MINISTRY OF ECONOMY
AND FINANCE

Authority for the Coordination
of Structural Instruments

MINISTRY OF ENVIRONMENT
AND SUSTAINABLE
DEVELOPMENT

Managing Authority for
Sectoral Operational
Programme Environment

GUIDELINES FOR
COST BENEFIT ANALYSIS
OF
WATER AND WASTEWATER PROJECTS
TO BE SUPPORTED BY THE
COHESION FUND AND THE EUROPEAN REGIONAL DEVELOPMENT FUND
IN 2007-2013

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The present guidelines were prepared under the coordination of Authority for the Coordination of Structural Instruments with JASPERS assistance[1].
The document reflects the consultations with the representatives of Ministry of Environment and Sustainable Development and its consultants on the practical details of CBA analysis, as well as the detailed guidance and clarifications received from the Romanian Desk and the Evaluation Unit in DG REGIO.

[1] JASPERS (Joint Assistance to Support Projects in European RegionS) is a major joint policy initiative of the European Investment Bank (EIB), the European Commission (Regional Policy Directorate-General - DG Regio), the European Bank for Reconstruction and Development (EBRD), and KFW. JASPERS is designed for twelve EU Member States to help them better prepare projects proposed for EU Fund financing. More information available at www.jaspers.europa.eu

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1. Reference framework

The Council Regulation (EC) 1083/2006 of 11 July 2006 lays down the general provision ruling programmes and projects financed by the European Regional Development Fund (ERDF), the Cohesion Fund (CF) and the European Social Fund (ESF).

In particular, as indicated in Art. 40 (e) of the Regulation, major projects seeking financial support from the Cohesion Fund (CF) and the European Regional Development Fund (ERDF) require the preparation of a Cost-Benefit Analysis (CBA) as part of the applications:

> *"Article 40. - The Member State or the managing authority shall provide the Commission with the following information on major projects:*
>
> *[…]*
>
> *(e) a cost-benefit analysis, including a risk assessment and the foreseeable impact on the sector concerned and on the socio-economic situation of the Member State and/or the region and, when possible and where appropriate, of other regions of the Community;"*

At the same time, the Regulation required the European Commission to develop indicative guidance regarding the methodology to perform CBA.

For the programming period 2007-2013, the Commission has provided a set of working rules to promote consistency in the CBA for CF and ERDF applications (see Working Document 4: Guidance on the methodology for carrying out Cost-Benefit Analysis[2], from now on the WD4). The general methodological framework to carry out CBA in the context of EC Funding is provided in the Guide to Cost-Benefit Analysis of Investment Projects, a manual published by the Commission in 2002 which has been recently updated[3].

The WD4 provides for generic guidance, and recommends the Member States to produce more detailed CBA guidelines, with the goal to ensure consistency across projects presented for financing in the various sectors, and '*taking account of specific institutional settings, particularly for the transport and environment sectors.'*

In line with the above regulations, Romanian Government Ordinance HG nr. 28 of 9th January 2008 "on the methodological rules for elaboration and approval of technical and economic documentation for investment projects" requires CBA as part of the technical-economic documentation related to public investments. More specifically, HG 28/2008 requires the following steps to be performed and presented as part of the documentation of the proposed investment:

1. investment identification and definition of objectives, including specification of reference period;
2. option analysis;
3. financial analysis, including the calculation of financial performance indicators: cumulated cash -flow, NPV, Financial Rate of Return (FRR) and B/C;
4. economic analysis, including the calculation of economic performance indicators: NPV, Economic Rate of Return (ERR) and B/C;
5. sensitivity analysis
6. risk analysis

These national CBA Guidelines build on the following framework:

[2] Available at http://ec.europa.eu/regional_policy/sources/docoffic/2007/working/wd4_cost_en.pdf
[3] Now available at http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf

- Romanian legislation comprising provisions related to the cost benefit – analysis (in particular, the government decision HG28/2008 on the methodological rules for elaboration and approval of technical and economic documentation for investment projects)
- the national programming documents for the implementation of actions to be co-financed by structural instruments (ERDF and CF), namely the National Strategic Reference Framework (NSRF) and the relevant Sectoral Operational Programmes (SOPs);
- the relevant EC regulations and guidelines,
- statistics, forecasts and other documents that may provide information to be considered for the development of suitable methodological framework to carry out the CBA.

2. Rationale and Objectives of the Guidelines

2.1 Rationale of these Guidelines

The present document refers to **Sectoral Guidelines for Water and Wastewater projects**, and has been prepared in the general context of the water management projects included in the Action Plans between JASPERS and the beneficiary Member States. The intention was to close the gaps between the existing guidance and the specifics of the projects in the sector, with focus on the information and outputs required in the major project applications.

To that extent, while consistent with the general CBA framework mentioned above, the document is based on the experience of project appraisal for the first round of water/wastewater projects applications assessed during 2007, and the early part of 2008.

2.2 What is CBA and why to perform it

CBA is an analytical tool which is used to estimate the socio-economic impact (in term of benefits and costs) related to the implementation of certain policy actions and/or projects. The impact must be assessed against predetermined objectives and the analysis is usually made from the point of view of the society as whole, intended as the sum of all individuals concerned. Typically, CBA analysis works with national boundaries so that the word “society” usually refers to the sum of the individuals in a nation state.

The objective of CBA is to identify and monetise (i.e. attach a monetary value to) all possible impacts of the action or project under scrutiny, in order to determine the related costs and benefits. In principle, all impacts should be assessed: financial, economic, social, environmental, etc. Traditionally, costs and benefits are evaluated by considering the difference between a scenario with the project and an alternative scenario without the project (the so called “incremental approach”).

Then the results are aggregated to identify net benefits and to draw conclusions on whether the project is desirable and worth implementing. To that extent, the CBA could be used as a decision-making tool for assessing investment to be financed by public resources.

The term CBA within these guidelines and according to EU requirements encompasses both the financial and economic analysis of the project. More specifically, within the framework of preparation and appraisal of CF and ERDF project, the European Commission requires a CBA to:

(1) *To assess whether a project is **worth** co-financing*.
The goal is to answer to the questions: does it contribute to the goals of EU regional policy? Does it foster growth and boost employment? In simple words, if the net benefits for the society (benefits minus costs) of the project are positive, then society is better off with the project because its benefits exceed its costs. The project should therefore receive the assistance of the Funds and be co-financed. If not, it should be rejected. This assessment is performed using an ***Economic Analysis***.

(2) *To assess whether a project **needs** co-financing*.
Besides being desirable from an *economic* standpoint a project may also be financially profitable without EU assistance, in which case it would not be co-financed by the Funds.
To check if a project *should* be co-financed requires a ***Financial Analysis***: if the financial value of the investment (project revenues minus project costs) without the contribution of the Funds is negative, then the project can be co-financed. In this case, the EU grant should not exceed the amount of money that makes the project break even, so that no over financing occurs.

The CBA is therefore needed to provide evidence that, while fitting within the framework of EU regional policy objectives, the project is both desirable from an economic point of view and needs the contribution of the Funds for it to be financially feasible.

Projects in the environment sector result in economic benefits like the "improvement of quality of life" or the "improvement in ambient quality", which are difficult to quantify in monetary terms. For this reason, it is anticipated that CBA for this type of projects is especially challenging and the problem becomes more evident during the calculation of the project's Economic Net Present Value (ENPV) or the Economic Rate of Return (ERR).

2.3 When to perform a CBA

When submitting an application for funding under the CF and ERDF funds, information on the results of CBA is required only for Major Projects, which are defined as operations accomplishing a precise and indivisible task whose total costs is in excess of:

- EUR 25 million for environmental projects
- EUR 50 million for all other fields.

To that extent a full CBA (comprising both a Financial and an Economic Analysis along with a risk assessment) is compulsory only for Major Projects.

However, for smaller projects which are not subject to a preventive appraisal and approval by the European Commission, the relevant Managing Authority could decide to include a requirement for results of CBA to be assessed as part of the selection criteria. In those cases, the methodology described by these Guidelines, or a simplified version of it, will apply.

Details of the methodology to be followed for smaller projects will be discussed with the Managing Authority and will be reflected in relevant calls for proposal and applicant's guides.

3. General methodological approach

3.1 Steps to be performed within the CBA

The proposed sequence for the CBA in the framework of project preparation, which is consistent with the recommendations of the European Commission, is the following[4]:

- Strategic approach and definition of objectives
- Identification and selection of the most suitable alternative (in most cases, deriving from the master plan and the feasibility study)
- Financial Analysis
- Economic Analysis
- Risk and Sensitivity analysis
- Reporting conclusions

Most, if not all of the inputs for the definition of project objectives, the identification of alternatives and even the selection of the most suitable alternative will come from other parts

[4] The concept of CBA here has been expanded from the traditional economic analysis to the wider concept used in the relevant EU regulations and related guidance documents.

of the project feasibility studies, and more specifically from the analysis of the project's technical, environmental and institutional feasibility. For these sections, what is expected in the CBA is a summary and a presentation of those findings in a rational and consistent way.

The following sections provide the general recommendations on the actions to be taken when performing each of the steps mentioned above.

3.2 Strategic approach and definition of objectives

The basic strategic documents for the implementation of actions to be co-financed by the CF and ERDF are the National Strategic Reference Framework (NSRF) and the relevant Sectoral Operational Programmes (SOPs)

As any other Member State, Romania has prepared a National Strategic Reference Framework (NSRF), coherent with the Community Strategic Guidelines on Cohesion[5], which gives the strategic dimension to the Funds in line with the priorities of the Union. The NSRF is the document that defines the strategy chosen by Romania to contribute to achieving those priorities, and lists the SOPs that it endeavor to implement.

The SOPs present the priorities of the Member State (and/or regions) as well as the way in which it will lead its programming[6]. Each SOP summarises the overall objectives and targets sought at a sectoral level, as well as identifies the priority areas of interventions (priority axes), which, in turn, lists specific objectives.

Table 1 summarises the objectives of SOP Environment[7] agreed with the European Commission, while table 2 provide the details on the objectives of Priority Axis 1, under which water and wastewater projects have to be submitted.

Table 1: Objectives SOP Environment

Priority Axis 1	Improve the quality and access to water and wastewater infrastructure, by providing water supply and wastewater services in most urban areas by 2015 and by setting efficient regional water and wastewater management structures;
Priority Axis 2	Develop sustainable waste management systems, by improving waste management and reducing the number of historically contaminated sites in a minimum of 30 counties by 2015
Priority Axis 3	Reduce the negative environmental impact and mitigate the climate change caused by urban heating plants in most polluted localities by 2015.
Priority Axis 4	Protect and improve the biodiversity and natural heritage by supporting the protected areas management, including Natura 2000 implementation.
Priority Axis 5	Reduce the incidence of natural disasters affecting the population, by implementing preventive measures in most vulnerable areas by 2015.

Table 2: Specific objectives Priority Axis 1 – SOP Environment

Objective 1	Provide adequate water and sewerage services, at accessible tariffs
Objective 2	Provide adequate drinking water quality in all urban agglomerations
Objective 3	Improve the purity of watercourses
Objective 4	Improve of the level of WWTP sludge management
Objective 5	Create innovative and efficient water management structures

The objectives of the proposed actions and projects have to be defined in a manner consistent with the overall objectives and priority axes of the SOP, including defining the extent the propose projects will contribute to achieving the results the SOP is aimed at.

To that extent, as much as possible, reference shall be made to the set of indicator included in SOP Environment for priority Axis 1. A detailed list of indicators will be provided by Managing Authority.

[5] Avalaible at http://ec.europa.eu/regional_policy/sources/docoffic/2007/osc/index_en.htm.
[6] Please see http://ec.europa.eu/regional_policy/atlas2007/romania/index_en.htm for links to the approved NSRF and summaries for the SOPs.
[7] Available at http://www.mmediu.ro/integrare/comp1/POSmediu/POS_Mediu_EN.pdf

To provide a concrete example, the general objective of a project in the field of water management will typically be defined along the lines of the example in Table 3.

Table 3: Example of definition of the project's general objective

General Objective: to develop a sustainable water and wastewater system in the county of […] by improving the quality of the existing services and reducing the negative impact of wastewater discharges in line with EU practices and policies and in the context of the Priority Axis 1 of the SOP Environment.

Having defined the general objective, the specific objectives of the project will be formulated in a manner consistent with the specific objectives of the referred Priority Axis (see Table 4):

Table 4: Example of definition of the project's specific objectives

Specific Objective	Values without project (*)	Expected value after completion
1. Increase in coverage of water and sewerage services	[Percentage of population in beneficiary county, and localities connected to the water supply system and to the sewerage system],	[Percentage of population in beneficiary county, and localities connected to the water supply system and to the sewerage system],
2. Improvement of quality of drinking water in order to meet the standards in the EU Drinking Water Directive 98/83/EC	[indication of compliance with required quality standards in term of number of urban agglomerations] and/or [percentage of population covered by complaint water supply]	[indication of compliance with required quality standards in term of number of urban agglomerations] and/or [percentage of population covered by complaint water supply]
3. Increase of the coverage of wastewater treatment, with standards in accordance to Urban Wastewater Treatment Directive 91/271/EEC	[Number of agglomerations in the beneficiary county with population above 100,000 p.e, between 10,000 and 100,000, p.e. between 2,000 an 10,000 and below 2,000 p.e. with adequate treatment]	[Number of agglomerations in the beneficiary county with population above 100,000 p.e, between 10,000 and 100,000, p.e. between 2,000 an 10,000 and below 2,000 p.e. with adequate treatment]
4. Establishment of efficient operators and associated structures (i.e.: Regional Operating Companies and Associations of Municipalities)	[number of ROC/IDA with adequate institutional setting and capacity for the sustainable operation of the water and wastewater system]	[number of ROC/IDA with adequate institutional setting and capacity for the sustainable operation of the water and wastewater system]

(*) Refers not to the current situation but to the projected situation at the date of the foreseen completion of the project if the project is not implemented (business as usual)

It is recommended that each proposed project will carefully present both its overall and specific objectives according to the example developed above.

3.3 Option Analysis and selection of the most suitable option

The presentation of a project proposal for co-financing from the CF and ERDF requires performing a full feasibility study to justify that the project is a well thought series of works, activities and services aimed at the achieving the objectives mentioned above. The results of the feasibility studies need to be presented as part of the Application for Major Investment Projects according to the requirement of Art. 40(c) of Regulation 1083/2006, as well as of HG 28/2008.

Typical feasibility studies for Major Projects will include information on the economic and institutional context, forecasted demand and/or utilisation (either market or non-market), flows and loads for the wastewater, available technology, the production plan (including the utilisation rate of the infrastructure), personnel requirements, the scale of the project, its location, physical inputs, timing and implementation, phases of expansion, financial planning, environmental aspects. In many cases, detailed support studies are also needed (engineering, marketing, etc.).

While all the studies above <u>are not formally part of the CBA</u>, the results of feasibility studies are the basis upon which the CBA shall be performed.

In particular, as indicated in the WD 4:

"Evidence should be provided that the selected project is the most suitable alternative between the options considered. This information should typically be found in the results of the feasibility studies that have to be presented to the Commission under Art.40(c)."

The identification of options will normally start at the level of a Master Plan or equivalent planning document, which should provide the general context in terms of, inter alia, specific problems in the existing infrastructure in term of adequacy to serve the projected demand in compliance with the relevant standards, socio-economic conditions in the project area, main technological options and indicative costing.

It is expected that the Master Plan will identify a long term investment plan for the area under consideration, as well as a priority short term investment plan to achieve the objectives highlighted in the section above.[8] As a result of the Master Plan analysis, a list of selected alternatives, divided according to each agglomeration under consideration, will be retained for further assessment in the feasibility level.

Please note that HG 28/2008 requires that at least three options are taken into account: a zero option (without investment)[9], a maximum investment option and a minimum investment option. It is anticipated that more investment options can be considered in the analysis, depending on the characteristics of the project.

Selection of options will focus on the different alternatives to achieve the specific objectives (and standards after completion) of the project. This is typically done within the framework of the technical feasibility study and, if properly done in the first place, there is no reason to duplicate it just for the purposes of the CBA.

At feasibility study level, it is expected that the selection of the option to be retained for the subsequent steps will be performed according to the following:

1) check all identified alternative strategic options, based on the identified problems and technological options to be included in the project to achieve the intended objectives; the process of defining and screening of the possible options for each agglomeration or group of agglomerations should consider different technological options balancing advantages and disadvantages of the options analyzed, etc. In most of the cases this level of option analysis can be considered as sufficient. The analysis of options should be carried out in separate for water and wastewater systems, plants and networks (i.e. different locations for the plants, rehabilitation of plant components vs. demolishing and new construction, re-lining against replacement, sludge final destination, etc). It has to be noted that purely "technical" option analysis, such as material for pipe, process for WWTP would not be sufficient to provide the strategic assessment required.
2) screen the identified list against eventual qualitative criteria (to be established in light of overall policy orientations and/or technical considerations – this needs to be agreed with the MESD) with the aim of eliminating unsuitable options. This should be

[8] The preferred long term investment programme shall be divided into subcomponents in a manner that allows a prioritisation based on available funding. For example, treatment capacity may be possible to divide into phases if the treatment plant is of a sufficient size to make this viable and if the expected demand projections show that full capacity will not be required for some time.

The identification and grouping of the short term investments is a pragmatic exercise, taking into account:

- A logical sequence for implementation of components (i.e. treatment capacity must be available for new connections);
- The expected maximum programme size as a function of the availability of funds, taking into account macroaffordability constraints; and
- The need to balance investments in new capacity with a wish to see greater coverage.

[9] For the projects under priority axis 1 of the SOP Environment, the zero option will not be a feasible strategic option, due to the need to achieve compliance with the relevant directives within the timetable agreed by Romania as part of its Accession Treaty. In this case, the zero option shall be considered as the counterfactual option against which other options can be assessed.

duly justified in the analysis and applied consistently across projects. The result of the screening process is a short list of suitable alternatives which will be then subject to cost effectiveness analysis (see step below);

3) proceed to assess retained suitable alternatives in term of their cost effectiveness by:
   i) quantifying overall investment costs, as well as operating and maintenance costs related to each retained alternative[10]. All costs will be estimated on an annual basis, in real terms, for a period covering the economic life of the project facilities (hereafter the "reference period").
   ii) Subtracting (i) any revenues obtained from the sale of sub-product generated during the operation of the facilities, like compost or electricity in the case of wastewater treatment plants; and (ii) the residual value of the different facilities at the end of the reference period.
   iii) Ranking the options using an established least cost methodology.
4) assess if the alternatives differs in term of possible external impacts to society that are not captured by the least cost analysis (e.g., disruption of urban traffic when rehabilitating networks, impact of choice of location and number of wastewater treatment plants, etc.)
   i) if the overall impact expected from each of the considered alternatives can be justified as being similar, then retain the least cost option as the preferred one.
   ii) if differences in term of external impact are identified across alternatives, adjust the least cost analysis to incorporate the identified externalities (this will require monetising the external impact) in order to establish a final ranking that takes into account those externalities.

The option analysis performed according to the steps detailed above it is expected to identify the alternative that achieves the intended objectives at the minimum overall cost to society and that will be assessed in the framework of the CBA.

3.4 Financial Analysis

3.4.1 Objectives and scope of the analysis

The purpose of the financial analysis is to assess the financial performance of the proposed action and/or project over the period under consideration, with the view to establish the extent of financial self-sufficiency and long term sustainability of the proposed project, its financial performance indicators, as well as the justification for the amount of EU assistance being sought.

More specifically, the financial analysis has to cover the following steps: (i) estimate the project revenues and costs and their implications in terms of cash-flow; (ii) to determine the funding gap of the selected option and subsequently calculate the eligible expenditure that can be co-financed by the Funds (iii)define the project financing structure and its financial profitability; (iv) verify the sufficiency of the projected cash flow to ensure the adequate operation of the project and meet all investment and debt service obligations;

[10] This needs to cover at least the following items:
   a. Land property costs, like in the case of purchase, expropriations and/or compensation paid for changes in land use.
   b. Design and construction costs for the different facilities.
   c. Purchase cost of equipment to operate the different facilities, with the corresponding replacement cost if applicable when its economic life is lower than the reference period.
   d. Operation and maintenance cost for the different facilities involved in the alternative, including the cost of the final disposal of sub-products, like sludge from wastewater treatment plants.
   e. Costs associated to the measures to mitigate the environmental impact of the project, which are normally proposed as part of the project's Environmental Impact Assessment.

3.4.2 Calculation of financial flows

The analysis is typically made up of a series of tables that collect the financial flows of the project, broken down as total investment, operating costs and revenues, sources of financing and cash flow analysis for financial sustainability.

Water and wastewater projects will typically fall within the boundaries of an existing infrastructure, where a clear cut separation of the revenues and costs directly generated by the project might be problematic. To overcome this difficulty, the recommended methodology is the discounted cash flow analysis (DCF) [11], which uses an incremental method that compares a scenario with the project with an alternative scenario without project.

The incremental method is applied as follows:

1. Projections are produced of the overall operation's cash-flows (in term of expected revenues and costs, as well as other investments planned or needed in any case, for each year of operation) in absence of the proposed project (*without project scenario*). When the proposed project is entirely new, the without project scenario is a scenario of "no operations".
2. Similar projections of the operation's cash-flows are produced taking into account the proposed projects and its impact in term of operations (*with project scenario*). The project promoter shall take into account the whole investment plan, account for changes in O&M costs; adjusts tariffs (if relevant), taking into account affordability of services.
3. A cash flow for the investment is the difference between the cash flows in the *"with project scenario"* and the *"without project scenario"*. In case the proposed project is entirely new, the with-project scenario is the basis for the incremental cash-flow.

The result of the process above is the "incremental" impact of the proposed projects in term of a financial cash-flows statement for all years of operation.

In light of the methodology used, particular care shall be used in the definition of the without and with project scenario. For each scenario, key assumptions shall be made regarding:

Service performance indicators: service area and population served, demand development by category of customers, connection rates, metering rate, specific water consumption by category of customers[12], physical losses and infiltration to the sewerage network.

Operation and maintenance costs: projections of O&M costs split in fixed and variable costs, and by category. They also include, whenever applicable, savings generated by the project.

Clear assumptions shall also be made on financial performance indicators and tariff evolutions (on the latter, see section 3.4.5 below).

It is anticipated that the without scenario will have to be one of efficient operations, based on a realistic estimate of the continuation of the status quo. To that extent, it could cover some minor necessary investments, if estimated as needed anyhow, duly justified in the analysis and financed by the operator, but not to a level comparable to the ones envisaged in the with project scenario[13].

[11] The DFC method has the following features:
- Only *cash flows* are considered; i.e. the actual amount of cash being paid out or received by the project. Non-cash accounting items like *depreciation* and *contingency reserves* must not be included. Cash flows must be considered in the year in which they occur and over a given reference period
- When adding or deducting cash flows occurring in different years, the time value of money has to be considered using a predetermined discount rate.

[12] As regards to the level of consumption used in the analysis, this shall be consistent with what used in the technical feasibility study as design parameters.

[13] If the without scenario involve penalties for non compliance with prevalent legislative requirements, the level of those penalties needs to be based on the current level of penalties imposed by the relevant authorities, and projected according realistic and well defined assumptions.

All the assumptions mentioned above shall be clearly defined in a tabular format as an annex to the final CBA report, specifying the situation in the with and without scenario.

The beneficiaries are also requested to present a summary of the underlying assumptions for unitary investments and operating costs as used in the financial analysis following the format attached in Annex 1. This shall include details on the specific cost savings that the project will allow to achieve[14].

This assumptions need to be equivalent to those used in the feasibility studies to estimate the investment and operating cost of the proposed priority investment.

Please note that failure to duly present, as an annex of CBA reports and in the required format, the assumptions used for the financial analysis can result in delays in project approval and, ultimately, in the rejection of the Proposal.

3.4.3 Principles to follow in developing financial projections

The financial projections for the project should be prepared on the basis of a financial model under the following principles:

Reference period and life of equipment
The period of projection is the same as the project's reference period, which is typically **30 years** in the case of water and wastewater projects.

As regards to the technical life of equipment, which has an impact on the level of replacement costs that needs to be taken into consideration during the reference period, it is recommended to split the assets into three main categories:

- Civil works (including operational buildings, reservoirs, access ways, etc...) – 40 years
- Pipes (including transport and distribution pipes, connections) – 40 years
- E&M equipment (including electrical and mechanical equipment built in wells, plants, pumping stations) -15 years

Financial discount rate
The financial discount rate (in real term) to be used is 5%, as recommended by the European Commission in WD4.

Macroeconomic assumptions
Macroeconomic inputs shall be based on the relevant statistical sources and be consistent across project proposals. The assumptions to be used for the forecasts, as well as the main sources for the data to be used are detailed in Annex 3.

Features of the financial model
One single set of consolidated projections shall be developed for the whole project, as opposed to a number of sets reflecting different components or geographical areas of the project.

All inputs should be concentrated in one spreadsheet, with data entered in local currency and real terms, and inflation being considered separately and added later on for the projections.

[14] One way to calculate OM&A cost savings of individual project measures is by comparing the OM&A cost of two scenarios:

- with-project scenario as proposed in the application
- alternative (even if purely hypothetical) scenario, in which all project measures BUT the analyzed measure(s) are implemented (i.e. the with-project scenario without the analyzed measure).

In the alternative scenario, all model variables not directly affected by the measure remain as in the with-project scenario (i.e. connection rates, specific water demand, etc.). The difference in term of costs between these two scenarios is an estimate of the cost savings directly linked to the individual project measure.

The projection in local currency is done in nominal terms in order to reflect more accurately the reality under the assumption made for inflation.

The translation into euros is done using the so-called "all-current method", by which income statement values are translated using the average exchange rate for the year, balance sheet values are translated using the ending exchange rate for the year (with the exception of the shareholder's equity, which is translated at the historical rate), and the translation gain or loss is recorded directly into the shareholders' equity as *comprehensive income*.

3.4.4. Analysis of financial projections

The relevant aspects to be considered for the analysis of the output of the financial model in order to ensure that the financial projections for the project are acceptable are the following:

1. Justification and consistency of data: All relevant input data should be justified (in the CBA or with reference to other parts of the project feasibility studies) and consistent with the conclusions of the feasibility studies, the project description and the rest of the data in the financial projections. In particular, this refers to the following: (i) beneficiaries; (ii) demand; (iii) investment costs; (iv) revenues; (v) operating costs; and (v) expected changes of those variables during the projection period. For investment and operating costs, the applicant is requested to detail its underlying assumptions, by filling the form presented in annex 1. Also, there should be sufficient certainty regarding the financial arrangements for the financing of the project, and in particular in the case of direct contributions from national authorities and beneficiaries and loans from local lenders or international financial institutions.

2. Polluter pays principle: The chosen scenario for tariffs should reflect the correct application of the Polluter Pays Principle. In the case of the water and wastewater projects and according to Art. 9 of the Water Framework Directive 2000/60/EC, this means that

   > *"Article 9. – Member States shall take account of the principle of recovery of the costs of water services, including environmental and resource costs, having regard to the economic analysis conducted according to Annex III, and in accordance in particular with the polluter pays principle."*

3. Affordability: Art. 9 of the Water Framework Directive 2000/60/EC also states that "*Member States may in so doing have regard to the social, environmental and economic effects of the recovery […]*". In addition, Art. 55 of regulation 1083/2006 allows for *"considerations of equity linked to the relative prosperity of the Member State concerned*", which for all practical purposes implies that the total charges paid by the users for water and wastewater services should not exceed certain commonly accepted thresholds.

   In order to ensure that the affordability of tariffs for low income households is taken into account, the following steps are required in the analysis:

   a. Estimation of the average household income for those households subject to the payment of tariffs.

   b. Estimation of the number and income of low income households based on the lowest decile of a distribution of income for those households subject to the payment of tariffs.

   c. Verification that the total water and wastewater charges including indirect taxes for the lowest income household do not exceed 4.0% of their household disposable income (when calculated on the basis of an average per capita consumption of 75 lcd)[15].

[15] This needs to be consistent with the assumptions and parameters used in the feasibility study to establish the size of the investment and its operating costs.

The determination of the average household income as well as the income distribution by decile shall be based on data sourced according to the recommendation of Annex 3. In any case, the CBA report shall duly specify the source of the data used.

The calculation above implies the definition of a tariff rates that are affordable for all customers, but this does not mean that the same rates apply to all customers. That is, an affordability constraint for low income customer can be overcome with a tariff structure with lower rates for low income customers and/or progressive rates for higher levels of consumption, but the rest of the customers and in particular the non-residential ones can be subject to higher rates that are more consistent with the Polluter Pays Principle[16].

4. Financial sustainability: The verification of the project financial sustainability implies a cumulative positive cash flow for each one of the year of the projection. This shall ideally valid when performing the analysis at project's level, but surely at operator's level. Temporary shortfalls can be covered by a revolving credit (embedded in the model's cash flow statement) provided that the assumptions behind this revolving credit are reasonable with regards to the local financial markets. Also, when the financing structure of the project includes a long-term loan to be paid with revenues within the scope on the financial projections, a debt service coverage ratio (operator level)[17] of at least 1.2 will be required for each year of the loan amortization period[18].

3.4.5. Considerations on tariff increases

In light of the points raised above, incremental tariff increases shall be considered in the financial analysis with the goal to ensure an adequate level of recovery of the cost of providing the service, as well as financial sustainability of operations once the project is implemented, while at the same time respecting affordability constraints that might apply. Nevertheless, as stated in WD 4, tariffs shall be set at a level adequate to cover operating and maintenance costs, as well as a significant part of the asset's depreciation (meant as a proxy of the cost needed to replace the infrastructure in the future).

To that extent, the following approach is recommended:

- in the without project scenario: tariff shall be set at a level of full cost recovery of the existing systems, therefore allowing for coverage of O&M, as well as depreciation of existing assets[19]. If current tariffs do not achieve this, then the necessary tariff increase shall be assumed in the analysis, conditional upon existing affordability constraints.

- in the with project scenario: tariffs shall be increased to the level needed to a) cover O&M cost for the existing and new (project) assets, including depreciation; b) allowing for the necessary cash flow to meet the financial sustainability requirements detailed above; c) taking into account affordability constraints, allow the operator to build enough cash reserves to ensure the future replacement of all assets, starting from the ones with the shortest economic life[2021].

[16] This is in line with the affordability policy adopted by the Ministry of Environment and Sustainable Development for Cohesion Funds projects in the water and wastewater sector. According to this policy, higher tariffs are allowed for in case the general affordability limit threatens the financial sustainability of the operator or the project.

[17] Measured as EBITDA/DebtService, with EBITDA being the earnings before interest, taxes, depreciation and amortization

[18] Or higher as per already existing loan covenants or if required by the IFI co-financing the project, when applicable.

[19] Where existing assets are at the end of their economic life, and therefore already fully depreciated, the calculated depreciation cost could be low. In such cases, the tariff levels in the "without scenario" could allow for limited replacement of obsolete infrastructure where critical for the maintenance of the status quo. However, this investment shall be limited (not comparable to the situation in the with project and in particular not meant to achieve compliance) and the related tariff increases shall stay within affordability limits (an assessment shall be provided for the without project scenario). This provision shall be clearly justified in the CBA as part of the assumptions used in building the scenarios and shall be based on a duly presented estimate of the replacement value of the existing infrastructure.

[20] The beneficiary shall explain in detail the method used in the analysis to identify the tariff increases needed to achieve the coverage of such costs, as well as its consistency with the approach required by the relevant Romanian regulations.

Please note that tariff increases shall be implemented with the goal of achieving unification of tariffs in the service area of the operator by the time the project become operational, if not earlier.

Also, tariff increases needs to be designed taking into account realistic phasing which are socially acceptable, and to limit the risk in revenue reductions (do to affordability problems).

This is valid not only for the tariff increases needed to finance the investments envisaged in the short term priority investment (proposed for funding under this programming period) but also for the overall implementation of the long term investment plan agreed at Master Plan level.

To that extent, the beneficiaries are requested to complement the affordability analysis of the tariff increases proposed for the current investment, to be performed according to point 3 of the previous section, with an update of the macroaffordability analysis performed at Master Plan level, which takes into account the investments to be implemented within the same agglomerations after the current programming period (or phase of investment). This updated macroaffordability analysis shall aim at highlighting the remaining financial capacity of customers within the same service area to sustain further tariff increases for the implementation of investments in the following phases.

It is anticipated that this will require establishing clear assumptions about the corresponding timetable (linked to compliance with EC Directives) as well as the future rate of public contribution (assumed to stay at comparable level as in the current programming period, i.e. 90 per cent).

Tariff increases affect demand due to demand elasticity effects. To that extent, the assumptions used for both price and income elasticity shall be presented and justified as part of the analysis and the expected impact on demand duly assessed. As regards to the level of consumption used in the analysis, this shall be consistent with what used in the technical feasibility study as design parameters)

Whenever the area suffers, or is expected to suffer from water scarcity problems, the beneficiary is requested to consider the implementation of alternative tariff policy approaches to promote an efficient water allocation and use[22], as for example increasing block tariff systems, increasing the tariffs with the consumption.

The same recommendation is valid for those cases where due to low affordability levels, the application of the affordability ceiling detailed in section 3.4.4. above, will cause tariffs to be set at a level that endanger the financial sustainability of the project (and operator) or do not ensure full cost recovery of operation.

In such cases, alternative or cumulative options shall be explored in order to address the problem and ensure sustainability. It is anticipated that such options shall include, as a minimum:

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[21] One possible approach for setting tariffs in the with project scenario is to make reference to the levelized unit cost (or dynamic prime cost) as a proxy of the long term cost of the proposed project. This is calculated by dividing the discounted value (net present value) of the related cost flows (both investment and OM&A cost) by the discounted volume of billed water consumption. The period of reference and the discount rate to be used shall be consistent with the ones used in the analysis. The investment cost items that are taken into account in the calculation are: a) Initial investment cost of the system; b) Reinvestment cost for replacement of assets at the end of their economic lifetime; c) Residual value of all infrastructure at the end of the period of analysis.
Only cash-flows are taken into account in the calculation (i.e. no depreciation cost of the assets). Cash-outflows are entered in the year in which they occur. The residual value of the project infrastructure is entered as a cash- inflow in the last year of the period of analysis (even if the infrastructure is not liquidated). In the case of pre-existing infrastructure (i.e. extension projects), the residual value of existing infrastructure is entered in the first year.

[22] On this topic, see the Communication from the Commission to the European Parliament and the Council "Addressing the challenge of water scarcity and droughts in the European Union" published in July 2007, available at http://ec.europa.eu/environment/water/quantity/scarcity_en.htm

- a political decision to set tariffs above the affordability thresholds, while considering specific measures at the level of IDA to reduce the affordability burden on the poorest households (vouchers, lower "social" tariffs, etc)

- alternative and more sophisticated tariff systems are considered, allowing for example, tariff charges progressively increasing with consumption, increasing subscription part of the tariff, applying higher tariff for big consumers (industry), etc.

The CBA will have to duly describe the recommended tariff system.

3.5 Funding Gap Calculation

For the period 2007-2013, art. 55.2 of the Regulation 1083/2006 stipulates that the determination of the level of EU co-financing is based on the concept of funding gap, intended as the portion of the proposed (eligible) investment that cannot be covered by the net revenues accruing for the investment itself, both expressed in term of their current (present) value.

The difference between the two values is considered as Eligible Expenditure when applying the co-financing rates specified in the relevant SOPs.

Using cash flows calculated as in the previous section, the Applicant should calculate the maximum EU grant rate. WD4 gives clear instructions, which are replicated in the box below.

STEPS TO DETERMINE THE EU GRANT
2007-2013 PROGRAMMING PERIOD

Step 1. Find the funding-gap rate (R):

R = Max EE/DIC

where

Max EE is the *maximum eligible expenditure* = DIC-DNR (Art. 55.2)

DIC is the *discounted investment cost*

DNR is the *discounted net revenue* = discounted revenues – discounted operating costs + discounted residual value

Step 2. Find the "decision amount" (DA), i.e. "the amount to which the co-financing rate for the priority axis applies" (Art. 41.2):

DA = EC*R

where

EC is the eligible cost.

Step 3. Find the (maximum) EU grant:

EU grant = DA*Max CRpa

where

Max CRpa is the maximum co-funding rate fixed for the priority axis in the Commission's decision adopting the operational programme (Art. 52.7).

The resulting funding gap and subsequent grant rate will then feed-back to the financial projections in an iterative process.

While the tariff increases based on the approach recommended in the previous section are the basis for forecasting project's incremental revenues, the discounted cash flow analysis performed to calculate the Funding Gap (see following section), however, **should not include non-cash accounting items** such as depreciation and contingency reserves, as clearly stated in Working Document 4.

On the other side, replacement costs that are due to be incurred during the period of analysis (e.g., for electro-mechanical equipment with a shorter economic life, see Annex 2 for details) are included in the Funding Gap calculation as (discounted) operating and maintenance costs.

3.6 Profitability Analysis

The same incremental cash flows used for establishing the funding gap are also used to calculate the project financial performance indicators (i.e. the financial net present values FNPV/C and the corresponding financial return on the investment or FRR/C) in absence of co-financing from the Funds[23].

Since co-financing is required only if the proposed project or action is not financially profitable, a project will be eligible for co-financing only if, before EU interventions its FNPV/C is lower than 0, and its FRR/C is lower than the chosen discount rate[24].

In case of grant funded projects the profitability analysis is used to assure that the grant was properly calibrated and does not transfer too much funding to the operator promoter of the project. To that extent, the project promoter is also expected to calculate the following financial indicators to show that the EU grant rate identified above is not too generous:

- FRR/C and FNPV/C
- FRR/K and FNPV/K

FRR/C measures the capacity of the project to provide an adequate return on the investment, regardless the way it is funded. As discussed above, FRR/C is calculated from a cash flow projection that covers the project's economic life and includes initial investment, replacement costs for the project short-life equipments, operation and maintenance costs as outflows, and receipts from project revenues and project residual value at the end of its economic life as inflows. These estimates are made gross of taxes.

After the EU grant, FRR/C value shall be higher but most likely still below the financial discount rate.

FRR/K measures the capacity of the project to provide an adequate return to the capital invested by the project promoter. The FRR/K is calculated from the same cash flow projection used for calculating FRR/C, but detracting from the project investment costs both loans drawdown and the EU contribution[25].

FRR/K should never exceed the required return on equity for companies in the sector, since this would show an excessive return of the promoter at the expense of the EU tax payer.

If relevant, it may be useful to determine a separate FRR/K for the operator when this is different from the owner of the infrastructure/investor. Beside conducting a consolidated financial analysis (and a consolidated calculation of the indicators), this can addressed by calculating two FRR/K taking into account the capital outlays to be covered respectively by the operator and by the investor.

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[23] FNPV/C is calculated by calculating the Present Value of the stream of cash-flows in the net cash-flow statement. FRR/C is the corresponding Internal Rate of Return, at the chosen discount rate.

[24] The financing gap and financial profitability indicators (FRR/C, FNPV/C, FRR/K and FNPV/K, before and after Community assistance) are calculated using a financial discount rate of 5% in real terms, according to the regulations and more specifically according to the instructions in the Guide to Cost-Benefit Analysis of Investment Projects and Working Document 4: Guidance on the methodology for carrying out Cost-Benefit Analysis. It is worth noting that WD4 requires the profitability indicators to be calculated without including contingencies. However, as mentioned in these Guidelines the calculation of FRR/K shall be performed taking into account only the national contribution as investment outflow, based on the financing plan that stems out of the Funding Gap calculation. To that respect, the FG calculation takes into account contingencies (DA is calculated on eligible costs, which can include 10% contingencies).

[25] An alternative is to consider as cash outflows in lieu of the investment cost, all national financing sources, including loans at the moment they are reimbursed.

It has to be noted that investments in water supply and wastewater treatment are expected to have a low to medium financial profitability, as duly noted in WD4. This is expected to be even truer where a significant part of the investments are mainly aimed at improving service and environmental standards, which have a low impact on revenues.

3.7 Economic Analysis

3.7.1 Objectives and scope of the analysis

The purpose of the economic analysis is to prove that the project has a positive net contribution to society and is therefore, worth being co-financed by EU funds. For the selected alternative, the project's benefits should exceed the project's costs and, more specifically, the present value of the project's economic benefits should exceed the present value of the project's economic costs.

In practical terms, this is expressed as a positive ENPV, a Benefit/Cost (B/C) ratio higher than 1, or a project ERR exceeding the discount rate used for calculating the ENPV (i.e. 5.5%).

However, project economic (as opposed to financial) costs are measured in terms of their 'resource' or 'opportunity' costs; that is, the benefit which has to be foregone (the opportunity lost) by society in using scarce economic resources in the project rather than in some alternative use.

Similarly, project benefits can be measured in terms of the amounts that people benefiting from the project are ready to paid for (*willingness-to-pay terms*) or, alternatively, in *costs avoided* as a result of implementing the project, as well as in term of external benefits that are results of the implementation of the project and that are not captured by the analysis performed in financial terms.

3.7.2 Identification of project economic benefits

The estimation of the project economic benefits involves the identification of the project benefits, which can be classified into the following three main categories:

a. Benefits from improved access to drinking water, which translates into more water of adequate quality sold to the customers, either through increase of the coverage of the water supply service or to the increase in individual consumption due to the improvement of the quality of the service (i.e.: increase of pressure and decrease of service interruptions).

b. Benefits from improved quality of bathing and other surface waters, which translates into an improvement in the overall conditions of water bodies in the project area as a result of pollution prevention.

c. Resource cost savings:

   - for the customers, which takes place (i) when the customer does no longer need to rely on private wells, private pumps, septic tanks, and does no longer have to buy bottled water

   - for the operator, through the optimization of the system which allows for a reduced resource depletion through water abstraction as well as a reduction in emissions related to energy savings.

Note that the increase of economic activity in the region as a direct result of the project is not a project benefit *per se* since this is inherent to all projects involving employment generation regardless of the objectives to be achieved. However, the economic impact of employment

generation has indirectly been already considered when correcting the cost of un-skilled labour with the shadow wage[26] as explained with more detail below.

The methodology suggested for quantification and monetisation of potential project benefits, which due to the nature of those benefits in some cases is not straightforward and needs to be estimated, is detailed in Annex 4. A summary of the benefits to be used in the economic analysis is included in section 3.7.4.

As in the case of the financial analysis, also the economic analysis needs to be performed on an incremental basis.

3.7.3 Negative externalities

It is worth keeping in mind that the project could also have negative externalities that need to be taken into account in the economic analysis. Negative externalities could take the form of possible impacts on the environment (spoiling of scenery, naturalistic impact, loss of local land and real estate value due to disamenities, such as noise and odour), negative impact due to the opening of building sites (temporary effect) or increased emission due to increased activities triggered by the project.

The CBA shall list all potential negative externalities that are expected as a result of the project implementation, specifying the methodology to be used for their quantification and monetisation, or assessing their impact only on a qualititative basis.

As a minimum, however, the following negative externalities shall be taken into account in the economic analysis (as an economic cost):

a) CO_2 emissions from sludge digestors, based on a quantification of gas production and related CO_2 portion.

b) CO_2 emissions from sludge transport to disposal sites, based on quantification of dehydrated sludge and other waste from the WWTPs (screenings, grid) to be transported to a sanitary landfill and to surrounding agricultural fields.

3.7.4 Summary for calculation of benefits and negative externalities

Table 5 summarises the assumptions to be used to quantify and monetise the impact of the project in term of economic benefits and negative externalities, the latter to be included in the analysis as economic costs.

Please note that this list is not meant to be exhaustive, since the extent of benefits stemming from the project as well as its potential negative impact is expected to be wider.

The CBA shall identify and list all potential benefits/negative impact that are expected as a result of the project, beside the ones listed in these Guidelines, and provide details of their impact on the economic analysis, even if their assessment could be done only on a qualititative basis.

Table 5: Project benefits and negative externalities

Project Benefits			
Type	**Base for calculation**	**Monetary value**	**Comments**
Access to drinking water	Nr. Of households in project service area	148 Euro/household/year (2008 value)	Values for following years of projection to be increased by real GDP growth (see Annex 2)

[26] That is, the positive impact of the project in a region with high unemployment is considered through a lower shadow wage for un-skilled workers and therefore a lower project economic cost.

Improvement of water bodies (use value)	Nr. Of people living in the project service area	20.4 Euro/person/year (2008 value)	Values for following years of projection to be increased by real GDP growth (see Annex 2)
Improvement of water bodies (non use value)	Nr. Of households in project service area	0.004 – 0.011 Euro/household/year/KM river	See Annex 4 for further details
Cost savings to customers – private well	Nr. Of households newly connected	315 Euro/household/year	
Cost savings to customers – sewage disposal	Nr. Of households newly connected	348 Euro/household/year	
Cost savings to operator – water abstraction	Incremental water savings (in m_3)	Water abstraction fee (Apele Romane)	To be detailed in technical studies
Cost savings to operator – energy consumption	CO_2 emission savings (in tonnes)	From 25 Euro/tonne in 2010 to 45 Euro/tonne in 2030	To be detailed in technical studies. See annex 4 for details on prices.
Negative Externalities			
Type	**Base for calculation**	**Monetary value**	**Comments**
Increase in CO_2 emission – sludge digestion	CO_2 emission (in tonnes)	From 25 Euro/tonne in 2010 to 45 Euro/tonne in 2030	To be detailed in technical studies. See annex 4 for details on prices.
Increase in CO_2 emission – sludge transportation	CO_2 emission (in tonnes)	From 25 Euro/tonne in 2010 to 45 Euro/tonne in 2030	To be detailed in technical studies. See annex 4 for details on prices.

3.7.5 Conversion of project financial costs to economic costs

Fiscal corrections are needed for those elements of the financial prices that are not related to the underlying opportunity costs of the resources involved. To that extent, correction shall include deductions for indirect taxes (e.g. VAT), subsidies and pure transfer payments (e.g., social security payments). In particular, investment costs for beneficiaries that are not VAT registered (and for which VAT is therefore not recoverable) should include VAT in the *financial* analysis. This, however, should be excluded from the *economic* analysis.

However, economic prices should include direct taxes and specific indirect taxes/subsidies intended to correct externalities.

More specifically, converting project costs from market to economic prices implies breaking down the project cost into the different categories listed below, with the required treatment specified for each case:

a. Traded items: This category comprises all goods and services included in the project cost that can be valued on the basis of world prices. For an open economy with international tenders for procuring the equipment, materials and services, this category will normally cover most of the project costs. No specific conversion is required since market prices are assumed to reflect economic prices.

b. Non-traded items: This category comprises all goods and services that have to be procured domestically, like for example domestic transport and construction, some raw materials, and water and energy consumption. The conversion from financial to economic prices is usually done through a Standard Conversion Factor (SCF). The SCF is usually computed based on the average differences between domestic and international prices (i.e.: FOB and CIF border prices) due to trade tariffs and barriers. However, given that costs within this category are normally low with regards to total project costs and that roughly 70% of the Romanian trade is internal to the EU and therefore by definition not subject to trade tariffs, the SCF will be 1 unless otherwise justified.

c. Skilled labour: This category comprises the labour component of the project cost that is considered scarce and therefore adequately priced in terms of opportunity cost. No specific conversion is required since market prices are assumed to reflect economic prices.

d. Non-skilled labour: This category comprises the labour component of the project cost that is considered in surplus (i.e.: in a context of unemployment) and therefore not adequately priced from the economic point of view. The correction to reflect the opportunity cost of labour could be made by multiplying the financial cost of un-skilled workers by the so-called Shadow Wage Rate Factor (SWRF), which can be calculated as (1-u)*(1-t), where u is the regional unemployment rate and t is the rate of social security payments and relevant taxes included in the labour costs[27].

e. Land acquisition: This category comprises the land implicitly used in the project, even when no financial cost is included as part of the project cost Correction of land costs intends to adjust for the net output that would have been produced on the land if it had not been used by the project. In those cases in which the land has been acquired at market value, the applicable conversion factor is 1 since it is assumed that the market value reflects the present value of the future output. Otherwise, the adjustment to reflect economic costs will have to be calculated on a case by case basis.

f. Transfer payments: This category comprises indirect taxes (i.e.: VAT), subsidies, and pure transfers payments included in the market prices used to estimate the project costs. All these costs have to be eliminated for the purposes of the economic analysis.

Table 6 summarizes the corrections from market prices to economic prices here indicated. The financial costs are converted into the economic costs by multiplying by the corresponding conversion factor. Also, note that the relevant costs to be considered for the economic analysis are the project's incremental costs.

Table 6: Applicable conversion factor per cost item

Cost item	Conversion factor	Comment
Traded goods	1	
Non-traded goods	1	Unless otherwise justified
Skilled labour	1	
Non-skilled labour	SWRF	Calculated as (1-u) x (1-t)
Land acquisition	1	Unless otherwise justified
Transfer payments	0	

3.8 Sensitivity and risk analysis (Risk assessment)

As provided for by Art. 40 (e) of the Regulation 1083/2006, a "risk assessment" shall be included in the CBA. The goal is to deal with the uncertainty related to the implementation of investment projects.

The purpose of the sensitivity and risk analysis is to asses the robustness of the project financial and economic performance. For this purpose, the first part of the analysis (sensitivity analysis) aims at identifying the key variables and their potential impact in terms of changes in the financial and economic indicators, and the second part (risk analysis) aims at estimating the probability of these changes actually taking place, with the results expressed as a estimated mean and standard deviation for those indicators.

The relevant indicators to be considered for the sensitivity and risk analysis are:

[27] This corresponds to a Shadow Wage of SW=FW*(1-u)*(1-t), with FW being the financial (or market) wage, and a Shadow Wage Rate Factor of SWRF=SW/FW. It has to be stressed that this approach is more correct where condition of high involuntary unemployment exists.

- FRR/C and corresponding FNPV/C
- FRR/K and corresponding FNPV/K,
- ERR and corresponding ENPV.
- Cumulative cash flows (both at project and operator's level).

In addition, the beneficiaries are strongly encouraged to check the sensitivity of end-of-the year cash flows (both at project and operator's level), in order to be able to assess potential liquidity shortages during the period of analysis and identify measures to tackle them.

The sensitivity and risk analysis consists of three steps, with the result of each one of them having to be reflected in the application for funding:

1. Identification of key variables: This basically implies the calculation of the values of the indicators after variations of +/- 1% in the following variables: (i) project outturn cost; (ii) revenues; (iii) operation and maintenance costs; and (iv) economic benefits (possibly by disaggregate benefit categories). The +/- 1% variations will be applied across the board to the annual costs for the base case scenario, and the results will be duly presented in the CBA.

   Given the results of the analysis above, any variable for which a variation of 1% results in a variation of more than 1 percentage point in the base case of FRR/C, FRR/K and ERR or more than 5% in the value of the base case of other indicators, will be considered a key variable.

2. Calculation of switching values for the key variables: The key variables require the calculation of the so-called *switching value*, which is the maximum variation (in percentage) in the key variable that is permitted before the relevant indicator for that specific key variable turns negative (or positive in case of FNPV/C).

3. Estimation of probability distribution for the profitability indicators: First of all, this implies a qualitative assessment of the relevant factors that may affect the values of the key variables as well as the mitigating measures already included in the project to reduce the impact of those factors[28]. Then, there are two options to quantify the level of certainty of the calculated values for the profitability indicators:

   a. If there is reasonable information (based on data collected on similar projects or reliable expert judgement) to define a probability distribution for the key variables[29], then it is possible to use statistical methods as Monte Carlo or similar, which assigns random values to all the key variables simultaneously (within their expected distributions) for a number or repetitions sufficiently high in order to come up with a probability distribution for each one of the profitability indicators. Then each profitability indicator will be expressed as the mean and standard deviation of the values obtained after all the repetitions.

   b. If there is no reasonable information to define a probability distribution for the key variables, then the risk assessment will be carried out by defining optimistic and pessimistic scenarios that include all the key variables, and then calculating the two extreme values for the profitability indicators based on these two scenarios[30].

[28] For example, project outturn cost could be a key variable, poor definition of the different investments included in the project and their cost could pose a relevant risk in terms of project outturn cost, and the preparation of detailed designs and tender documents with realistic cost estimates as part of the feasibility studies could be a mitigating measure to control this risk.

[29] Or at least a reasonable range of variation, assuming a normal distribution between the maximum and minimum value.

[30] If low and high expected values could be identified, together with a most-likely value, one possibility is to assume a triangular distribution. Triangular distributions are used when there is only a limited sample data, or when the relation between the variables is know but data are scarce. Please see the 2008 version of the EC Guide for further details.

4. Presentation of results

The conclusions of the CBA need to be presented in a document covering the following sections:

1. Project area and beneficiaries, with detail of the service coverage, population concerned, demand projections, etc before and after the project.

2. Project objectives, with detail of the context within the relevant sector operational programme and the main indicators (in terms of standards) before and after the project.

3. Project description and cost, with the following sub-sections: (i) description of the alternatives considered and their corresponding cost; (ii) justification of the selection of the alternative considered as most suitable; and (iii) breakdown of project cost by component and type of expenditure.

4. Financial analysis, with details of the financial projections and conclusions of the analysis in terms of application of the polluter pays principle, affordability, financial sustainability and profitability indicators (FRR/C and corresponding FNPV, and FRR/K and corresponding FNPV).

5. Economic analysis, with identification and quantification in monetary terms of the project benefits, correction of project cost with economic prices and calculation of the ENPV, B/C ratio and ERR.

6. Sensitivity and risk analysis, with details of the key variables, the switching value on each case, the relevant factors and mitigated measures related to changes in these key variables, and the estimated probability distribution for the financial and the economic profitability indicators or, failing that, simply their values under an optimistic and pessimistic scenario.

Annexes

Annex 1 Itemised Unitary values for Investment and Operating Costs (to be confirmed)

Item	*Unitary value (€)*	*Comments*
INVESTMENT COSTS		
Water sector		
Construction of 1 wellfield composed of x wells in the agglomeration of X		
Rehabilitation of 1 wellfield composed of x wells in the agglomeration of X		
Construction of 1 reservoir of x m^3		
Rehabilitation of 1 reservoir of x m^3		
Construction of 1 intake of x m^3/s		
Rehabilitation of 1 intake of x m^3/s		
Construction of 1 pumping station with a capacity of x m^3/h		
Rehabilitation of 1 pumping station with a capacity of x m^3/h		
Construction of 1 booster station with a capacity of x m^3/h		
Rehabilitation of 1 booster station with a capacity of x m^3/h		
Setting up of a SCADA system for the municipality of X		
Construction of the DWTP (specify the treatment process and the capacity), in the agglomeration of X		
Rehabilitation of the DWTP (specify the treatment process and the capacity), in the agglomeration of X		

Construction of 1 chlorination plant, with a capacity of x m³/h		
Rehabilitation of 1 chlorination plant, with a capacity of x m³/h		
Replacement/ rehabilitation of 1 km of distribution pipe (Ø X mm)		*Important depth, particular geotechnical conditions*
Construction of 1 km of distribution pipe (Ø X mm)		*Important depth, particular geotechnical conditions*
Replacement of 1 km of transmission pipe (Ø X mm)		*Important depth, particular geotechnical conditions*
Construction of 1 km of transmission pipe (Ø X mm)		*Important depth, particular geotechnical conditions*
Construction of 1 connection to the distribution network		
Other (specify)		
Wastewater sector		
Replacement of 1 km of sewer (Ø X mm) – open trenches		*Important depth, particular geotechnical conditions*
Rehabilitation of 1 km of sewer (Ø X mm) -relining		
Extension of 1 km of sewer (Ø X mm)		*Important depth, particular geotechnical conditions*
Construction of 1 retention basin of x m³		
Rehabilitation of 1 retention basin of x m³		
Construction of 1 wastewater pumping station of x m³/h		
Rehabilitation of 1 wastewater pumping station of x m³/h		
Construction of 1 connection to the sewage network		
Construction of 1 flow metering point on the sewage network		
Removal of 1 connexion with the rainwater network		

Construction of a WWTP of x p.e., (specify the treatment process), in the agglomeration of X		*Additional treatment requirements, specific geotechnical conditions or other constrains (landscape integration, flooding area,..)*
Rehabilitation of a WWTP of x p.e. , (specify the treatment process), in the agglomeration of X		*Additional treatment requirements, specific geotechnical conditions or other constrains (landscape integration, flooding area,..)*
Other (specify)		
OPERATING COSTS (ON ANNUAL BASIS)		
Water sector		
Maintenance of the wellfield X– specify the identification number, of x m³(annual capacity), for the agglomeration of X	EUR	
Maintenance of the water intake of x m³(the annual capacity), for the agglomeration of X	EUR	
Maintenance of the transmission pipes, in the agglomeration of X	EUR/km	
Maintenance of the chlorination of x m³(the annual capacity), for the municipality of X	EUR	
Maintenance of 1 DWTP of x m³ (specify the treatment process and the annual capacity), in agglomeration X *including management of sludge (specify destination)*	EUR	
Maintenance of water reservoirs, of x m³(annual capacity), for the agglomeration of X	EUR	
Maintenance of the pumping system (boosters and pumping stations), of x m³(annual capacity), for the municipality of X	EUR	
Maintenance of the distribution pipes, in the agglomeration of X	EUR/km	
Maintenance of the SCADA system, for the municipality of X	EUR	
Other (specify)		

Wastewater sector		
Maintenance of sewer, in the agglomeration of X	EUR/km	
Maintenance of the pumping system, of x m³(annual capacity), for the municipality of X	EUR	
Maintenance of the retention system, of x m³, for the municipality of X	EUR	
Maintenance of 1 WWTP of x p.e. in the agglomeration of X, *including sludge management (specify destination)*	EUR	*Based on average destination to the fields (agricultural reuse) or landfill*
Other (specify)		
Savings (if applicable)		

Annex 2 Technical lifespans of equipment and works

Equipment and Works – Water

Equipments and works	Technical lifespan (years)
Boreholes (equipment)	15
Water intakes: civil engineering	40
Access ways	40
Treatment plants: civil engineering and pipes	40
Treatment plants: electromechanical equipment	15
Pumping stations (equipment)	15
Transport pipes	40
Supply pipes	40
Concrete water reservoirs	40
Metallic water reservoirs	40
Mechanical equipment (including piping)	15
Electromechanical equipment (including production for isolated sites)	15
Water Connections	40
Users' Meters[31]	15

Equipment and Works – Wastewater

Equipment and works	Technical life (years)
Access ways	40
Treatment plants: civil engineering and pipes	40
Treatment plants: electromechanical equipment	15
Pumping stations (equipment)	15
Collection pipes	40
Mechanical equipment (including piping)	15
Electromechanical equipment (including production for isolated sites)	15
Wastewater Connections	40

NOTE: Equipment with technical lifespan shorter than the reference period shall be considered as replaced at the end of its lifespan, and such costs built into the CBA analysis.

For items whose technical lifespan equals the reference period, and beyond, the values above shall only be considered, *prorata temporis*, for the calculation of the residual value (in case of technical life equal to the reference period the residual value is zero).

[31] Provided that regular check and calibration is performed

Annex 3 Assumptions and sources of data for forecasts to be performed in the CBA

1. Rationale

This guidance is to be provided as part of the National CBA Guidelines to establish the framework for analysis to be performed by the Applicants (and their Consultants).

The data presented below are consistent with the macroeconomic assumptions used for the development of the National Strategic Reference Framework (NSFR), which is the guiding document for the preparation of Operational Programmes, and their related projects.

2. Macroeconomic and population growth assumptions

a) GDP Growth

Forecasts shall be based on the latest available prognosis of the Comisia Nationala de Prognoza (CNP). The current version of the Guidelines builds on the data published in May 2008 as part of the document *Prognoza de primavara pe termen lung 2008-2020*, available at www.cnp.ro.

For period after 2021, and for all remaining years of the analysis, the forecasts will take into account a stable **average 5% GDP growth rate** (in real terms) per annum.

The following table summarises the assumptions to be used.

Table 1 – GDP growth assumptions (% per annum)

2006*	2007	2008	2009	2010	2011	2012	2013	2014
7.7	6.0	6.5	6.1	5.8	5.8	5.7	5.7	5.5
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021 and beyond**		
5.3	5.4	5.6	5.7	5.3	5.2	5		

** data from previous CNP publications*

The table above refers to data at a National level, as published by CNP.

b) Inflation

Data on inflation are based on the development of the yearly Consumer Price Index (CPI), where inflation is calculated deducting 100 from the yearly CPI. The current version of the Guidelines builds on the data published in May 2008 as part of the document *Prognoza de primavara pe termen lung 2008-2020*, available at www.cnp.ro.

For period after 2021, and for all remaining years of the analysis, the forecasts will take into account a stable **average 2,0% inflation rate** per annum.

The following table summarises the assumptions to be used.

Table 2 – Inflation dynamics assumptions (growth rate per annum in %)

2006*	2007	2008	2009	2010	2011	2012	2013	2014
6.56	4.84	7.5	4.5	3.6	3.2	2.8	2.5	2.3
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021 and beyond**		
2.0	2.0	2.0	2.0	2.0	2.0	2.0		

** data from previous CNP publications*

c) Exchange rate

Forecasts will be based on the latest available prognosis of CNP. The current version of the Guidelines builds on the data published in May 2008 as part of the document *Prognoza de primavara pe termen lung 2008-2020*, available at www.cnp.ro.
For period after 2014, and for all remaining years of the analysis, the forecasts will take into account **a stable exchange rate of 3.25 RON/Euro**.

The following table summarises the assumptions to be used.

Table 3 – Exchange rate assumptions (RON/EUR)

2006*	2007	2008	2009	2010	2011	2012	2013	2014
3.53	3.34	3.55	3.45	3.38	3.33	3.30	3.25	3.25
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021 and beyond**		
3.25	3.25	3.25	3.25	3.25	3.25	3.25		

** data from previous CNP publications*

d) Population Growth

The latest available prognosis of CNP on population growth (PROIECȚIA PRINCIPALILOR INDICATORI MACROECONOMICI ÎN PERIOADA 2008 – 2013 – Prognosa de Primavara available at www.cnp.ro) indicates the following prognosis for population growth at a national level:

Table 4 – Population dynamics assumptions (% growth per annum)

2006	2007	2008	2009	2010	2011	2012	2013	2014+
-0.2	-0.3	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3

If more detailed official data are available for population growth at local level, then it is recommended to use those, clearly specifying the source of the data[32].

If not, reasonable assumptions shall be used (and duly presented in the CBA) to derive population growth at local level from National values.

3. Data on Household Income for affordability assessment

Current
Unless more detailed official data at the local level are available (sources needs to be clearly specified in any CBA to be presented), data from the Family Budget Surveys on INSSE (the Statistical office) shall be used for establishing disposable income at local level. The latest INSSE's Statistical Yearbook includes a chapter summarising statistics taken from Family Budget Surveys.

Forecasts
It is recommended considering household's disposable income growth as equal to GDP growth. As a result, current data collected, split by income decile, will be projected using a growth rate equal to the GDP growth.

Please note that the income of the lower three deciles are likely to evolve at a lower pace than the average income, which is indexed fully to GDP growth. To that extent, it is recommended to use historical averages during (at least) the last 5 years to determine the percentage of growth rate that can be attached to the income of the last three deciles.

[32] As a information, please note that in September 2008, the INS has published a new population forecast at national level with a horizon to 2050, which provides information about population data for the years 2007 and 2050, including detail of population at County Level.

Annex 4 Methodology followed in estimating and monetising project's benefits and negative externalities in these Guidelines

A4.1 Introduction

For the economic analysis to be performed in line with these Guidelines, ***a minimum set of project benefits*** needs to be taken into account, according to the following main categories:

1. Benefits from improved access to drinking water, which translates into more water of adequate quality sold to the customers, either through increase of the coverage of the water supply service or to the increase in individual consumption due to the improvement of the quality of the service (i.e.: increase of pressure and decrease of service interruptions).

2. Benefits from improved quality of bathing and other surface waters, which translates into an improvement in the overall conditions of water bodies in the project area as a result of pollution prevention.

3. Resource cost savings:

   - for the customers, which takes place (i) when the customer does no longer need to rely on private wells, private pumps, septic tanks, and does no longer have to buy bottled water
   - for the operator, through the optimization of the system which allows for a reduced resource depletion through water abstraction as well as a reduction in emissions related to energy savings.

Turning to the negative impact of the implementation of the project, the following ***negative externalities*** are to be taken into account, as an economic cost:

4. CO_2 emissions from sludge digestors, based on a quantification of gas production and related CO_2 portion.

5. CO_2 emissions from sludge transport to disposal sites, based on quantification of dehydrated sludge and other waste from the WWTPs (screenings, grid) to be transported to a sanitary landfill and to surrounding agricultural fields.

For the project benefits under category 1 and 2 above, the approach is based on unitary values identified in a study performed by Ecotec for an assessment of the benefits to comply with environmental acquis.

The results of this assessment are included in the report "*The benefits of compliance with the environmental acquis for the Candidate Countries*"[33]. These Guidelines relies particularly on the methodological approach and findings of part C of the above mentioned study, focused on the implementation of Water Directives.

The monetisation of benefits of category 3 above, as well as negative externalities are based on estimates provided by MESD. The price for CO_2 emission is based on the latest scenarios published by EIB.

A4.2 Improved access to drinking water services

The ECOTEC study uses the result of other studies to estimate the WTP for the benefits for three impacts categories related to the implementation of all water related directives:

[33] Available at http://ec.europa.eu/environment/enlarg/benefit_en.htm

1. Benefits to human health from cleaner drinking water;
2. Benefits to users of water bodies (lakes and rivers) for bathing; and
3. Non-use benefits due to better water quality in rivers.

This is only a subset of the total identified benefits in the ECOTEC study, which is limited by the difficulties encountered in providing a monetary value to all benefits. The first benefit is discussed in this section, while the other two in the following section.

As a result of the project, benefits of improved drinking water will accrue to households that have a new connection to water supply, and to households that already have water supply, but are guaranteed better quality water and more reliable supply. In practice, the benefits will relate to both new access to supply and to availability of improved drinking water.

These types of benefits are generally difficult to estimate, and their monetisation is normally done on the basis of willingness to pay surveys conducted with a representative sample of the potential customers. Since such surveys are currently not available for Romania, it is recommended to use a benefit transfer approach, where the willingness to pay is inferred from other studies, under appropriate assumptions.

Based on other studies, ECOTEC identify the WTP for cleaner drinking water as ranging between 6.58 and 114.17 Euro/household/year in 1999 values, which in 2008 values become respectively [10] and [175] Euro/household/year[34].

The ECOTEC study recognized that the upper limit shall be surely considered as more representative of the real WTP and justify the assumption that this WTP concerns both unconnected and already connected households.

To that extent, for the calculation of this benefit is recommended to use as a starting value for the analysis of ***[148] Euro/household/year*** (85% of the upper value).

This will have to be calculated for all households in the service area concerned by the project .

Since WTP measures generally depend on income levels, annual values will have to be projected by increasing them following real per capita GDP growth over the project reference period (in line with the assumptions presented in Annex 2).

A4.3 Benefit for improved quality of bathing and other surface waters

This second benefit refers to the use value of an improvement in the quality of water bodies in the region under consideration. This is linked to the benefits accruing to people undertaking water related recreational activities.

Based on survey performed for Hungary, ECOTEC calculate the WTP for such benefit for Romania in an average of 13.3 Euro/person/year in 1999 values, which in 2008 values equals ***[20.4] Euro/person/year***.

Given the characteristics of the original study and due to the fact that the local communities are likely to be the first one ready to pay for improved water bodies condition in their surrounding, the values above are considered realistic.

This benefit has to be calculated for the whole population living in concerned area (the County).

The ECOTEC study provides also an estimate for the non use value of an improvement in the water bodies as a result of pollution prevention. In 2008 values, this will be ranging between 0.004 and 0.011 Euro/household/km of river/year.

[34] According to Eurostat data, in the period between 1999 and 2007, Romania have experienced an average real GDP growth rate of 4.88% per annum. The calculations in this document are based on the assumption that this is equally transferred on GDP/household.

However the choice of the value depends on the specific conditions of the water bodies in the areas under analysis. To that extent, an assessment of such conditions in the technical feasibility study is a needed to justify the monetization of this benefit according to these lines.

Since WTP measures generally depend on income levels, annual values will have to be projected by increasing them following real per capita GDP growth over the project reference period (in line with the assumptions presented in Annex 2).

A4.4 Resource cost savings to customers

Resource cost savings to the customers are avoided capital and O&M cost for drinking water wells and septic tanks. New users connected with the project to drinking water and sewage collection system would not need to use private wells and septic tanks, which involve annual capital and O&M expenditures.

The total cost savings (Opex+Capex) per person has been estimated by MESD in 315 Euro/household/year for the operation of a private well[35] and 348 Euro/household/year for the operation of a septic tank[36].

Connection to the water supply system would also substitute the consumption of 1,5 bottle of mineral water per person/day.

The saving applies to the customers that are going to be newly connected by the project.

A realistic assumption on cost savings related to the connection of non-residential users, per economic agent, shall be developed in the individual analysis.

A4.5 Resource cost savings to operator

Since avoided O&M costs are already taken into account when performing an incremental analysis, resource cost savings to the operator shall be considered in term of i) avoided opportunity cost of water and ii) avoided emissions due to energy savings.

Through loss reduction and other efficiency measures envisaged in the project, less raw water has to be abstracted, i.e. more water will be available for alternative purposes or left in the natural environment. The value to monetise the avoided opportunity cost of water could be set at the level of the fee for water abstraction paid to Apele Romane.

A reduction in overall energy consumption brought forward by the project both in term of energy saving and in-house energy production, if relevant, will result in a reduction in CO2 emissions. The extent of such reduction shall be considered in the feasibility studies to assess its relevance.

The proposed values to monetise the reduction in CO_2 emission are in line with the latest EIB energy price scenario, going from 25 EUR per tonne of CO2 until 2010, and then assuming a gradual increase to 45 EUR per tonne of CO2 until 2030[37].

[35] Based on an annual cost per person of 110 Euro and an average household size of 2.87 persons.
[36] Based on an indicative estimate for Opex of 90 Euro/person/year, and Capex of 90 Euro/household/year, and an average household size of 2.87 persons. It is very important to note that for these calculations, and thus for a valid benchmarking, it has been considered the cost of a “correct individual treatment systems”: composed of tanks acting as pretreatment (settler + digestor) before drain systems. If the "correct individual treatment (tank + filtration / drain) is not always technically possible (for ex insufficient surface, slope, impermeable soil,...) then the "reservoir" option could be needed as fall back position.
[37] Clean Energy for Europe, a reinforced EIB contribution. Available at http://www.eib.org/about/publications/clean-energy-for-europe.htm

A4.6 Negative Externalities

When relevant to the technical solutions envisaged in the project, the economic analysis will have to take into account, as economic costs:

CO_2 emissions from sludge digestors, based on a quantification of gas production and related CO_2 portion, to be justified in the technical feasibility study.

CO_2 emissions from sludge transport to disposal sites, based on quantification of dehydrated sludge and other waste from the WWTPs (screenings, grid) to be transported to a sanitary landfill and to surrounding agricultural fields.

To ensure consistency, the corresponding increases in CO_2 emissions needs to be monetised according to the same price scenario used in the previous section.