectors, secondary wastewater network, and storm water network including rainwater overflow structures (length, capacities, location, combined system/separate system, etc.)
- Provide detailed table with current sewerage network lengths, materials, and diameters

Table: Material used in wastewater network (current situation)

N°	Diameter	Length of Network			
		Concrete	Asbestos Cement	PVC/PE/PP	Total Length

- Assess physical condition of infrastructure (as far as possible apply CCTV inspection to identify critical sections)
- Summarize wastewater network system parameters using the following indicators table:

Table: Current wastewater network system parameter

Item* (indicative numbering)	Indicator	Unit
3.6.1	Total length of wastewater network (incl. stormwater & main collectors)	km
3.6.1.1	Percent of length of combined system	% of 3.6.1
3.6.1.2	Percent of length of separated system	% of 3.6.1
3.6.1.3	Percent of length of partially combined/separated system	% of 3.6.1
3.6.2	Length of main collectors	km

3.6.2.2	Percent of main collectors rehabilitated (related to existing main collectors)	% of 3.6.2
3.6.3	Number of wastewater pumping stations	number
3.6.4	Capacity wastewater pumping stations	1000 m^3/d
3.6.5	Length of wastewater network (without storm water and main collectors)	km
3.6.5.1	Length wastewater network rehabilitated	km
3.6.5.2	Percent of wastewater network rehabilitated (related to existing network)	% of 3.6.6
3.6.7	Population served per length of wastewater network	capita/km
3.6.9	Capacity of storm water retention basins	1000*m³

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1 (the selected indicators are highlighted in there). The item numbers in the table above are identical to the item numbers in the table in the Excel sheet version.

4.3.1.2.2 Wastewater Pumping Stations

Describe existing pumping stations:

- Table showing electro-mechanical equipment (capacity of pumps; Q, H,P)
- Assess current physical condition of electro-mechanical equipment of pumping stations (indicators for energy efficiency – kWh/m³)
- Assess physical condition of civil structures of pumping stations

Table: Assessment of existing pumping stations in Agglomeration xx

N°	Name of Pumping station	Number of pumps	Q[6]	Hp	P	Energy efficiency	Year of installation	Rating of physical condition of E&M equipment	Rating of physical condition of Civil Structures
			m³/h	M	kW	kWh/m³	year		

4.3.1.2.3 Wastewater Treatment Plants

Describe main components of existing wastewater treatment plant(s):

- Inlet pumping station
- Pre-treatment
- Primary sedimentation
- Biological Treatment
- Secondary clarifier
- Sludge treatment
- Other components (discharger, etc,)

Table: Assessment of physical condition of electro-mechanical equipment and civil structures in Agglomeration xx

N°	Component	Description [7]	Year of installation	Rating of physical condition of E&M-equipment	Rating of physical condition of Civil Structures	Need for renovation [8]

[6] Sum of nominal capacity of pumps in the pumping station (more details might be provided in the annex)
[7] Main deficiency of component (i.e. insufficient capacity, outworn, etc.)
[8] Short comment on extend of renovation (i.e. full renovation, partly - %, no renovation necessary)

Evaluate treatment performance using the following table:

Table: Assessment of current treatment efficiency in Agglomeration xx

N°	Parameter	Unit	Influent WWTP	Effluent WWTP	Treatment Performance

Summarise performance of WWTP with the following indicators (before and after project implementation):

Table: Performance Indicators for Wastewater Treatment

Item*	**Indicator**	**Unit**	**Current situation**	**Target**
3.2.1	Total wastewater volume collected (average wastewater flow)	m3/d		
3.7.2	Hydraulic design capacity of WWTPs	m^3/d		
3.7.3	Biological design capacity	kg BOD/d		
3.7.5	Percent of biologic design capacity used (3.4.1 / 3.7.3)	%		
3.7.7	Capacity of WWTPs in Population equivalent	p.e.		
3.7.8	Total volume of wastewater treated in WWTPs (yearly average at the outlet of WWTP)	m^3/d		
3.7.8.10	*Volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC*	*m3/d*		
3.7.8.11	*Percent of volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5)*	*% of 3.2.1*		
3.7.8.12	*Total BOD treated / removed*	*kg BOD/d*		
3.7.8.13	*Total COD treated / removed*	*kg COD/d*		
3.7.8.14	*Total N treated / removed*	*kg N/d*		
3.7.8.15	*Total P treated / removed*	*kg P/d*		

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1.

4.3.1.3 Operation and Maintenance

(1) Briefly describe and quantify operation and maintenance efficiency for all of the above mentioned components of the wastewater system as follows:

- Wastewater effluent quality monitoring
- Monitoring of industrial wastewater polluters (reason and frequency of operating problems in the WWTP due to infringement of legal requirements regarding industrial discharge)
- Describe current procedures with regard to maintenance of equipment, civil structures and network and main consequences on the existing infrastructure (degradation of infrastructure due to inadequate maintenance)
- Network failures such as sewer overflows, sewer clogging (development during past i.e. 5 years, reasons for failures i.e. incorrect design, construction, damages or insufficient operation)
- Current treatment performance (reasons for inefficient performance i.e. insufficient operation of air-blowers, etc.)
- Current procedures in place to improve operating efficiency (i.e. measurement campaigns for sewer infiltration or treatment process optimisation

(2) Assess current operation & maintenance costs (energy, chemicals, staff, material) for all components (see table below):

Table: Current Operation & Maintenance Costs Wastewater

Cost Item	Amount [€/year]	% of Total
Energy costs		
Chemicals costs		
Staff costs		
Material costs		
Others [9] costs		
TOTAL		**100%**

(3) Conclude on key deficiencies with regard to Operation & Maintenance

- Briefly summarise the key deficiencies identified
- Summarise current operation performance using the following indicator table for efficiency of sewer system

Table: Efficiency of sewerage system

Item* (indicative numbering)	Indicator	Unit
3.9.1	Number of sewer blockages per year	number/year
3.9.2	Number of sewer blockages per km of sewer network per year (3.9.1 / 3.6.1)	number/km/a
3.9.3	Number of days with flooding caused by sewerage system	number
3.9.4	Number of days with flooding caused by sewerage system per km per year (3.9.3 / 3.6.1)	days/km/a
3.9.5	Average electricity consumption per year	kWh/a
3.9.6	Average electricity consumption per volume of wastewater treated (3.9.5./3.7.8)	kWh/m³

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1. The item numbers in the table above are identical to the item numbers in the table in the Excel sheet version.

- Make sure that the proposed action plan for the ROC includes measures (sufficient training) to improve operation & maintenance of the assets
- Additionally, consider in the procurement strategy outsourcing of operational tasks (including intensive training) as an option (i.e. Design-Built-Operate - DBO contract)

4.3.1.4 Main Deficiencies in Wastewater System

(1)Summarise conclusions in Chapter 2.3.6 and Chapter 2.3.7 as follows:

Table: Main Deficiencies in Wastewater System

Item	Components	Main Deficiencies*
1	Wastewater network	-
2	Wastewater Pumping stations	-
3	Wastewater treatment Plant	-
5	Distribution network	-

[9] ie. costs External Services (excavation, construction, etc.)

**Describe the deficiencies as specific as possible and quantify as far as possible.*

(2) Summarise compliance of current situation with UWWT Directive 91/271 EEC and other relevant environmental directives (i.e. Water Framework Directive).

Note: most of the investments on networks are justified by the obsolescence of the current assets. To avoid similar situations in the future, propose (action plan for ROC) a streamlined maintenance and replacement strategy with dedicated financial resources.

4.3.2 Agglomeration y, z and so on

Prepare sub-chapters as defined in Chapter 45.3.1. above.

5. INDUSTRIAL WASTEWATER DISCHARGE

***Key note*: The below requirements are prepared having in view that a Industrial Wastewater Report and Action Plan is a specific output according to the TA contract. We recommend that a separate document should be prepared for this purpose and then include the summary of the Industrial Wastewater Report in the chapter 5 of the FS.**

Scope of work as defined in the ToRs:

- Investigate quantity and type, extent of pre-treatment, institutional and legal framework (e.g. what kind of arrangements exists between industries and the city/water company concerning discharge and treatment of industrial wastewater).
- Assess existing wastewater treatment facilities, including sludge handling and disposal: type of process, capacity, flow, technological appropriateness, treatment effectiveness, condition, maintenance practices, suitability, bottlenecks, and quality of materials and equipment.
- Quality standards: analyse compliance with applicable effluent standards and applicable regulations
- Sustainability: what investigations and investments are recommended to ensure the sustainability of the measure in reducing operational costs?
- The Consultant's review of industrial loads and characteristics should include a review of current mechanisms for licensing and enforcing discharge to the sewer network, with a view to managing the risk that future pollution incident damages the new plant, or substances harmful or toxic to the process might be discharged. Consider compliance with the Integrated Pollution and Prevention Control (IPPC) Directive (96/61/EC) covering pollution from large industrial installations.
- Prepare a report on industrial wastewater discharge and draft an action plan. Acceptable templates for the **report** and the **action plan** are available at MESD.

Note: the industrial wastewater report is a specific output according to the TA contract

The following structure of the report is recommended:

ABSTRACT

5.1 Introduction

5.2 Objectives

Prepare a report on industrial wastewater discharge and draft an action plan with the following objectives:

- Adequately pre-treat industrial wastewaters in compliance with EC Directives and Romanian legislation and/or recycled as appropriate;
- Pre-treatment to be monitored and enforced by competent environmental authorities;
- Industrial effluent loads not to hamper the designed technology of the WWTPs;
- Introduce appropriate wastewater charges for industries, based on quantity and quality of effluent produced and on cost of treatment.

5.3 Legal regulation on Industrial Wastewater

- EU Directives and Romanian laws
- Prevention and control of accidental pollution
- Polluters pays principle
- Restrictions Concerning Wastewater Discharge into Municipal Sewerage Systems

5.4 Approach and Methodology

Briefly describe the approach and methodology to carry out the study:

- Inventory of industrial activities (data base with specific data on production and pollution)
- Current performance of ROCs
- Impact of industrial discharge

5.5 Investigations of Wastewater Discharges

5.5.1 Inventory of Industries

Table: Existing industrial companies in agglomeration x discharging wastewater into the municipal sewer network

Item	Economic unit/industry	Field of activity

5.5.2 Wastewater Volume and Load

Table: Pollution Load and wastewater characteristic for selected industries

Item	Parameter	Value industry x	Value industry y etc	Value industry z etc

5.5.3 Industrial Wastewater Pre-treatment Plants

Prepare list of industries currently endowed with a pre-treatment plant (see table below):

Table: Pre-treatment facilities of the industrial agents

Item	Economic unit/industry	Status	Technical information	Efficiency
1	1 S.C. ROFEP S.A.	functional	mechanical treatment clarifying tanks	Satisfactory
2	S.C. PRIMA COMPANZ S.R.L.	-	Clarifying tanks	Unsatisfactory

5.6 Current Performance of Service Operators with regard to Control of Industrial Wastewater Discharge

- Describe performance of service operators with regard to monitoring industrial polluters (monitoring programme in place)
- Monitoring frequency and quality analysis facilities (laboratory, etc.)
- Contracting and billing of industrial agents
- indicate what has been done to identify industrial discharges: agreement signed to buffer the quantity and quality of discharges, monitoring under the control of the ROC of subsequent data, paying particular attention to heavy metals

5.7 Impact of Industrial Wastewater Discharges on WWTP Influent and Downstream Users

- Impact of industrial pollution on sewer network and WWTP (impact of missing pre-treatment)
- Impact on downstream users (agricultural users, water intake for DWTP, etc.)
- Impact of industries not yet connected to the sewer system

5.8 Proposal for Managing and Monitoring Wastewater discharges

Describe briefly roles of:

- ROC to monitor industrial discharge
- EPA as controlling body
- SGA (“Apele Romane”) as controlling body for WWTP effluents discharge
- EG as responsible body for controlling and inspection, subordinated to the National Authority for Control.

5.9 Action Plan to Control Industrial Wastewater Discharges

Elaborate an action plan to reduce/control wastewater discharges, with short and medium term actions and responsibilities. The Short-term Action Plan defines the Goals and Activities to be undertaken, addresses the responsibilities, and sets out the deadlines for its execution during this period.

- Data base elaboration
- Defining the polluting substances and potential
- Initiating the monitoring programme
- Elaborating and implementing a plan for unforeseen (accident) situations

In conclusion, the Short-term Action Plan will focus on creating an effective data collection system and implementing appropriate monitoring programmes. The complexity of the measures needs strong cooperation among all involved authorities.

5.10 Conclusions and Recommendations

Conclusions and recommendations with particular focus on:

- Potential impact on downstream users
- Potential impact on WWTPs
- Pre-treatment facilities (existing and required)
- Polluters pay principles

Use the following table to summarise the data for industrial pollution for all [10]agglomerations (current and future[11]):

Table: Performance Indicators Industrial Pollution

Item* (indicative numbering)	Indicator	Unit	Current	Future
3.5.1	Total number of industrial units in agglomeration	Number		
3.5.2	Percent of industrial units NOT connected to the wastewater system	% of 3.5.1		
3.5.3.1	Number of connected industrial units with pre-treatment facilities	Number		
3.5.3.2	Percent of connected industrial units with pre-treatment (compliant with EC/RO regulations)	% of 3.5.3		
3.5.4.1	Percent of industrial pollution load reduced by pre-treatment (3.5.4./3.4.1.2)	% of 3.4.1.2		
3.5.5	Number of industrial units discharging dangerous substances into the aquatic environment	number		

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1. The item numbers in the table above are identical to the item numbers in the table in the Excel sheet version.

6. SLUDGE MANAGEMENT

***Key note*: The below requirements are prepared having in view that a Sludge Management Strategy is a specific output according to the TA contract. We recommend that a separate document should be prepared for this purpose and then include the summary of the Sludge Management Strategy in the chapter 6 of the FS.**

Scope of work as defined in the ToR:

- Prepare a specific study on the sludge disposal strategy. This study needs particular emphasis and development in conjunction with the Environmental Impact Assessment study.
- There are significant costs associated with this aspect. National guidelines for sludge use in agriculture are not yet developed; therefore, adapt European practice to local use.
- Prepare an environmentally sound and sustainable sludge disposal strategy in line with applicable EU directives and in co-ordination with other solid waste projects developed in the area.

[10] Detailed tables for each agglomerations are to be presented in the annex of the FS

[11] Indicate year and assumptions for projected future development of industrial pollution

NOTES:

- Appropriate Sludge management is an important element of the FS and should not be considered as a "side problem" of wastewater treatment.
- Clear and specific sludge disposal options for each county are important
- Discuss the options with local authorities – urge for decision before the application is submitted; decision must be clearly reflected in the application along with the reasons for the decision (option analysis) and steps/actions to be undertaken during the project implementation (before the WWTP is commissioned); please review the EC letter and the MESD instruction in this regard
- Agricultural reuse of sludge should be the preferred solution (sufficient storage capacity has to be foreseen).

ABSTRACT

6.1 Introduction

6.2 Objectives

6.3 Legislative Framework

- Legislative transition process (Romanian Laws)
- EU Directive 86/278 EEC and Romanian Minister's Decree 344/2004
- Parameters subject to the provisions of the Directive
- Revision of EU Directive 86/278 EEC and future aspects (recent research development with regard to dangerous substances in the sludge and measures for prevention)

6.4 Approach and Methodology

- Existing sludge management
- Approach and methodology
  - economic, technical, and ecological parameters
  - specific criteria (practicability, flexibility, environmental acceptability, safety and viability, cost efficiency)

6.5 Current Sludge Disposal

- Describe current sludge disposal and quantify as far as possible
- Current problems regarding sludge disposal (environment, etc.)

6.6 Sludge Volume and Sludge Quality

- Prepare a table with current and projected sludge volume (yearly development) based on generated load for each agglomeration and DS content
- Assess current sludge quality for each WWTP (sludge quality analysis at WWTP as far as possible a series of at least three analyses)
- Assess source of pollution (type of industry discharging particular hazardous substances to the sewer network)
- Comment on development of sludge quality (development of sludge quality if measures proposed in the action plan will be implemented – i.e. disconnection of/pre-treatment for critical industries). Assess the risk

for degradation (or non improvement) of sludge quality (i.e. socio-economic consequences if polluter pays principle will be applied for some important industries). For planned WWTPs, assess the potential risk of sludge quality degradation and prepare reasonable assumptions for projection (i.e., classify according to degree of industrialization and if possible type of industries).

6.7 Available Capacities for Sludge Disposal

Assess current and future capacities for:

- Municipal landfills:
  - Assess the current and future capacity of landfills taking into consideration the projects for regional landfills currently under preparation (CF-Applications). In particular, pay attention to the requirements of the landfill directive (max. admissible volume of biological waste per year) which will limit the capacity for sludge disposal in the future.
- Re-use in agriculture:
  - Assess current and potential application of sludge on agricultural land depending on surface area of agricultural land suitable for sludge reuse (criteria: types of crops, type of soil, inclination of fields, soil texture, etc.). Data for these parameters are available at the national soil research institute ICPA and its local branches (OSPA);
  - Assess current willingness of farmers to use sludge (of quality compliant with standards) and make assumption for future development of willingness; include in the TA-measures a campaign to improve the willingness of farmers to apply sludge;
  - Assess current (and foreseen) agreements between ROC and farmers (farmers associations) or landfill operators to receive sludge;
  - Based on maximum potential sludge use and assumptions on willingness of farmers, prepare a sound projection for demand of sludge in the future;
- Thermal reduction (incineration/co-incineration):
  - Consider co-incineration (i.e., cement industry) as a potential short-term alternative; a long-term development of sludge incinerators might cover the deficit between total projected sludge volume and projected use for landfills and agriculture.
- Re-use in reforestation (surface of forest suitable for sludge re-use)
- Composting
- Other types of reuse (i.e., use of sludge for land re-cultivation or specific products)

6.8 Strategic Sludge Disposal Alternatives

- Assess sludge disposal alternatives above and compare current and future capacities for sludge disposal with the sludge volume and quality produced (current and future development);
- Describe legal constraints for each option and assess environmental and health impact (advantage, disadvantage);
- Options such as recycling and agricultural re-use are encouraged by EC Directive 86/278/EEC (Law no. 426/2001 for approval OUG. no. 78/2000 regarding sludge disposal), but others will need to be studied. The disposal costs define and limit the treatment options that might be developed;
- Foresee sufficient storage capacity (in case of agricultural use for 6 months storage period). Indicate the estimated dewatering performance;
- Make sure that there is no odour nuisance due to sludge disposal (sufficient distance to settlements);

- Compare option analysis considering the following methodology:
  - Compare NPV for different options retained (i.e. landfill and agricultural reuse)
  - Select the most cost effective solution (least cost option)
  - Prepare action plan to assure viability of selected measure (i.e. if agricultural reuse is the most cost effective solution, measures such as (i) disconnect/pre-treat industrial polluters (ii) campaign to increase willingness of farmers to receive sludge, etc.)
  - Full justification is necessary if another option (not the least-cost option) is selected (i.e. socio-economic and political constraints are too high to implement stringent measures – i.e. disconnect).

6.9 Sludge Disposal Costs

Assess current and future costs (yearly development of costs for each agglomeration) for sludge dumping and sludge transport for the selected sludge disposal alternatives and relevant combinations of it (sludge scenarios).

6.10 Proposed Sludge Disposal Strategy

Evaluate sludge disposal alternatives based on the following criteria (or similar ones):

- Practicability
- Environmental impact acceptable
- Clear regulations and control mechanisms implemented?
- Acceptable from potential users
- Costs
- Tendency in other European countries

Make sure that, before tendering of works, a final decision on the selected sludge disposal alternatives is taken as the investment costs (storage capacity will be needed in case of landfill solution only) and operation & maintenance costs will strongly depend on the selected alternative (agricultural reuse in many cases will have lower operation costs for the ROC compared to landfill alternative (high transport costs and disposal costs).

6.11 Conclusions and Recommendations

Conclusions and recommendations based on the results of the Chapters above. The summary should briefly present the proposed sludge management concept and should focus on:

- Sludge disposal alternatives
- Quantities and ratios for each of the proposed alternatives
- Costs for sludge disposal

Summarise the result of the sludge disposal strategy (present details for each agglomeration in the annex) based on the following indicators[12] (current and projection of future development[13]):

Table: Performance Indicators Sludge Management

[12] And/or graphs based on these data

[13] Iterative estimation of situation after project implementation based on estimated wastewater flow and design of WWTP

Item * (indicative numbering)	Indicator	Unit	Current	Future
3.8.2	Sludge volume	tons/a		
3.8.3.1	*Dry solids content*	*%*		
3.8.3.2	*Total number of parameters NOT-compliant with RO/EC regulations*	*number*		
3.8.4	Sludge disposal and reuse			
3.8.4.1	Sludge reuse in Agriculture	tons/a		
3.8.4.2	Sludge reuse in Reforestation	tons/a		
3.8.4.3	Sludge composting	tons/a		
3.8.4.4	Sludge disposal at sanitary landfill	tons/a		
3.8.4.5	Sludge Incineration	tons/a		
3.8.4.6	Others *(please specify)*	tons/a		
3.8.4.7	Sludge reuse in Agriculture	% of 3.8.2		
3.8.4.8	Sludge reuse in Reforestation	% of 3.8.2		
3.8.4.9	Sludge composting	% of 3.8.2		
3.8.4.10	Sludge disposal at sanitary landfill	% of 3.8.2		
3.8.4.11	Sludge Incineration	% of 3.8.2		
3.8.4.12	Others *(please specify)*	% of 3.8.2		
3.8.6	Sludge storage capacity in months (i.p. for agricultural reuse)	months		
3.8.7	Total volume of sludge end-disposed in compliance with EU directives	m^3/day		

7. DESIGN PARAMETERS

Prepare the design parameters for preparing the FS for the following sub-sections:

Note: Justify any deviation from the assumptions and standards above, by providing sufficient data and agreeing with MESD prior to developing further steps of the FS.

7.1 Population growth

Data base: National statistic institute, projection of the population of Romania on averages until 2025 issued in 2005; county official statistics.

7.2 Water Supply

Prepare basic design parameters for the planning horizon of the MP, taking into account the transition periods agreed for compliance with the relevant EU Directives and the population size of the concerned localities.

7.2.1 Domestic Water Demand

Base for flow calculation is the revised Romanian standard STAS 1343-1/2006.

- Specific water consumption,
  - House Connection: 110 litres/capita/day
  - Yard connection: 80 litres/capita/day
  - Public tap supplies: 50 litres/capita/day
- Variation coefficients to be applied based on STAS 1343-1/2006
  - Daily variation coefficient (average value) – Kday = 1.25
  - Daily variation coefficient (average value) – Khour = 1.40

Assumption:

- Current specific consumptions of domestic water will be reduced / increased to the levels above after introducing water metering and cost covering tariffs
- Consumption elasticity rate to be considered

7.2.2 Non-domestic Water Demand

Determine specific flow and variation coefficient based on specific data on type of industry/commercial/institutional entity:

- Specific flow – according to the specific type of industry;
- Daily variation coefficient – according to the working days per week;
- Hourly variation coefficient – according to the working hours per day.

Assumption:

- Reduce demand for small scale livestock and garden irrigation to a minimum (replaced by local water sources if available) after introducing water metering and cost covering tariffs.

Present in a table the proposed values for the target years with sound justifications. Pay particular attention to the robustness of the assumptions for water demand (current and future levels, both domestic and non-domestic).

7.2.3 Hydro-geological Data:

When there are available geological surveys, use them to determine the main parameters of the ground water intakes. If surveys are not available, collect data related to existing wells in the area or carry out measurements and investigations.

7.2.4 Water Quality and Treatment:

The quality of drinking water for human consumption is defined by the Drinking Water Law 458/2002, amended by Law no. 34/2005. Collect sufficient water quality data to conclude on current compliance with the EC DWD 98/83/EC and the respective Romanian laws. If there are no sufficient data, carry out a quality analysis campaign. In particular, compliance with the parameters in the accession treaty should be ensured.

Present in the annex the design parameters for each treatment step (pre-oxidation, coagulation and flocculation, sedimentation, filtration, post-oxidation adsorption, and final disinfection). When designing a Treatment Plant, consider:

- Precautions for sludge from Treatment Process (environmental impact)
- For the sustainability of the plant, ensure that the ROC has enough capacity and know-how for operating the plants (avoid complex treatment plants for small agglomerations, ensure that the ROC is sufficiently supported in the first years of operation of the system (i.e. DBO contracts, sufficient technical assistance, contractor's training).

7.2.5 Transmission Mains:

Present the design criteria used for dimensioning the transmission main:

- Optimise the pipe diameter with regard to investment and operation costs.
- Design flow is the maximum daily flow.

Recommended pipe material (to be agreed with the operator):

- For smaller diameters (i.e. up to DN 500 mm), select HDPE or protected steel pipes as preferred materials
- For larger diameters (above DN 500 mm), select GRP or Ductile Iron as preferred materials

7.2.6 Pumping stations and reservoirs:

Present the key design criteria used for dimensioning the pumping stations:

- Foresee enough standby capacity
- Automatic steering of pumps in the SCADA system should allow for continuous monitoring of water quantity data and energy data
- Give high priority to reducing energy (high efficiency pumps, pressure losses, etc.) and maintenance costs when selecting the design parameter. Select high efficiency pumps
- Consider frequency converters for pump operation in cases of flow and/or pressure fluctuations
- Provide enough reservoir capacity to ensure supply security (depending on risk of accidental pollution of water).

7.2.7 Distribution Network:

Present the key design criteria used for dimensioning the network:

- Maximum velocity
- Design flow is the maximum hourly flow
- Agree with operator on preferred material for smaller diameters (HDPE) and for larger diameters (protected steel or Ductile Iron or GRP).

7.3 Wastewater

7.3.1 Wastewater collection system

Present the key design criteria used to dimension the sewer network:

- The design flow of the sewerage network is $Q_{u,h,max}$, the maximum hourly flow
- Interconnections between the rain-water and sewer networks
- New sewer networks should be designed as separate system
- If the network is too long, with intermediary pumping stations, provide information on the risk of H_2S creation and the possible subsequent corrective measures taken (oxygen injection), in particular, when the material of the pipe is vulnerable to such risk
- The preferred pipe material smaller diameter (below 600 mm) is HDPE/PP and GRP or concrete for large diameters
- The minimum diameter for sewers in a separate system is 250 mm
- Admissible velocities in the sewers: 0.7 ÷ 3 m/s; if the minimum admissible value of 0.7 m/s (self-cleaning rate) cannot be reached due to the low flows in some sectors, manholes should be cleaned in the respective sectors of the sewer
- Inspection manholes should be built every 60 m according to Romanian standards
- Admissible minimum invert slopes: 0.5%

7.3.2 Wastewater Treatment

The treated wastewater should comply with the Romanian standard NTPA 001 – 011, which transposes the Urban Wastewater Treatment Directive 91/271/EEC.

Table: Treated wastewater quality according to NTPA 001-011.

Parameter	Concentration	Minimum percentage of reduction (%)
Biochemical oxygen demand (BOD_5 at 20^oC), without nitrification	25 mg O_2/dm^3	70 – 90 40 in special condition
Chemical oxygen demand (COD)	125 mg O_2/dm^3	75
Total suspended solids	35 mg/dm^3 (more than 10,000 p.e.) 60 (2,000 – 10,000 p.e.)	90 (more than 10,000 p.e.) 70 (2,000 – 10,000 p.e.)
Total Phosphorus	2 mg /dm^3 (10,000 – 100,000 p.e.) 1 mg /dm^3 (more than 100,000 p.e., or sensitive area)	80
Total Nitrogen	15 mg/dm^3 (10,000 – 100,000p.e.) 10 (more than 100,000 p.e., or sensitive area)	70 - 80

The treatment complies with the Romanian standards for WWTPs (NP 032-1999), biological treatment (NP 088-03), advanced treatment (NP 107-04), and sludge treatment. Describe the type of WWTP (treatment technology) depending on the biological and hydraulic loads.

7.3.3 Sludge digestion and disposal

- Present design criteria for sludge digestion and disposal.

8. OPTION ANALYSIS

The option analysis in the feasibility study should be based on the general strategic options prepared in the MP. The option analysis compares alternative solutions to ensure that the most cost-effective solution is chosen.

- Start by reviewing the strategic options at the County level prepared in the MP. Option analysis is closely related to the definition of agglomerations. Review the borders for the priority agglomerations and define them in more detail based on the option analysis at the feasibility stage.
- Develop general options (different technological options) applicable for all agglomerations;
- Finally, for each agglomeration, prepare an option analysis by (1) screening the options and (2) conducting a detailed evaluation of the retained options;
- Justify the selected option with a detailed financial and economic assessment.

Note:

- *Diferentiate between options required at MP level (county strategic related) and options required at FS level (compare relevant technical options, compare investment and operational costs etc.)*
- *Ensure consistency with options presented in the CBA document.*

Abstract

8.1 Water Supply Options

8.1.1 Strategic Options and definition of agglomeration borders

Summarise the strategic options presented in the MP:

- Use the abstracts of each chapter focusing on aggregated tables for the options analysed at the MP level;

- Revise the strategic options for the selected priority agglomerations based on new information available;
- Define in more detail the borders of agglomerations based on a more detailed assessment (define in detail which parts of the settlement areas are to be connected to the water supply network);
- Present on an overview map the strategic options (i.e. centralized versus decentralized option)
- Present map with revised/confirmed borders of agglomerations taking into consideration the results of the option analysis for each agglomeration (i.e. centralized versus decentralized option).

8.1.2 General Options

Briefly assess general options valid for all agglomerations (if any) such as:

- Technological process for water treatment
- Comparison of different materials , if considered relevant

8.1.3 Options Agglomeration x

(1) Identified Options

- General Supply Options (based on general assessment at MP stage)

  Example:
  - *Option 1: Ground water source*
  - *Option 2: Surface Water source*
  - *Option 3: River bed filtration and groundwater recharge (mix between ground water and surface water)*
  - *Option 4: Transport of water from agglomeration xxx*
- Specific Technical Options

  For specific system components (water abstraction, water treatment, water distribution) identify relevant technical options:

  Example:
  - *Horizontal well versus well field with vertical wells*
  - *Depth of wells (hydro geological layer)*
  - *Floating intake versus fix intake for surface water abstraction*
  - *Location of water abstraction*
  - *Submersible pumps versus horizontal pumps*
  - *Rehabilitation versus construction of new abstraction facilities*
  - *Etc.*

(2) Description of options

Briefly describe each of the identified options and present the following information:

- Summary of base data (i.e. water quality, hydro-geology)
- Refer to unit cost data in the annex (unit investment, unit operation & maintenance costs)
- Cost estimation (investment and operation costs)
- Main characteristic of option

(3) Screening of options

- Screening of options (first step for elimination of non-feasible option)
- Compare advantages and disadvantages of options (as in the example table below)

Example of Option Screening

Existing assets	***Description of key deficiencies***	***Identification of options***	***First screening***	***Justifications for selection***
WTP for surface water (Standard Process: coagulation/ flocculation, sedimentation, filtration, disinfection)	- Water quality does not meet EU directive - WTP built in 1960 - Old electromechanical installations All structures need significant improvement - Capacity of WTP is above water demand - Poor automation and control - Poor chemical handling: (storage, preparation, dosage, etc.) - Poor safety standard by handling of chemicals - sludge treatment is not performed	1)- Use other water source (ground water, lakes, other river, etc.)	rejected	- Advantages: xxxxxxxx - Disadvantages: xxxxx - Justification for selection
		2)- Connect to other water producer	rejected	- Advantages: xxxxxxxx - Disadvantages: xxxxx - Justification for selection: xxxx
		3)- Rehabilitate existing WTP	retained	- Advantages: xxxxxxxx - Disadvantages: xxxxx - Justification for selection
		4)- Construct new WTP	retained	- Advantages: xxxxxxxx - Disadvantages: xxxxx - Justification for selection: xxxx

(4) Detailed evaluation of options

For the retained options, prepare a more detailed assessment with regard to:

- technical advantages and disadvantages
- investment cost breakdown (detailed cost calculations to be presented in the annex)
- operation cost calculation (detailed cost calculations to be presented in the annex)

Present maps and sketches to support understanding of the options.

(5) Financial and economic evaluation

For the retained options, prepare a financial evaluation that will calculate Financial Net Present Value (for different quantities) of O&M and investment costs.

Assumptions (please check also a more detailed table in the CBA guidelines, for various components, in line with legal requirements):

- Proposed discount rate: 5%
- Reinvestment for equipment: after 15 years
- Reinvestment for network: after 40 years
- Reinvestment for civil structures: 30 years

Prepare an economic evaluation that will take into account externalities for a particular option (ENPV):

- Health impact
- Development effects
- Resource effects (land use, effects on value of real estate)
- Job effects

- Environmental effects

If monetizing externalities (ENPV) is not possible, assess if there is a significant difference of externalities for the considered options (qualitative assessment).

(6) Selected option

Compare the retained options based on the results of the FNPV for investment and operation costs. Externalities and technical arguments (supply security, etc.) may also be used to justify the selected option.

8.1.4 Options Agglomeration y

Prepare option analysis for all agglomerations as defined in the Chapter above.

8.2 Wastewater Options

Prepare an option analysis similar to the one presented in previous Chapter for Water Supply.
Specific examples for wastewater are given below:

8.2.1 Strategic Options and definition of agglomeration borders

- Define in more detail the borders of agglomerations based on a more detailed assessment (define in detail which parts of the settlements areas are to be connected to the sewer network and which parts will remain outside of the agglomeration for individual treatment systems).
- Use the abstracts of each chapter focusing on aggregated tables for the options analysed at the MP level
- Revise the strategic options for the selected priority agglomerations if new information is available;
- Define in more detail the borders of agglomerations based on a more detailed assessment (define in detail which parts of the settlements areas are to be connected to the sewer network and which parts will remain outside of the agglomeration for individual treatment systems).
- Present on an overview map the strategic options (i.e. centralized versus decentralized option)
- Present map with revised/confirmed borders of agglomerations taking into consideration the results of option analysis for each agglomeration (i.e. centralized versus decentralized option).

8.2.2 General Options

8.2.3 Options Agglomeration x

(1) Identified Options

- General Options

  Based on general assessment at MP stage, confirm or revise the initial option preparing a more detailed technical and economic assessment of the following options:

1. *Centralised wastewater system (one treatment plant for "cluster" agglomerations)*
2. *Decentralised wastewater system (one treatment plant for each agglomeration)*
3. *In exceptional cases for insufficiently concentrated areas within an agglomeration: individual and other appropriate treatment (septic tanks, etc.) according to Chapter 2.3 of "Definitions of the Urban Wastewater Treatment Directive 91/271/EEC" might be considered.*

Note: for a defined agglomeration, to comply with the UWWTD, at least 90 % should be connected to a sewer network, the remaining max. 10 % might be served with individual and appropriate systems (i.e. septic tanks).

Note: in case of increasing demand (if additional supply capacity is required), compare increase of supply capacity with alternative options to reduce water losses or to interconnect with other water supply systems.

The result of the option analysis is a confirmation/revision of "cluster" agglomerate borders showing whether interconnection with a trunk sewer and treatment in one wastewater treatment plant (WWTP) is the most favourable solution[14] or if individual wastewater treatment plants are more cost effective.

Base (but not limit to) the detailed technical and economical assessment on the following criteria:

(i) Topographic features (altitude, distance between agglomerations)
(ii) Size of agglomerations
(iii) Existing trunk sewers and WWTPs
(iv) Investment costs for trunk sewers and treatment plants
(v) Operation costs for trunk sewers and treatment plants
(vi) Available land for WWTPs and trunk sewers

- Examples of specific technical options for wastewater:
  - *Combined sewer network versus separated sewer network*
  - *Relining (trenchless systems) versus conventional sewer pipe laying (trenching)*
  - *(Partly) Rehabilitation of WWTP versus new WWTP*
  - *Type of WWTP (technological process)*
  - *In-situ construction or prefabricated (compact) WWTPs*
  - *Comparison of different pipe materials (Concrete/PVC/GRP/PE/PP)*
  - *Different locations and discharge points for WWTPs*
  - *Sludge dewatering (centralised dewatering, decentralised, mobile dewatering units)*
  - *Deep sewer trenches and low number of pumping stations versus shallow sewer trenches and high number of pumping stations*
  - *Pressure mains versus gravity sewers*

  Etc.

(2) Description of options

(3) Screening of options

[14] Economies of scale

Example for Screening of Options

Existing assets	*Description of key Deficiencies*	*Identification of options*	*First screening*	*Justifications for selection*
WWTP with x p.e.	- Effluent quality does not meet requirements of UWWTD - outworn electromechanical installations (all structures need significant improvement) - Insufficient Capacity of WWTP - Poor automation and control - Poor chemical handling: (storage, preparation, dosage, etc.) - Poor safety standard by handling of chemicals - sludge treatment is not performed	1)- Construction of new WWTP for all agglomerations (cluster)	**retained**	- Advantages: xxxxxxxx - Disadvantages: xxxxx - Justification for selection
		2)- Construction of x individual WWTPs for each agglomeration	**retained**	- Advantages: xxxxxxxx - Disadvantages: xxxxx - Justification for selection: xxxx
		3)- Rehabilitation of existing WWTP for larger agglomeration and construction of new individual WWTPs for small agglomerations	rejected	- Advantages: xxxxxxxx - Disadvantages: xxxxx - Justification for selection

(4) Detailed evaluation of options
(5) Financial and economic evaluation
(6) Selected option

8.2.4 Options Agglomeration y

Prepare option analysis for all agglomerations as defined in the Chapter above.

8.3 Summary of Option Analysis

Summarise the options developed in Chapter 9.2 above for all water supply and wastewater agglomerations.

- Technical comparison of options
- Financial and economic evaluation
- Selected option

9. PROJECT PRESENTATION

Present the investment project by describing

- Overall characteristics, justifications, and impact of the project;
- Investment measures including a justification for each investment measure;
- Technical assistance measures proposed to accompany the investment measures
- Cost breakdown of all investments
- Operation and maintenance costs before and after project implementation
- Unit costs in an aggregated form as a result of investment costs and quantities of implemented infrastructure.

Abstract

9.1 Overall Project Presentation

Present the overall project summarizing

- Main characteristics of investments
- Main justifications
- Investment strategy
- Main impact of investment measures.

A breakdown of investments per agglomerations and per contracts should be provided. The rationale to group the investments should be adequately explained in the FS.

The investments should presented for each agglomeration with respect to the following requirements.

9.1.1 Water Supply

Summarise the investment measures proposed for improving the water supply system:

- Main characteristics of investment components applying the following structure:
  - water abstraction
  - pumping stations
  - water treatment
  - water mains
  - distribution network
- Quantities of infrastructure components proposed (output indicators)
- Main justification for each investment component (i.e. water losses, number of pipe failures, condition of pipes, etc.); quantify as far as possible relating the key deficiencies identified in previous Chapters to the proposed investment measures.
- Describing the technical features (of the selected option) with sufficient detail (refer to more detailed presentations in the annex)

With the view to present and justify the investments, the following recommendations/indications should be taken into account.

Water Abstraction

Indicate preventive measures to:

- Track and reduce polluting sources (Technical Assistance for Project Management should include assistance to the Beneficiary in implementing an action plan for protecting water sources). The action plan will:
  - Prepare a programme for permanently monitoring the raw water quality,
  - Implement a sound information system on possible pollution sources,
  - Improve the contact with the Water Administration (Apele Romane) incorporating the water monitoring system of Apele Romane to be continuously informed about water quality upstream.
- Guarantee security of supply in case of accidental pollution (security storage capacity, upstream warning system, interconnection, …). In particular, in case of vulnerable resources (river intakes).

Pumping Stations

- Proposed measures should take into account increased efficiency of the PS.

Water Treatment Plants

- Describe the proposed sludge discharge/disposal of backwash water from Drinking Water Treatment Plants (untreated discharge to receiving water or any other environmentally harmful solution is not permitted).

Water Transmission Mains

- Proposed measures should be adequately justified in terms of key priority, cost-efficiency and insufficiency of water for the project area or non-compliant water quality (if so, which parameters are not compliant?)
- Any investment which is not sufficiently justified will be not eligible for SOP financing.

Water Distribution Network

Note:

- Priority should be given to *extension* of networks to ensure full compliance with the Directive and Accession Treaty in the selected agglomerations (full coverage population and quality water requirements)
- *Rehabilitation* of networks should be based on a critical assessment of the existing infrastructure and prioritisation of needs; the amount of proposed rehabilitation should have in view the critical priorities needed to ensure an optimal operation of the system.
- For rehabilitating the distribution network:
  - provide information on the metering measures supporting the identification of main leakages
  - indicate the outputs expected in terms of reducing the losses' rate on the network
  - indicate the measures to be taken by the operator to detect more "*diffuse*" leakages and keep a reasonable performance in this respect. If needed, foresee the necessary equipment in the application (metering, SCADA, acoustic detection material, etc.).
- if no investments for replacing the pipe network are proposed to reduce water losses (i.e. low priority in the MP), give high priority to water loss reduction in the Action Plan for ROC and foresee enough leak detection equipment in the project to assure that the ROC will be able to reduce water losses to an acceptable level (i.e. 20 – 30 %) after completing the subject CF investments.
- Provide indicators on the efficiency of the proposed rehabilitation measures (investment measures in € per quantity of water losses reduced => see unit cost table in annex 3). This should provide the Managing Authority with some benchmark to assess the opportunity of the beneficiary's request. If the indicator shows high unit costs for rehabilitating the network (i.e. because water losses are already at a relatively low level, and further reduction of losses through pipe replacement may not be cost efficient), one should consider that the investment is not financially opportune or that leakage's reduction is an operational issue, under the responsibility of the operator.
- Recommend measures for water loss reduction (active leakage control, pressure management, etc.) to continuously improve water losses in the network after project implementation
- Define realistic water loss target after CF-project implementation and continuous reduction of water losses)

SCADA System

9.1.2 Wastewater

Summarise the investment measures proposed to improve the wastewater system:

- Main characteristics of investment components using the following structure:
  - Wastewater network,
  - Wastewater pumping stations
  - Wastewater treatment plant
  - Sludge treatment

- Quantities of infrastructure components proposed (output indicators)
- Main justification for each investment component (i.e. water losses, number of pipe failures, condition of pipes, etc.); quantify as far as possible relating the key deficiencies identified in previous Chapters to the proposed investment measures.
- Describing the technical features (of the selected option) with sufficient detail (refer to more detailed presentations in the annex)

With the view to present and justify the investments, the following recommendations/indications should be taken into account.

Wastewater Network

- Give priority to *extension* of networks to ensure full compliance with the Directive in the selected agglomerations (minimum 90% wastewater collection coverage)
- *Rehabilitation* of networks should be based on a critical assessment of the existing infrastructure and prioritisation of needs; the amount of proposed rehabilitation should have in view the critical priorities needed to be addressed in order to ensure adequate design and operation of the WWTP.

Wastewater Pumping Stations

- Proposed measures should take into account increased efficiency of the PS.

Wastewater Treatment Plants

- Ensure measures to ensure full compliance with the WWTD and Accession Treaty; the level of compliance needed for each selected agglomeration should be checked.
- Coherence with other programmes should be checked and describe in the FS (e.g. if extension of networks are proposed for SOP financing and WWTP is foreseen in a parallel programme, the FS should address the coherence of the 2 investments; in particular, the design and the level of compliance of the WWTPs prepared within other programmes should be checked)
- Describe clearly what is foreseen for grit and grease generated by the WWTP (washing of sand, grease recycling etc.) and how *sludge from sewer cleaning is treated.*
- *Review the requirements for sludge management and ensure adequate justification and description of sludge treatment facilities as part of the SOP project.*

Sludge Management

- *Include investment measures necessary to assure proper sludge management (i.e. storage facilities in case of agricultural reuse of sludge)*

9.1.3 Investment Strategy

Describe the proposed investment strategy for improving the water supply system:

- Reference to priorities for implementing investment components. Coordination of proposed measures. Provide an overview of all investment components (summary list of aggregated investment components).
- Reference to implementation strategy (i.e. combine water and wastewater network construction to avoid double trenching)

- General time frame for implementation (key milestones)
- Main difficulties and constraints expected during implementation of the water system (i.e. capacity of the operator, etc.)
- Particularly highlight important implementation risks and propose mitigation measures – e.g. refer to adequate implementation capacity, TA needs, land availability, complementary measures needed, political support for the project etc.

Note: confirm land availability at feasibility stage.

9.2 Expected Impact of the project and Performance Indicators

Present the main impact of the investment measures as follows:

- Describe the main result of the investments and quantify as far as possible by using relevant performance indicators for the proposed measures (i.e., increase of connection rate, reduction of infiltration, population benefiting from the measure, etc.)
- Present the expected improvements after implementing the selected investment components with the performance indicators in the next table below (before and after project implementation):
- Describe the contribution of the measures to the Targets in the Accession Treaty (Percentage for intermediate targets).

  ***Note**: Do not mix Country targets with county targets (i.e. it is not acceptable that only 60 % will be connected in an agglomeration referring to the intermediate targets in the Accession Treaty).*

A series of indicative tables for the presentation of the project performance and impact, in line with EC requirements for 2007 projects, is presented below:

Table: Performance Indicator Water Supply

Item (Indicative numbering)	Indicator	Unit	Before Project	After Project
2.1.1.	Total population in service area concerned (water supply zone)	capita*		
2.1.2	Service Coverage: Percent of population connected to water supply system (2.1.3/2.1.1)	% of 2.1.1		
2.3.6	Specific domestic water consumptions	lcd		
2.4.14	Population served per length of water supply network (distribution network + water mains)	capita/km		
2.4.15	Production capacity installed (minimum capacity of wells, pumping stations, WTP)	1000 m3/d		
2.4.7	Length of transmission mains	km		
2.4.8	Percent of transmission mains rehabilitated	% of 2.4.7		
2.4.10	Length of distribution network	km		
2.4.11	Percent of distribution network rehabilitated	% of 2.4.10		
2.5.1	Total non-revenue water (IWA standard: Total system input - total water sold)	m^3/d		
2.5.2	Percent of non-revenue water (2.5.1/2.2.1)	% of 2.2.1		

Item (Indicative numbering)	Indicator	Unit	Before Project	After Project
2.5.4	Percent of real water losses (physical losses) in the network (excluding technical losses in the WTP)	%		
2.5.5	Real water losses per number of connections (at average system pressure of 30 -40 m)	liters/con/day		
2.7.1	Average electricity consumption (treatment plant + pumping stations)	1000 kWh/a		
2.7.2	Average electricity consumption (treatment plant + pumping stations) per volume of water produced (per 100 m of pressure)	kWh/m³		
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		

*Note: the indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1.

- Present the estimated impact of each investment measure aiming at cost reduction on operation costs (i.e., energy savings through replacement of pumps and other electro-mechanical equipment or reduction of network losses) on energy costs. Do not consider additional costs due to improvement of the level of service (i.e., increase of quantity of water supplied to customers or increase of network pressure) in the following tables.

  As an Example, the impact of water supply network renovation on water losses is in the table below. Similar tables should present the impact of other investment measures on efficiency improvement (i.e. renovation of pumps on electricity consumptions).

Example table: Impact of Pipe Renovation on Reduction of Real Water Losses

Material of	L*	Real Losses before rehabilitation			L	Real Losses after rehabilitation			Reduction of water losses	
Pipes / Zones	[km]	Yearly Water losses [m³/year]	% of total network length	Yearly Water Losses per length of network [m³/km*y]	[km]	Yearly Water losses [m³/year]	% of total network length	Yearly Water Losses per length of network [m³/km*y]	Yearly Water losses [m³/year]	[%]
Renovated Pipes					81.5	252,863	6	3 103	-252,863	
AC old	**120**	**14,536,606**	**95**	**121,138**	**38.5**	**3,469,397**	**87**	**90 114**	**11,067,208**	**76**
- High zone	65	10,075,000	66	155,000	0.0	0	0	155 000	10,075,000	
- Middle zone	55	4,956,282	32	90,114	38.5	3,469,397	87	90 114	1,486,885	
Other material	**30**	**270,408**	**2**	**9,014**	**30**	**270,408**	**7**	**9 014**	**0**	**0**
- High zone	2	30,000	0.2	15,000	2	30,000	1	15 000	0	
- Middle zone	28	240,408	2	8,586	28	240,408	6	8 586	0	
Total	**150**	**15,301,690**	**100**	**102,011**	**150**	**3,992,668**	**100%**	**26 618**	**11,309,022**	**74**

L= Length of water supply network

- Summarise the impact of investment measures on electricity costs as given in the table below:

***Indicative* Table: Impact of each investment measure on energy costs - Water Supply**

Investment measure	Energy costs before project [€/year]	Energy costs after project [€/year]	Energy savings [€/year]	% Reduction
Replacement of pumps in agglom. Xx				
Replacement of xx km of network				
Etc.				
TOTAL				

- Summarise the impact of all investment measures on operation & maintenance costs in the table below.

Table: Impact of all investment measures [15]on Operation & Maintenance Costs Water Supply

Cost Item	Amount before project [€/year]	Amount after project [€/year]	Savings [€/year]	% Reduction
Energy				
Chemicals				
Staff				
Material				
Others [16]				
TOTAL				

Table: Performance Indicators for Wastewater (WW)

Item * (Indicative numbering)	Indicator	Unit	Before Project	After Project
3.4.4	Total generated load in agglomeration	P.E.		
3.4.6	Connection rate of generated load: connected load to collection system / total generated load (UWWTD Art.2(5))	% of 3.4.4		
3.2.1.8	Sewer Infiltration rate: Volume of infiltration water into the wastewater network / total wastewater volume collected	% of 3.2.1		
3.4.1	Total Biological load (BOD5)	kg BOD/d		
3.6.1	Total length of wastewater network (incl. stormwater & main collectors)	km		
3.6.5.2	Percent of wastewater network rehabilitated	%		
3.6.8	Population served per length of wastewater network	capita/km		
3.7.7	Capacity of WWTPs in population equivalent (p.e.)	p.e.		
3.7.8.10	Volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5)	m3/d		
3.7.8.11	Percent of volume of wastewater treated with effluent quality in compliance with EC UWWTD 91/271/EEC Article 4 (5)	% of 3.2.1		

[15] Impact of all investment measures aiming at efficiency improvement

[16] ie. costs of External Services (excavation, construction, etc.)

Item * (Indicative numbering)	Indicator	Unit	Before Project	After Project
3.9.5	Average electricity consumption per year	kWh/a		
3.9.6	Average electricity consumption per volume of wastewater treated	kWh/m³		

*Note: The indicators mentioned above are a subset of the "Performance Indicators" table in Annex 1.

- Present the estimated impact of each investment measure aiming at reducing operation costs (i.e., energy savings through replacement of pumps and other electro-mechanical equipment). Do not consider additional costs due to improving the level of service (i.e., improvement of effluent quality) in the following table.

Table: Impact of each investment measures on Energy Costs - Wastewater

Investment measure	Energy costs before project [€/year]	Energy costs after project [€/year]	Energy savings [€/year]	% Reduction
Replacement of pumps in agglom. Xx				
Replacement of xx km of sewer network				
Etc.				
TOTAL				

- Summarise the impact of all investment measures on operation & maintenance costs in the table below.

Table: Impact of all investment measures [17]on Operation & Maintenance Costs Wastewater

Cost Item	Cost before project [€/year]	Cost after project [€/year]	Savings [€/year]	% Reduction
Energy				
Chemicals				
Staff				
Material				
Others [18]				
TOTAL				

A more detailed table for performance indicators of all agglomerations is in Annex 1.

9.3 Technical Assistance

Technical Assistance should help implement the project by putting in place a reliable system and effectively improving the water service. The Technical Assistance will focus on:

- Project Management

[17] Impact of all investment measures aiming at efficiency improvement
[18] ie. costs for External Services (excavation, construction, etc.)

- Works Supervision.

Based on the identified risks and needs assessment, the proposed SOP project may include Technical Assistance to ensure an efficient implementation of the proposed works and sustainability of the programme.

A proposed Technical Assistance for **Project Management** may include:

- Support the Beneficiary in Project Implementation, Reporting and Publicity
- Support the Beneficiary in documenting the waster supply networks and in developing hydraulic network models and carrying out calibration measurements (with the view to ensure sustainability of the proposed measures and to prepare a second phase investment as needed)
- Develop sewer network models including the survey of all existing manholes, the preparation of digital record, impermeability surveys, flow measurements with associated rainfall measurements, CCTV inspection, model development and its verification(with the view to ensure sustainability of the proposed measures and to prepare a second phase investment as needed)
- Support the Beneficiary in equipment procurement
- Training in new technologies, equipment, and instruments.

A proposed TA for **Construction Supervision** may also be included in the SOP project. The related TA will be responsible for managing and supervising the works contracts and in general will fulfil all duties of the Engineer as similarly defined in the FIDIC Yellow and Red Book Conditions of Contract for Construction.

9.4 Estimated Project Costs

9.4.1 Investment costs

The scope of work is defined in the ToR:

- Provide in annexes detailed construction cost estimates (in EUR) for the proposed project components. Cost estimates should be sufficiently detailed, subdivided into logical project elements, and supported by assumptions and bases for figures in adequate details to permit detailed analysis. The estimates and any revisions thereon should be dated, and should show local and foreign costs, local duties and taxes, design, supervision, legal and administration costs associated with the projects, consultant's fees and allowances for prices increases and contingencies.
- Provide an estimated schedule of expenditures, by year, for each project. Dates of expenditures should be the dates payments are due. Subdivide the schedule to show requirements for the major parts of the projects and coordinate with the estimated construction schedule.

Summarise investment costs based on the templates in Annex 2 – to be provided.

Prepare a detailed investment cost breakdown for each agglomeration separated in the main project components. Complete and attach to the FS the template for investment cost breakdown (see template in Excel in Annex 2, separate document to be submitted to MESD).

9.4.2 Operation and Maintenance Costs

Present Operation & Maintenance (O&M) costs considering the following aspects:

- Give details on the cost of and operation and maintenance (O&M) and operator management
- Give details on the expected variation of O&M costs in the future

- Consider the cost calculation below as the basis for calculations in the Financial and Economic Sections of the FS

Operation and Maintenance Costs for Water Supply System

- Provide O&M cost calculation before and after[19]project implementation, and at the end of the planning horizon (clearly explain assumptions for development) for each agglomeration and a summary table for all agglomerations,

Indicative presentation of the O&M costs is presented in the template below:

Table: Operation & Maintenance Costs for Water supply – Agglomeration x[20]

Cost Item	Before Project	After Project	End of Planning Period	Comments
Energy				
Chemicals				
Staff				
Material				
Others				
TOTAL				

Constant Prices in EURO cost base 2008

Provide more detailed cost calculation for each cost component (i.e. water abstraction, water treatment plant, water mains, pumping main, distribution system) in the annex.

Operation and Maintenance Costs for Wastewater System

- Provide O&M cost calculation before and after[21] project implementation as well as at the end of the planning horizon (clearly explain assumptions for development) for each agglomeration and prepare a summary table for all agglomerations.

Indicative presentation of the O&M costs foe wastewater system is presented in the template below:

[19] i.e. in the year 2013
[20] Prepare one table for each agglomeration and a summary table aggregating data of all agglomerations
[21] i.e. in the year 2013

Table: Operation & Maintenance Costs for Wastewater – Agglomeration x[22]

Cost Item	Before Project	After Project	End of Planning Period	Comments
Energy costs				
Chemicals costs				
Staff costs				
Material costs				
Others costs				
TOTAL				

Constant Prices in EURO cost base 2008

Provide more detailed cost calculations in the annex (i.e. split in cost components: WWTP, sludge management, main collector, pumping stations, wastewater network).

Summary of Operation and Maintenance Costs

Provide a summary table for Operation and Maintenance Costs for water and wastewater (aggregated for all agglomerations). Present more detailed data in the annex.

The table below separates change of O&M costs (before and after project) into two components: (i) due to efficiency improvement (i.e. reduction of specific energy costs) and (ii) increase of O&M costs due to increase of service level (increase of supply, increase of pressure, etc.).

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

Cost Item	Water Supply	Wastewater	Total
Total O&M costs before Project			
Total O&M costs after Project			
Difference in O&M costs between before and after Project			
O&M cost decrease due to efficiency improvement			
O&M cost increase due to increase of service level			
TOTAL			

Constant Prices in EURO cost base 2008

9.4.3 Aggregated Unit Costs

Based on the results of cost estimates in the chapters above,

- Prepare a table with specific costs to provide a benchmark for the investment components proposed;
- Compare data between all agglomerations and comment on major deviations of unit costs and compare data with international benchmarking data;
- Present summary table for unit investment costs at county level (minimum, maximum, average of all agglomerations for selected indicators);
- Complete the summary table below in the attached Excel sheet (see Annex 3) and submit to MESD in Excel format.

[22] Prepare for each agglomeration

Table A: Unit Investment Costs

Item*	Indicator	Unit	Unit costs per agglomeration		
			x	y	Average[23]
1.	**Unit Investment Costs Water Supply**				
1.1	Total per capita investment costs **water supply**	€ / capita			
1.2	Investment costs per capacity of **water treatment plants** installed	€ / capita			
1.3.	Investment costs per length of **distribution network**	€ / km			
1.4	Investment Costs for **wastewater pumping stations** per capacity installed	€/ (l/s)			
2	**Unit Investment Costs Wastewater**				
2.1.	Total investment costs **wastewater system** per P.E. in agglomeration	€ / P.E.			
2.2.	Investment costs for **WWTP** per P.E.	€ / P.E.			
2.3.	Investment costs per length of **sewer network**	€ / km			
2.4	Investment costs for **wastewater pumping stations** per capacity installed	€/ (l/s)			

Table B: Unit Operation & Maintenance (O&M) Costs

Item*	Indicator	Unit	Unit costs per agglomeration		
			x	y	Average
1.	**Unit Operation & Maintenance (O&M) Water Supply**				
1.1	Yearly O&M costs water supply systems per capita	€ / capita.			
1.2	Yearly O&M costs water treatment plants per capacity installed	€ / (l/s)			
1.3.	Yearly Operation & Maintenance costs per length of water supply network	€ / km			
1.4	Yearly O&M costs per capacity of water pumping station installed	€/kW			
2	**Unit Operation & Maintenance (O&M) Costs Wastewater**				
2.1.	Yearly O&M costs wastewater systems per P.E.	€ / P.E.			
2.2.	Yearly O&M costs wastewater treatment plant per P.E. excl. sludge management	€ / P.E.			
2.3.	Yearly O&M costs per length of sewer network	€ / km			
2.4	Yearly O&M costs wastewater pumping stations per capacity installed	€/ kW			

10. RESULTS OF FINANCIAL AND ECONOMIC ANALYSIS

TO BE ADDED – A SUMMARY TO PRESENT MAIN RESULTS OF THE CBA (PREPARED AS A SEPARATE SUPPORTING DOCUMENT)

Maximum number of pages: 20

[23] weighted average of all agglomerations in the county if applicable (meaningful)

11. RESULTS OF INSTITUTIONAL ANALYSIS

TO BE ADDED - A SUMMARY TO PRESENT MAIN RESULTS OF THE INSTITUTIONAL ANALYSIS (PREPARED AS A SEPARATE SUPPORTING DOCUMENT)

Maximum number of pages: 20

12. RESULTS OF ENVIRONMENTAL IMPACT ASSESSMENT

TO BE ADDED - A SUMMARY TO PRESENT MAIN RESULTS OF THE EIA (PREPARED AS A SEPARATE SUPPORTING DOCUMENT)

Maximum number of pages: 20

13. PROCUREMENT STRATEGY AND IMPLEMENTATION PLAN

Scope of work as defined in the ToR:

- Recommend (based on a thorough risk assessment) the most appropriate conditions of contract and consequent tendering/contracting approach for each works contract. The Managing Authority will decide, in consultation with relevant partners based on the Consultant's proposal.
- Prepare the procurement strategy and implementation plan after the design, cost, scope of work, and objectives of each project have been clearly defined in the earlier phases of the assignment and after the project has received favourable opinion by the competent authorities.
- Draw up a procurement plan ensuring that the project is implemented in the fastest and most efficient manner. Both open and restricted tender procedures are acceptable; recommend an optimal procedure for the circumstances of the project and agree with relevant stakeholders.

Abstract

13.1 Introduction

13.1.1 General

13.1.2 Definitions

Define the most important terms such as:

- Implementation plan
- Procurement plan
- Procurement strategy
- Etc.

13.1.3 Legislation

Refer to the procurement rules applicable to Cohesion Funds. In particular, consider the new public procurement law: "Government Emergency Ordinance GEO no.34/2006" for preparing the procurement strategy.

13.1.4 Procurement Process

Summarise the procurement process defined in the Romanian legislation and list the steps and time constraints defined in the "Guidelines for application of Romanian Procurement Law":

- Develop annual program of public procurement

- Issue award / selection documentation
- Contract finalization – final taking-over

13.2 Procurement Strategy

13.2.1 Criteria for Grouping of Tenders

Define the criteria to group the tenders considering:

- Nature of procurement- i.e. whether for services, works or supplies;
- Value - i.e. whether open or restricted and if local or international.

For the planned scope of works, use the following types of *works contracts*:

- "Design - Build" to rehabilitate existing water and wastewater treatment plants;
- "Construction" to rehabilitate and extend existing water distribution and sewerage systems.
- The size and number of works contracts will determine the potentially interested bidders. In principle, larger value tenders should result in lower prices due to economies of scale and reduced costs. If, for some reason, smaller contract packages (and large number of contracts) are considered as the most favourable option, measures should be foreseen in the procurement process to avoid excessively high bidding prices (i.e., ensure that there is enough competition in place).
- To ensure that contractors can offer all the requirements, it is necessary to divide the works into lots, or packages, containing similar kinds of works or supplies, as the case may be, which can be more easily provided by companies specialising in such packages.
- It is necessary to do this carefully, on a case by case basis, taking into account also the market conditions for the works concerned, the limitations of contractors, the geographical aspects of the project, capacity of supervision & monitoring and the management capacity of the ROC.
- Note: 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).

13.2.2 Potential of National Construction Companies

- Assess the experience, general capacity and available capacity of local construction companies during the foreseen implementation period.
- Use the amount of similar works (i.e., relevant for network construction) performed during previous years as an indicator of the general capacity of local construction companies. The second criterion is the financial capacity of construction companies in Romania (estimate the number of companies and their capacity which would meet i.e. minimum turnover criteria).
- Further, use the interest of construction companies to participate in similar tenders and/or other criteria to assess the potential of national construction companies and their interest to participate in the subject tender procedures.

13.2.3 Proposed Procurement Strategy

Based on the criteria above for grouping projects and the potential of construction companies, propose a strategy for:

- Procurement procedures (to be agreed with MESD – i.e. open tendering or restricted tendering)
- Size/value and number of contracts
- Standard conditions of contract (CHECK with MESD applicable conditions of Contract)

- Type of Contract ((i) Plant & Design-Build Type; (ii) construction type; (iii) supply contracts; and (iv) service contracts Technical Assistance contracts)
- Sequence and timing for implementation (minimum timing for each step as defined in the procurement law depending on type of contract and works, proposed timing considering the overall implementation strategy and justification for selected timing)

13.3 Proposed Tenders

List all contracts including the following minimum information:

- Contract code name
- Short description
- Condition of contract (i.e., design and build book)
- Type of contract (i.e., works contract, service contract)
- Tendering procedure (i.e., international open)
- Works to be performed (i.e., WWTP)
- Location of work (i.e., agglomeration xx)
- Proposed separation in Lots
- Estimated Contract Value of works

13.4 Proposed Procurement and Implementation Plan

Prepare:

- 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 should include:

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

The implementation schedule should include:

- Contract/activity name
- Duration of task
- Start date

- End date
- Gantt chart with duration of activities

The milestone table should include:

- Contract/activity name
- Start date
- End date

13.5 Documents required for project implementation

- Prepare a list of permits or authorizations required for project implementation before starting construction.
- Indicate which permits are already available and at which implementation stage other documents shall be provided.
- Copies of available documents are to be presented in an Annex to the FS.

13.6 Assumptions and Risks

Describe all assumptions related to the implementation of contracts and the risks that may affect the successful execution of the project, such as:

- Availability of funding
- Difficulties due to lack of cooperation
- Late commencement of the works contract due to difficulties in tendering and selecting contractors

13.7 Conclusions and Recommendations

Summarise the chapters above and present a table including:

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

VOLUME II: ANNEXES THE FS – TO BE COMPLETED

For easy reference, please check also the Required Documents According to Romanian Standard

1. **Base Data**
   Population, Urban Development Study, etc.
2. **Water Supply System**
   - 3.1 Hydro-geological Investigations and Water Quality Analysis
   - 3.2 Unit Cost Data Base (detailed unit costs as basis for investment cost calculation)
   - 3.3 Design Standards
   - 3.4 Flow Measurements
   - 3.5 Calculations and Design Requirements
     - *3.5.1 Water Abstraction*
     - *3.5.2 Pumping Stations*
     - *3.5.3 Water Treatment Plants*
     - *3.5.4 Water Transmission Mains*
     - *3.5.5 Water Distribution Network*
     - *3.5.6 SCADA System*
   - 3.6 Option Analysis

3. **Wastewater System**
   - 4.1 Geo-technical and Hydrological Investigations
   - 4.2 Unit Cost Data Base (detailed unit costs as basis for investment cost calculation)
   - 4.3 Design Standards
   - 4.4 Flow Measurements
   - 4.5 Calculations and Design Requirements
     - *4.5.1 Wastewater Network*
     - *4.5.2 Wastewater Pumping Stations*
     - *4.5.3 Wastewater Treatment Plants*
   - 4.6 Option Analysis

4. **Technical Assistance**

5. **Detailed Investment Cost Breakdown**
   - 6.1. Assumptions for calculation of Investment Costs
   - 6.2. Benchmark Unit [24]Investment cost table (as presented in Annex 3-Table 1 of the Guidance document)
   - 6.3. Template as presented in Annex 2 of this Guidance document
   - 6.4. Other investment cost break-downs (as required by the Romanian standards for preparation of FS)

6. **Operation and Maintenance Costs**
   - 7.1. Assumptions for calculation of Operation & Maintenance Costs
   - 7.2. Benchmark Unit[25] Operation & Maintenance Costs (template presented in Annex 3-Table 2 of this Guidance document)
   - 7.3. Detailed Calculation of Operation & Maintenance Costs (in compliance with the summary tables presented in the guidance text - i.e. Chapter 8.2.2.)

[24] Specific costs to benchmark the investment costs
[25] Specific costs to benchmark the operation & maintenance costs

7. **Performance Indicators**

   Templates presented

8. **Industrial Wastewater Discharge**
9. **Sludge disposal strategy**
10. **Institutional Analysis**
11. **Procurement Strategy and Implementation Plan**

VOLUME III: DRAWINGS

VOLUME IV: FINANCIAL AND ECONOMIC ANALYSIS - COST BENEFIT ANALYSIS (CBA)

Present entire Cost Benefit Analysis (CBA Report) in a separate volume

VOLUME V: ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Present entire Environmental Impact Assessment Report (EIA Report) in a separate volume