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IDENTIFICATION AND DEFINITION OF TECHNICAL-ECONOMIC SCENARIOS AND OPTIONS IN THE COST-BENEFIT ANALYSIS OF INVESTMENT PROJECTS FINANCED FROM ERDF AND CF

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1. INTRODUCTION

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 achieving the identified objectives. The decision making process aims to prove that the project alternative chosen can actually be implemented and it is the best option among all feasible alternatives.

EU Regulations require the applicant to provide the results of feasibility and option analysis. The main result of such analysis is to identify the most promising option on which detailed CBA should be carried out. Sometimes, this selection process is managed as part of the preparation on an Operational Programme or masterplan.

CBA analysis is designed to identify options for which benefits are greater than costs. According to the theory underlying CBA, an option should normally not be adopted if benefits are smaller than costs. It will, however, often be the case that costs and benefits are not known with certainty. An explicit consideration of uncertainty, as a minimum in the form of a sensitivity analysis[1] should be part of any cost-benefit analysis.

The CBA analyzes and evaluates, from a cost perspective, the candidate solutions to meet the stated need. It also describes the feasible alternatives that lead to sustainable development in society, all tangible and intangible benefits, and the results of the analysis. It will discuss which system costs are analyzed, present the total costs for all the years the analysis covers and outline the comparison between the costs and the tangible benefits of each alternative.

A project is feasible when its design meets technical, legal, financial and other constraints relevant to the nation, region or specific site. Feasibility is a general requirement for any project and should be checked carefully. Moreover, as mentioned, several project options may be feasible.

The results of the feasibility studies need to be presented as part of the Application for Major Investment Projects according to the requirement of European and Romanian legislation[2]. Evidence should be provided that the selected project is the most suitable alternative between the options considered[3].

After defining the project area and beneficiaries and also project objectives, the cost-benefit analysis for the proposed application must contain a section regarding the project description and cost. First, the alternatives considered are described. The next step is to estimate, for each forecasted scenario, all the investment costs and expenses for maintenance (ordinary and extraordinary) and for renewals. Finally, the most suitable alternative is selected and the decision is justified.

In this paper we use two important notions: ***scenario*** and ***option***. Describing a scenario represents the forecast of the future for an activity. Technical and economical *scenarios* represent the so called ”project alternatives” which entirely meet the required objectives. For example, if we have a plot of land and the aim

[1] For more details on how to prepare a sensitivity analysis please refer to the Working Paper “Elaboration of the sensitivity analysis as part of the Cost-Benefit Analysis”.
[2] See EC Regulation 1083/2006, Art. 40(c), as well as HG 28/2008
[3] European Commission, *Working Document No. 4 – Guidance on the methodology for carrying out Cost-benefit analysis*, 2006, Brussels, page 6

is to give the best possible use for this land, we can consider some different scenarios (depending on the restrictions imposed by various factors): amusement park, park with flowers, SMEs park (business park) or even use of the land for agriculture. If we analyze a new investment, various scenarios for location could occur. Or if the objective is to reduce losses in water supply system with 40%, this can be achieved through different scenarios (alternative projects): changing pump and tank and some network renewals or network identification losses and network replacement as much as possible. Or if the objective is to train all school-aged children from an area, the scenarios include: expanding existing schools, building new schools (but where?), redistribution of children in the existing schools, rehabilitation of some school buildings and purchasing school buses. These technical and economic scenarios are usually analyzed in pre-feasibility study. They appear in the feasibility study only if the pre-feasibility phase was skipped.

We use the term *options (or alternatives)* to define some alternative ways of achieving the objectives of the project, into the framework defined for a scenario. In other words, first we define scenarios and then we select a few options/alternatives for each scenario. ***Options*** in cost-benefit analysis are always compared to ***a reference scenario*** and represent changes from that ***scenario.***

For each option, the most common approach is the incremental methodology, meaning: 'without project' scenario, respectively 'with project' scenario, which are discussed in detail below.

In this context, the objective of this paper is to provide guidance for the identification and selection of the most suitable alternative for a project, but also for defining investment options that must be considered in a CBA. The paper helps both applicants and assessors of projects define the expectations regarding project options taking into consideration differences across sectors.

The paper describes how to identify and define the technical and economic scenarios and options in Cost Benefit Analysis and includes examples. Using incremental approach, examples of defining the assumptions for the 'without project' (base case or business as usual) scenario, but also 'with project' scenario, are included.

This process aims at providing evidence that the project choice can actually be implemented and it is the best option among all feasible alternatives.

The alternative selection is a matter of technical, but also economical approach. The fact that the selection of the most suitable alternative comes from other parts of the project feasibility studies (technical, environmental etc.) is also emphasized, but it must be presented in the Cost Benefit Analysis.

A Cost Benefit Analysis must present at least three alternatives. One alternative that should be always included in the CBA is to continue with no change. During the work process evaluation, a number of alternatives can be considered, describing how to do development, operations, and maintenance. Each technical approach that is a viable alternative from a work process perspective should be included, as an alternative. However, the number of technical approaches may be limited if only one or two are compatible with EU and national general framework (policies and legislation). Some alternatives could be rejected because they are not feasible for reasons other than costs and benefits.

Considering these issues, the second part of the case deals with the option analysis performed to identify the alternative that achieves the intended objectives at the minimum overall cost to society. In this section,

the paper discusses how to define the least three options required for analysis: a 'zero option' (named 'business as usual'), a 'maximum investment option' and a 'minimum investment option'. Some examples of identifying these options for a project are also provided.

The basic approach of any investment appraisal aims to compare the situations with and without the project. So, the case also refers to the incremental method that must be used in a Cost Benefit Analysis, and how to define the 'without project' scenario, respectively 'with project' scenario, with some examples.

2. THE CASE

2.1 SCENARIOS: BASE SCENARIO AND INCREMENTAL APPROACH

To select the best option, the person that prepares the application must first define some scenarios, then alternatives (options). A very important issue has to be underlined: all the scenarios must be consistent with the objectives of the project. *An analysis that emphasizes one or more financially successful scenarios, which do not respond to the purposes of the proposed project, is not properly conducted*.

In addition, it has to be justified that the project will contribute to the broad objectives of the EU regional and cohesion policies and it is logically related to the main objectives of the funds involved: ERDF and CF. The project must be also coherent with EU legislation in the specific area of intervention (mainly transport and environment) and more generally with EU legislation (public acquisitions, competition, State aid etc.). The project appraisal considers the consistency of objectives with the key priorities of the Operational Programmes (OPs), formulated at the national or regional level, and the National Strategic Reference Frameworks and legislation. So, it is a waste of time and resources to analyze scenarios that are not consistent with the general requirements described above.

Starting the option analysis, the construction of the **base scenario**[4] is just as decisive for the outcome of the CBA as the configuration of the project alternative. The base scenario is the best alternative for the project. This therefore does not mean 'doing nothing' and, per definition, also does not constitute 'current policy'[5]. A risk-free interest rate investment is often used as the best alternative way of spending investment resources. The best alternative policy implementation can, for example, consist of utilization measures or of smaller investments.

In case the project is not realized, sensible choices must be made. The base case is therefore a combination of the best other application of resources and the best possible other solution. The base scenario is therefore something other than 'not doing anything' and is also not the 'existing policy'. For each situation, the best alternative for the project must be determined. Sometimes, the implementation of another, much smaller project, is the best way, and sometimes it is more advantageous to reduce the negative effect to society rather through another policy. Postponing the project is also often a relevant choise. The difference between the project alternative and the base case is not only determined by the project itself. The construction of the project could, for example, challenge competitors to make efficiency improvements. As a result, the environment in the project scenario could look different from the environment in the base case.

The implementation of a project usually leads to a development in society which does not occur without the implementation of the project. Social decision-making means choosing from one of these development paths: one of the project options or the base case[6]. Project effects can be defined as the differences

[4] We also use 'base case' to name the base scenario
[5] Eijgenraam, CJJ., Koopmans, CC., Tang, PJG., Verster, ACP., Evaluation of Infrastructural Projects, *Guide to Cost Benefit Analysis*, Netherlands Economic Institute, 2001, Rotterdam, page 27
[6] Using this approach, the base case is a scenario, but it is also an option, because in the most of the situations there are not defined more options for the base scenario

between a project alternative and the base case. When measuring these effects, the base scenario is therefore just as important as a project alternative. There is a danger of serious overestimation of the profitability if the base case is not developed extensively enough.

When conducting the CBA of a project, all costs and benefits should be exclusively attributable to the project. This means that in CBA the 'with project' situation should be compared to the 'without project' situation, which is not the same as the 'before project' and 'after project' situation! The 'without project' situation is the next best alternative to the project. The net benefits of the next best alternative should be subtracted from the net benefits of the project.

Without the project, some social or economic problems will probably develop, so that the developments in the base case will probably not be an extrapolation of historical trends. The people preparing the project will probably also deem the base scenario to be not interesting enough to pay a lot of attention to it. They may even find, from a technical point of view, that spending much time on it is illogical, because the task is to find a solution to a problem by designing the best project. Why should therefore spend a lot of time and energy on a situation which should be avoided? If they think along these lines, they take as a certainty that the problem, for which the project can offer a solution, must be solved whatever happens. It seems as if it is already clear in advance that the social benefits will be greater than the social costs. The project preparation must then be reduced to setting out priorities based on a cost-effectiveness analysis (CEA).

The financial and economic performance analysis must be made with the incremental net benefits technique, which considers the differences in the costs and benefits between the do something alternative(s) and the scenario without the project[7]. In other words, the use of the incremental method in the cost-benefit analysis means that the project is evaluated on the basis of the differences in the costs and benefits between the scenario with the project and an alternative scenario without the project.

Sunk costs and realized benefits should be ignored. Past experience is relevant only in helping to estimate what the value of future benefits and costs might be. Analysis should take particular care to identify the extent to which a policy, such as a subsidy program, promotes substitutes for activities of a similar nature that would occur without the policy. It should be explicitly recorded displaced activities as costs or only incremental gains as benefits of the policy.

It is important if the project aims to build a new infrastructure or to rehabilitate an existing infrastructure. When the project consists of a development of a pre-existing infrastructure, the application of the **incremental method** may prove to be very difficult and it is suggested that the method of remaining historical costs is used in the financial analysis. This approach means that the scenario with the project takes into consideration the cost of investment not only of the new element of infrastructure but also of the infrastructure that already exists estimated at its current residual value, but also all the income generated by all infrastructure after the project. Operating costs and revenues considered for the entire infrastructure must be those of a scenario of efficient operation.

One issue that sometimes arises when considering the expansion or restructuring of existing infrastructures is how to distribute incremental flows between the old and the new capacity. Unfortunately, simple

[7] The scenario without the project is usually called BAU scenario (business as usual)

accounting apportionment rules (e.g. the share of 'old' and 'new' revenues are attributed in proportion to 'old' and 'new' capital expenditures) are often misleading. The right approach is always to compare the 'with' and 'without' project scenarios, which is the incremental approach, as we mentioned above.

In other cases, an incremental benefit cannot always be quantified in terms of output, because the output does not change at all. In such cases, the incremental benefit should often be appraised as an improvement, for example, in service quality, or as avoided cost, because of service interruptions (e.g. based on willingness-to-pay for quality or continuity of supply).

Specifically, the incremental method consists in the following steps[8]:

1. Forecasts 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. Estimations of the operation's cash-flows, taking into account the proposed projects and its impact in term of operations ('with project' scenario). It must be taken into account the whole investment plan, account for changes in operational and maintenance costs.
3. The 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 entirely the incremental cash-flow.

It is expected that the 'without project' 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 proposed in the 'with project' scenario.

2.2 DEFINING OPTIONS

The search for alternatives is very important within the project. The alternatives could be related to the timing and scale of the project. The advantages and disadvantages of 'now' versus 'later' and 'small' versus 'large' should be investigated systematically. This also involves looking at building the project in stages. CBA is extremely well suited for comparing various (project) alternatives systematically and for providing information in terms of which the various alternatives can be assessed.

During the work process evaluation, a number of alternatives could be considered, for example, whether to do development, operations, and maintenance with in-house personnel or contractors, providing several potential, competing alternatives. The decision to use in-house resources or contractor resources is often a case where in-house resources are not available, so only one alternative may be feasible for the CBA. If that is the case, it should be documented.

[8] Ministry of Economy and Finance, Ministry of Environment, *Guidelines for Cost Benefit Analysis of Water and Wastewater Projects to be supported by the CF and ERDF in 2007-2013*, 2008, Bucharest, page 12

Each technical approach that is a viable alternative from a work process perspective should be included. However, the number of technical approaches may be limited if only one or two are compatible with the EU and national requirements. Some alternatives could be rejected because they are not feasible for reasons other than costs and benefits.

For any project that involves acquiring equipment, it should be considered the alternatives of leasing or purchasing. With the rapid changes in technology, the lease-purchase analysis is useful in the decision making process.

Romanian in force legislation[9] requires that at least three options are taken into account: a 'zero option' (without investment or 'no change')[10], 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.

So, to be consistent with this legal requirement, *a CBA must normally present at least three alternatives*. Our recommendation here is that a difference between non major investments and major projects to be made in the legislation. For smaller projects (but anyway over 5 million Euro[11]), it is recommended to require only two options instead of three. There are also types of investments for which options are very difficult to describe, because the future depends on an uncertain variable (e.g., for research projects this variable is the level of success for the research activity). In such cases, the number of minimum required options could also be reduced.

First, it is helpful to describe a base scenario[12]. This will usually be a forecast of the future without the project, called the 'business as usual' (BAU)[13] forecast or the alternative to continue with no change. This is also sometimes labelled the 'do-nothing' scenario, a term that does not mean that operations of an existing service will be stopped, but simply that they will go on without additional capital expenditures (a no-investment forecast of what will happen in the future in the context under consideration). This scenario is not necessarily non-costly, because for already existing infrastructures, operational and maintenance costs will incur, while revenues are generated, if any).

For the BAU scenario (it is also the case for each alternative), the preliminary step is to estimate all the investment costs and expenses for maintenance, ordinary and extraordinary, and for renewals, and then to allocate these costs over the time horizon. It is necessary to ensure that the project will include all the works required for its functioning (for example, the links to the existing networks, the technological plants, etc.) as well as the relevant costs of each alternative. The estimates of costs and times need to be realistic and preferably 'on the safe side' given the uncertainties involved. The latter point is particularly important for those projects which may be of significant relevance for the local community.

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[9] See HG 28/09.01.2008
[10] For the projects in Environment (extension and modernization of water and wastewater systems), 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.
[11] See WP No 2
[12] As we mentioned above, this scenario is also an option.
[13] European Commission, *Guide to Cost Benefit Analysis of Investment Projects*, Directorate General Regional Policy, 2008, Brussels, page 32

If the 'no change' alternative is unacceptable, the costs and benefits of that alternative may not have been documented. Including that alternative should prove that it is not the best alternative. If there are other factors that make the 'no change' alternative unacceptable, that can be documented, and it would not be necessary to compare its costs and benefits against the feasible alternatives.

In some circumstances, it is useful to consider, as a first project option against the 'business as usual' scenario, a 'do-minimum' project, because the EU does not finance the mismanagement and the applicant for EU funds must demonstrate the self financial sustainability, for both 'without project' scenario and 'with project' scenario.

Hence, this option includes a certain amount of costs for necessary improvements, in order to avoid deterioration or sanctions. In some cases, for example, public investment projects are motivated by the need to comply with new regulations. The 'do-minimum' option here is the least cost project that ensures compliance. This is not always, however, the most beneficial option and in some cases the compliance investment costs can be substantial.

After having defined the BAU scenario and the 'do-minimum' option, it is necessary to look for other possible alternative solutions on the basis of technical, regulatory and managerial constraints, and demand opportunities ('do-something' alternatives). One critical risk of distorting the evaluation is to neglect some relevant options, in particular some low-cost solutions (i.e. managerial capacity-building, pricing changes, alternative infrastructure interventions).

Once the feasible 'do-minimum' and a small number of 'do-something' alternatives have been identified, simplified CBA should be carried out for each option in order to rank them.

A simplified CBA usually implies focusing only on the key financial and economic items, with rough estimates of the data, because in a differential approach the absolute values of the variables involved are less important than in a fully developed comparison of alternatives.

Under some exceptional circumstances, the BAU option should be disregarded and the 'do-minimum' scenario used as the reference solution. In fact, in some cases, the BAU ('do-nothing') scenario cannot be considered acceptable because it produces 'catastrophic' effects.

In general, when dealing with options, pricing policy is often a decision variable and will have an impact on the performance of the investment, not least through influencing demand. Thus, the relationship between each option and the assumptions on tariffs, or other prices, should be explored. The combinations of locations, investment expenditures, operating costs, pricing policies, etc., may amount to a large number of feasible alternatives, but usually only some of them are promising and worth detailed appraisal. An experienced project analyst will typically focus on the BAU scenario, the 'do-minimum' option and a small number of 'do-something' options[14].

[14] In our opinion, this is only the case for major projects

2.3 OPTION SELECTION

This type of analysis entails looking at the returns of a project in comparison with alternative ways of making investment resources work for the community. The notion that the cancellation of a project could result in a loss of income and employment for the economy is not always correct. This can only be determined after the benefits have been compared to the alternative returns. This is exactly what takes place in a CBA.

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.

Because a CBA often relies on many assumptions, it is important to document all of them, and, if possible, justify them on the basis of prior experiences or actual data. This can also be an opportunity to explain why it does not include some alternatives in the analysis. It is possible to eliminate some alternatives in the early stages of a CBA because of a conclusion that it is not feasible. If that conclusion is based on an assumption, that assumption must be clearly explained and justified.

The selection of the option to be retained has to be performed according to the following subsequent steps[15]:

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; this process of defining and screening of the possible options should consider different technological options balancing advantages and disadvantages of the options analyzed. In most of the cases, this level of option analysis can be considered as sufficient. But it has to be noted that purely 'technical' option analysis, 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) with the aim of eliminating unsuitable options. This should be 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 terms of their cost effectiveness by quantifying overall investment costs, as well as operating and maintenance costs related to each retained alternative[16]. All costs will be estimated on an annual basis, covering the entire reference period. The least cost methodology consists in subtracting the discounted inflows (the revenues generated during the operation period of the investment and also the residual value of the different facilities/equipments and other assets at the end of the reference period) from the discounted outflows (costs). After the costs and benefits are discounted for each competing alternative, the discounted net value is used to compare and rank the competing alternatives. When the alternative with the lowest discounted cost

[15] Ministry of Economy and Finance, Ministry of Environment, *Guidelines for Cost Benefit Analysis of Water and Wastewater Projects to be supported by the CF and ERDF in 2007-2013*, 2008, Bucharest, page 10

[16] The costs comprises at least the following items: land acquisitions or expropriations, design and construction costs for the different facilities and buildings, costs for purchases of new equipments, costs of replacement of equipments when its economic life is lower than the reference period, operation and maintenance costs etc (for a detailed analysis of costs see The Working Paper no.4).

provides the highest discounted benefits, it is clearly the best alternative. In other words, the best option is selected using the NPV criteria.

Financial analysis does not capture the possible external impacts to society for the different options. If the overall expected impact is similar for each of the considered alternatives, the least cost option is retained as the preferred one. If differences in term of external impact are identified across alternatives, the least cost analysis is adjusted to incorporate the identified externalities, in order to establish a final ranking that takes into account the monetized external positive or negative impacts[17].

When some benefits have monetary values assigned, but others do not, and the cost figures do not show a clear winner among the competing alternatives, the non-cost values could be used as tie-breakers. If the non-costed benefits are key factors, the costed benefits could be converted to scaled numeric values consistent with the other non-costed benefits. Then the evaluation is performed by comparing the discounted costs and the relative values of the benefits for each alternative. When the alternative with the lowest discounted cost provides the highest relative benefits, it is clearly the best option. If that is not the case, the evaluation is more complex.

If no benefits have monetary values, numerical values (using some relative scale) can be assigned to each benefit for each competing alternative. Then the evaluation is completed and the alternatives are ranked as described in the previous paragraph.

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

* * *

In the following subsections, we use a sectoral approach that synthesizes the issues that must be considered when describing scenarios and options for a project. We also include some examples.

- ***regional and local transport infrastructure*** – investments in this field are similar in terms of investment structure, which differs is only the general objective of investments: road, rail, water or air transport infrastructure, traffic safety, intermodality, etc.

  For projects in transport infrastructure, the BAU scenario should not be a 'catastrophic' one, resulting in traffic paralysis and in very high social costs. In the case of strong congestion phenomena, whether at present or in the future, the reference solution should include those interventions (management, maintenance, etc.), which will probably be put into action in the absence of the project. The analysis of alternative project solutions is equally critical. It is necessary to identify all promising technical alternatives on the basis of physical circumstances and available technologies. The main potential for distorting the evaluation is the risk of neglecting relevant alternatives, in particular low-cost solutions, such as managing and pricing solutions, infrastructure interventions that are considered as not 'decisive' by designers and promoters, etc.

  In order to verify the feasibility of a project in ports, airports or intermodal facilities, the key issue is the quantification of the present volume of passenger and/or goods traffic, based on daily and seasonal

[17] See Working Paper no. 7 regarding externalities

trends and forecasts for the future pattern of traffic flows. Quite often ports, airports and intermodal and logistics facilities compete with other similar infrastructure. The strategies of competing nodes should be explicitly considered in the estimate of future demand. Alternative technical solutions to be explored could include the upgrading of existing facilities, for instance by adding a new berth, or the use of new technologies, like innovative air traffic control devices. The advantages and drawbacks of each solution are to be carefully compared.

As an example, we present a project consisting of a city ring road rehabilitation and modernization of the existing infrastructure. The Feasibility Study contains a detailed description of the technical solutions offered to ensure minimum safety traffic conditions and stop the degradation process. A brief overview of the proposed solutions is found in the CBA.

- *Without Project Scenario*: This scenario assumes that the project has not been implemented. The analysis is based on the current maintenance costs inferred by the actual technical status of the infrastructure. However, despite of these annual maintenance works, the road condition will slowly deteriorate, so that the City Hall will be forced to carry out important maintenance works in order to keep this section in good use conditions. Regular maintenance works will be carried out every seven years. Another problem of this scenario is represented by the ecological costs of the future inaction from present.
- *With Project Scenario*: This scenario assumes that the project is fully implemented. The proposed investment will cause a certain decrease of maintenance costs.

➢ ***environment*** – investments in this field consists in infrastructure development (water and wastewater infrastructure, waste management systems), but also addresses non-traditional fields of interventions like efficient urban heating systems, risk prevention, ecological reconstructions and Natura 2000 management plans implementation

For a project consisting in water supply infrastructure, the alternatives could be: the BAU scenario; the possible alternatives within the same infrastructure, for example: different location of wells, alternative routes for aqueducts or trunk lines, different building techniques for dams, different positioning and/or process technology for plants, utilization of different energy sources for desalination plants, etc.; the possible alternatives of sewage drains (lagoons, different receptors, etc.); the possible global alternatives, for example: a dam or a system of crosspieces instead of a wells field or the agricultural re-utilization of properly treated sewage, a consortium depurator instead of several local depurators, etc. In selecting the options, the constraints arising because of the legislative framework (EU acquis), and in particular, from the European policy on water have to be taken into account. In addition, the design alternatives to be evaluated must meet the water sector programmes (planned of use of water sources, programme of construction of new water infrastructure, rules of management of water services, plan of waste water disposal and/or re-use, etc.) of the Member State.

For the waste treatment projects, against the BAU scenario, some available alternatives are analyzed to give the reasons for the choice of 'doing something' instead of maintaining the status quo option. The arguments will focus on the economic, social and environmental benefits of the project and should emphasize the resulting costs for the status quo option in terms of economic costs, environmental and

human health impacts. The feasibility study will expose the technical alternatives to the option selected. It could be for an incinerator, for example, the type of furnace or the adjunction of a steam boiler for energy recovery. In the global scenario (for example the study of an incinerator as an alternative to a landfill, or a separate collection centre for recycling in place of a final disposal plant as a landfill), the study will focus on the different methods for waste management in the context of the project. The project should distinguish one alternative focusing on the prevention, the re-use, the recycling or the recovery to be compared with the option chosen. The aim is to fulfill the hierarchy principles and initiate their concrete integration into waste management project analysis.

A project in the area of natural risk prevention may consist of: policy planning (policy and planning measures are implemented at the national or regional level and help to integrate disaster risk measures into the policy framework); physical components (physical measures are designed for prevention, to reduce the vulnerability and exposure of the infrastructure to natural hazards, as well as to provide coping and adaptive infrastructures in case of a disaster. Options analysis is particularly important and should consider global alternatives as well as solutions closely linked to the local context.

We illustrate here with an example of a project consisting of implementation of water and wastewater services. It will offer to the beneficiaries the following benefits: improving drinking water quality and safeguarding public health; protecting the environment, in particular, water quality in natural rivers and groundwater; maximizing the number of inhabitants connected to drinking water; increasing the collection of wastewater; improving service standards and increasing water supply wastewater reliability; optimizing the water distribution network and wastewater collection and treatment system; achieving energy savings and reducing operating costs generally; increasing the capacity of the local operator. As we mentioned before, for such projects, the 'zero option' will not be a feasible strategic option. Nevertheless, to use the incremental cash flows generated by the project, the project is evaluated on the basis of the differences between the scenario 'with the project' and an alternative scenario 'without the project'. For the 'with project' scenario cost and revenues considered must be those of a scenario of efficient operation. For the 'without project' scenario cost and revenues considered are those of a BAU scenario, without any major new investments or replacements. The assumptions for each of the two scenarios could be formulated as follows:

- *Without Project Scenario*
  - ✓ connection rates are kept constant at the level of base year
  - ✓ the metering rates remain constant to the level recorded in the base year
  - ✓ specific billed water consumption is assumed to decrease in the first stage as result of price increases (elasticity with tariffs) and then increases as result of individual wealth (elasticity with individual wealth)
  - ✓ due to lack of network rehabilitation, physical water losses are expected to be kept constant at the level recorded in the base year; if there are other investments performed by local stakeholders for infiltration reduction, the infiltration record a slight decrease or kept constant at the level from the base year

- ✓ specific assumptions for fixed and variable cost items[18]

- *With Project Scenario*
  - ✓ connection rates to water supply and sewerage networks increase in line with the network extension measures of the project
  - ✓ the metering rates increase for all consumers categories up to *p*% in *n* years from the completion of the project
  - ✓ specific billed water consumption is assumed to decrease in the first stage as result of price increases (elasticity with tariffs) and then increases as result of individual wealth (elasticity with individual wealth)
  - ✓ due to project implementation, the level of losses are expected to decrease, reaching the minimum level in the year of project completion
  - ✓ specific assumptions for fixed and variable cost items

➢ ***social infrastructure*** (social services infrastructure, health and public safety, education infrastructure)

The feasibility of the projects in health infrastructure should be verified according to patient flows and trends and by taking into consideration the epidemiological data available. For the alternative options, the critical issues to establish are: different medical-technological solutions; the construction of a new infrastructure, or the enlargement of an old one; different treatment systems.

Option analysis for projects in education infrastructure must focus on evaluating the demographic and labour market trends, which determine the potential number of pupils and the opportunities available to them. The description should include: demographic trends, disaggregated by age range and by geographical area; the rates of enrolment, attendance and completion of studies; this information will be even more useful if broken down by sex and geographical area; employment forecasts for various sectors, including forecasts of the organizational changes within the various productive segments; it is important to forecast the growth of new professions and the decline of others. The alternative feasible options for the project can be differentiated by the following aspects: target (unemployed, young people, disabled etc.), economic sectors involved in the training programmes, connections with the local economic environment.

For improvement of social services infrastructure we will consider an example of a project that consists of establishment of a social service center for the elderly. Its specific objectives are: prevent or limit the situations of difficulty or vulnerability that can lead to marginalization and social exclusion of representatives of the third age; addressing the large number of requests for free medical services in a center with qualified medical personnel; development of quality services offered to old people in social risk; organizing group activities / social information through specialized personnel, in various fields of interest, to prevent the social marginalization; increasing quality of life for the beneficiaries of services in the new center.

[18] For details about operational and maintenance costs forecasts see The Working Paper no.4

Three alternative options could be considered and analyzed:

- *The zero option* (the scenario without any investment): the building identified for this purpose is arranged for starting the activities, without any rehabilitation or intervention
- *The minimum investment scenario*: different solutions for thermic rehabilitation and recompartment of the building are analyzed, in order to meet the needs of optimum running of the proposed activities
- *The maximum investment scenario:* some construction works and changes are proposed, for different parts of the building; proposed changes lead to a major intervention on the structure of resistance and therefore a massive consolidation of the building, which means high costs of execution

➢ **development of regional and local business environment** (development of business support structures, rehabilitation of unused industrial sites, support for microenterprises)

For example, the feasibility of a project in industrial zones and technological parks should be verified by estimating the demand from existing companies to relocate to the new industrial area and the number of new companies that would be born thanks to the new equipped area. The options analysis should consider alternative policy approaches, e.g. direct subsidies to companies for moving premises, purchases of real services, technological innovation, new production lines or newly constituted companies, etc.

➢ ***tourism*** (restoration of cultural and historical heritage, tourism infrastructure)

For investments in museums and cultural sites, the potential flow of visitors, broken down according to type (for example: youngsters or adults, residents or tourists, etc.) is the main variable to be analyzed in the feasibility analysis, along with the construction or restoration costs. The comparisons in the options analysis should consider: variations in structural arrangement or lay-out of the infrastructure, possible alternative technology and methods of restoration/recovery for existing buildings, alternative choices of infrastructure (e.g. one could consider establishing a museum of technology on a new site instead of recovering a historical industrial structure, etc.).

We take an example of a project that consists of rehabilitation and restoration of a heritage building and including it in regional touristic circuit. To properly conduct the CBA, two scenarios could be defined, as follows:

- *Without Project Scenario*: The activity of the Art Museum will continue under current circumstances. The heritage building is public property and it is of local interest. It houses an important collection of paintings, sculptures and art objects, which are currently endangered due to the improper storage conditions. An important part of the collection is not properly put in value, due to insufficient and inadequate exposure space. As we can see, this scenario is gloomy, because perpetuating the current situation affects the tourists' image of the city and preserving quality of art collections.

- *With Project Scenario*: Restoration of heritage building and its introduction in Touristic circuit in a museum complex will bring benefits for all categories of visitors.

➢ ***innovative and eco-efficient production systems*** (sustainable development of Romanian production system and enterprise development)

The feasibility of the project in productive investments should be verified evaluating both the technological features (e.g. the production technologies employed) and the economic/financial ones (the financial solidity and the economic efficiency of the company and the possible dynamics of the product market). Moreover, it could be important to make a more in-depth analysis with regard to the: management skills and capabilities; organizational activities described in the business plan supplied by the companies, like logistics, supply chain and commercial policies. The options analysis should consider: location; alternative methods of financing (e.g. financing the interest account instead of the capital account, financing through a leasing contract, or other methods of financing); technical or technological alternatives to the proposed project and the global alternatives (e.g. supplying low-cost real services).

We illustrate this type of investment with an example of a project that consists in establishment of a business center and it aims to increase quality of life and create new local jobs by supporting business infrastructure development (establishment of a business center) and local entrepreneurship. Having high quality standard infrastructures, it will contribute to attracting new investments, creating conditions for growth, and social welfare and a high standard of living. By creating and providing better conditions for business infrastructure, there will be also new opportunities for employment for the population.

Three alternative options could be considered and analyzed:

- *The zero option* (which is in the same time the BAU scenario): only acquisition of supplies and equipments
- *The minimum investment option*: strengthen the existing building and purchase of supplies and equipments
- *The maximum investment option*: demolition of the existing space and construction of a new building, including facilities and equipment

➢ ***research, technological development and innovation for competitiveness*** (increase the capacity for RD, stimulating cooperation between RDI institutions and enterprises and increasing enterprises' access to RDI)

We present here a project consisting in development of research infrastructure, according to the principle of sustainable development. Thus, the proposer of the project is to incubate in more advantageous conditions, those companies performing analyses for the implementation of the most efficient renewable technologies (solar, wind, biogas, renewable plants) or of a mixture of them, depending on the energy potential and on the specific features of the concerned area, both transferring the already existent good practices, and also developing new practices for the research results. The general objective of the infrastructure investment is to create a specific and endowed center especially

for research and development in the renewable energy area. The centre built in the logic of two action strategies: one for the improvement of the quality in this research area and the other one for the actual empirical research programs and activities. The mixture of these two basic strategic lines is vital for the achievement of another good practice in this research field. Specific objectives of the project are: creation of innovative elements in the renewable energy area in order to increase the efficiency in the sustainable use of resources; dissemination of results, in order to promote the results of the research and to implement the newly improved technologies in various urban and rural areas, taking into account the specific features of each area; performing a pilot unit and complementary laboratories for the actual research.

In this case, the situation is extremely complex and the combination of the three possible decisions is presented below:

- *The zero option* (the 'do nothing' scenario) would represent the continuation of the research process, using the present development level. This fact leads to stagnation in the research process due to the lack of certain requirements.
- *The minimum investment option* would represent the upgrade of the existent infrastructure, using only the own funds and possibly smaller amounts from the public funds (structural and not only structural, for instance the possible set up of some locations for conferences and partnerships). At the same time, because of the lack of the sufficient infrastructure, the meeting between the institutions with research activities in the renewable energies field will not be possible. The hosting area of the already existent infrastructure would be repaired and restructured and also the existent infrastructure for RD would include main investments in the upgrade of some technologic lines in the renewable energy area at the level of the research endowment.
- *The maximum investment option* would represent the full achievement of the new infrastructure, using the structural funds according to this project, but also the own financing according to the schemes and percents stipulated in the project.

➢ ***information technology and communications for public and private sectors***

For projects in telecommunications infrastructures, the key issues are the volume of traffic and the daily, weekly and seasonal trends (the optimum capacity must be a reasonable compromise between the highest peak levels of traffic and that which the system can handle). The different options in these kinds of projects could be related to: possible technical alternatives within the same infrastructure (e.g. different types of cables, different transmission protocols, different commutation/connection technologies etc.); alternative locations for radio stations, possible global alternatives for the projected infrastructure, which can offer similar services such as a satellite transmission or mixed network (air-cable) rather than optic fiber cables.
For example, in the case of a project for the public sector that would implement an integrated information system:

- *The zero option* (the 'do nothing' scenario) is the version without investment, the continuation of the activity at current parameters, without implementing the investment project. The beneficiary

will work with existing fixed assets and additional needs will be met by renting equipment in those activities that exceed the technical possibilities of the Institution. There will still exist the inability to link information between departments of the institution and the contact with the citizen will continue to be nonexistent.

- *The minimum investment option* involves the purchase of equipment of medium performance at an average cost on the market. In the event that, for various reasons (financial / technical), the implementation of an integrated information system to ensure only the inner activity of the institution will be choosen, this would eliminate
  - The incompatibility of information sent between departments (we refer here to the departments that provide strictly internal functionality);
  - the possibility to duplicate information;
  - existing errors in the records, occurred as a result of various and internal documents encoding;
  - Difficult access to various informations from other departments;

  But still, there would be issues such as:
  - Difficult access to public information by citizens;
  - existence of several forms of applications or petitions to be filed with the Registrar (each citizen will be complete them in different way as there is no standard type of document for external communication available);
  - inability of citizens, and the Registry, to track the traceability of documents;
  - transparent decision-making will not be provided by the institution;

    Such a system will ensure the institution's internal functionality but is not open to citizens; virtually there will be no information flow which would allow bidirectional communication between the institution and citizens.

- *The maximum investment option* would represent implementing an integrated information system which improves specific management processes, while providing public administration and public services, through online components. Unlike previous scenarios, this leads to the modernization of public administration through:
  - Increased quality and accessibility of services offered to citizens and businesses
  - Increasing the transparency with citizens and businesses
  - Achieving fast and efficient internal information flow, improving the critical decision-making through the use of modern means of communication

➢ ***increasing energy efficiency and security of supplying energy (sustainable and efficient energy, use of ren***ewable sources of energy, diversifying energy interconnection networks)

If we discuss about projects in energy transport and distribution, the key information is the demand for energy, seasonal and long-term trends and the demand curve for a typical day. The options analysis should consider, for example: different technologies for transporting electricity (direct or alternating current, transport tensio*n etc.), alternative routes f*or gas pipelines or power lines, different sites or various technologies for a regassification terminal, different district networks, and alternatives for

satisfying the demand for energy (e.g. mixed use of gas and electricity instead of just electricity, the construction of a new power station on an island instead of underwater power lines, etc.).

For energy production and renewable sources projects, information related to the demand for energy, seasonal and long-term trends and also, for electricity power stations, a typical graph of the daily demand for electricity is very important. The comparison in the options analysis should consider possible alternatives within the same infrastructure (e.g. different technologies for production and drilling, different technologies for ash and waste treatment, etc.). Possible realistic alternatives for producing the energy required should also be considered (e.g. launching actions and policies aimed at energy saving, instead of building a new power station).

3. CONCLUSIONS

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

One possible selection approach, which should perhaps allow for sectoral specificities, could be as follows:

- ✓ establish a long list of alternative actions to achieve the intended objectives
- ✓ screen the identified long list against some qualitative criteria (for example, a set of scores to be established in light of overall policy orientations and/or technical considerations, to be duly justified in the analysis) and set a short list of suitable alternatives
- ✓ accomplish option rankings and select preferred options based on their net present values in financial and economic terms

To conclude this paper, we could say that the feasibility and option analysis has to emphasize the folowing:

- ➢ the application should contain sufficient evidence of the project's feasibility (from an engineering, institutional, management, implementation, environmental point of view)
- ➢ the do-nothing scenario ('business as usual') is identified
- ➢ the situations with and without the project are compared
- ➢ it is demonstrated that other alternative feasible options have been adequately considered (in terms of do-minimum and a small number of do-something options)

The CBA should also demonstrate that the chosen alternative is the most cost-effective within the context of budgetary and political considerations.

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