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Clarification Paper no. 4

COSTS INCLUDED IN THE COST-BENEFIT ANALYSIS OF INVESTMENT PROJECTS FINANCED FROM ERDF AND CF

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1. INTRODUCTION

Investment decisions imply financial and economic resources allocation, hoping for future and uncertain economic and social benefits. Such a decision making process always involves a comparison between outflows (costs) and inflows (benefits) generated by a project. In this respect, costs are a key variable included in cash flow estimation.

In the context of the Cost-Benefit Analysis (CBA), the term "**costs**" should be understood as all cash outflows, which affects the results of a project. These outflows include direct costs for implementing and operating the project (preparation costs, investment costs during the construction period, development costs during the life span of the project and so on), but also the costs in economic analysis and costs related to project financing.

In a project appraisal, it is unwise to assume that because costs may take the form of equipment and capital infrastructure investments their estimation is more certain than benefits. The experience confirms that the costs of major projects can be seriously understated.

In practice of cost estimation for a project, it can be found cost pessimism or cost optimism. In light of this, it is important to conduct sensitivity analysis, to show how the final net benefit figure changes if costs are increased or decreased by some percentage¹. In practice, costs often increase during the decision-making process. This uncertainty should, as far as possible, be taken into consideration in the project evaluation, through risk analysis².

For estimating the costs (and benefits) of each project alternative, the person(s) that prepare the application could collect data using six potential sources: historical organization experience, current system costs, market research, publications, analyst judgment, and special studies. Information on costs is mostly provided by those people responsible for the technical aspects of the project.

Costs incurred in the past (sunk costs) and savings or efficiencies already achieved (realized benefits) should not be considered in a CBA. In that situation, the question someone needs to answer is whether or not the benefits of proceeding justify the costs associated with continuing the project. The classic example of this is a situation where large amounts of money have been spent designing a system that has not been successfully implemented, and the project is being re-evaluated. The fact that a lot of money has been spent is no reason to continue spending. CBA focus on the future, and decisions have to be based on the expected costs and benefits of the proposed alternatives. Past experience is relevant only as a benchmark to estimate the value of future benefits and costs.

A project's likelihood of successful implementation or long term sustainability will be severely reduced if the anticipated budgetary support to cover the facility's cost of maintenance and repair is not available. The possibility of a successful implementation of a project that is economically attractive will be lowered if the financial position of the project is weakened.

¹ See Working Paper no. 9 regarding Sensitivity Analysis

² See Working Paper no. 10 regarding Risk Analysis



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2. SCOPE AND OBJECTIVES

For preparing the investment projects, it is necessary to put at disposal of all parties involved standard guidance on what is the minimum set of costs that should be considered when preparing a CBA. We are speaking about a minimum set of costs per type of investment, because no CBA Guide can cover all possible type of costs and benefits for a certain investments, in many cases these being influenced and specific to local conditions. But certainly this type of CBA cost guideline can provide a stable reference for everybody (Managing Authorities, Intermediate Bodies, Joint Technical Secretariats, Consultants that are preparing CBAs, evaluators) to work with the same understanding of information and most importantly with the same categories of input data.

In this context, the objective of this study is to provide guidance for identifying and determining the types and categories of costs used in Cost Benefit Analysis for a project funded by for the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).

The paper identifies and lists, for each type of investment, the types and minimal categories of costs that should be taken into account by applicants when they prepare the cost-benefit analysis for projects financed by ERDF and CF.

The types of expenditures related to a project (investment costs, operating and maintenance costs, as well as replacement costs) are discussed. It is also noted the split of categories of operating and maintenance costs in two different categories: fixed and variable costs.

After that, an overview of the concepts of constant prices (analysis carried out in real terms), respectively current prices (analysis carried out in nominal terms) is made. There are also included rules and recommendations for the correct use of one approach or another.

Then, for each type of investments, the minimal categories of investment and operating costs required when performing a CBA are identified.

Finally, two Study Cases are presented for a major project and also for a non-major project, which deals with issues regarding the quantification of investment and also operational and maintenance costs in a Cost Benefit Analysis, for the entire reference time period of a project, but also with assumptions and sources of data used in forecasting the costs.



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3. THE CASE

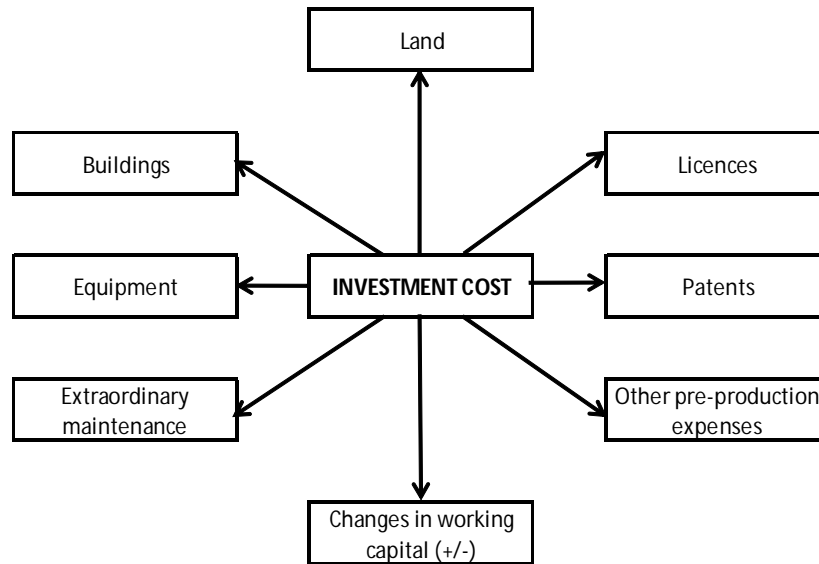
3.1 TYPE OF COSTS

3.1.1 INVESTMENT COST

The first type of cost that must be estimated in the financial analysis of CBA is the investment cost, which is defined as the capital cost incurred in the construction of the project³, and includes all the expenditures for acquire or build the fixed capital goods and intangible assets, but also costs related to changes in working capital, which are needs of current assets that must be financed (see Figure 01).

It is very important to understand that the initial cost of the project is independent of the financing sources or eligibility criteria. It is related to the economical and technical resources implied to accomplish the project.

Figure 01. The main components of total investment cost



Source: Author's adaptation from European Union, *Guide to Cost Benefit Analysis of Investment Projects*, 2008

Based on project specific features, every project has a proposed reference period⁴, using a sectoral benchmark and also international practice. In accordance with the time horizon set for a project, the investment costs are classified in:

³ European Commission Working Document No. 4, *Guidance on the methodology for carrying out Cost-benefit analysis*, 2006.

⁴ The number of years for which forecasts are provided in the cost-benefit analysis, according to European Commission Working Document No. 4, *Guidance on the methodology for carrying out Cost-benefit analysis*, 2006.



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- *fixed investments* (such as land, buildings, equipment, extraordinary maintenance)

It represents the incremental cash disbursements for purchasing all the fixed assets needed for the project. It is, in most of the cases, the largest component of total investment costs. If the life period for the fixed assets is longer than the reference period, their value in the last year of forecasts is included in the residual value of the investment⁵, which is an inflow.

- *start-up costs* (consisting in licenses, patents and other pre-production expenses)

These costs are considered investments and should be included in the total investment costs because they have effects beyond the financial period in which the cash disbursements were made. These include several start-up costs, such as: licenses, preliminary studies, planning and other technical studies, feasibility and other preparatory studies, costs incurred in the implementation phase, costs for some consulting services, hiring and training expenses, price revision, research and development etc.).

- *changes in working capital*, determined as the difference between the net working capital of the current year and the net working capital of the previous year

Net working capital, considered especially for investments that consist in productive activities, is calculated as the difference between current assets and current liabilities. Current assets consist of inventories at every stage of the production process, receivables and cash or other short term cash equivalents. Current liabilities include short term accounts payable to suppliers or to other creditors. If there is an increase in working capital comparing with the previous year, this positive amount is assimilated with an investment and it is added to the investment cost. If there is a decrease in working capital, this negative difference represents in fact a recovery of cash invested in current assets in the previous year(s), which is equivalent with a disinvestment.

For projects of no large dimensions, investment cost is easy to estimate, almost a deterministic variable, which means that there is no impact of uncertainty for appraisal of how large the total investment cost will be.

Sometimes, especially for major projects, the initial cost has a complex structure and it is spread over a number of years⁶. In these particular cases, it is computed as the sum of all the discounted annual costs of the project (see Figure O2). The impact of uncertainty regarding the evolution of cost components for the first n years, which could lead to values different from the ones forecasted in the project, may be quantified in the sensitivity and risk analysis of the project⁷.

A special category of costs are reinvestments (or costs with purchasing new equipments, in order to replace the old assets, during the operational period), but also extraordinary maintenance, which occur periodically during the reference time period (because these are not annually costs, there are not considered operational costs).

⁵ See Working Paper no. 3 regarding the Residual Value

⁶ We use the term "the first n years" to refer to this period of time.

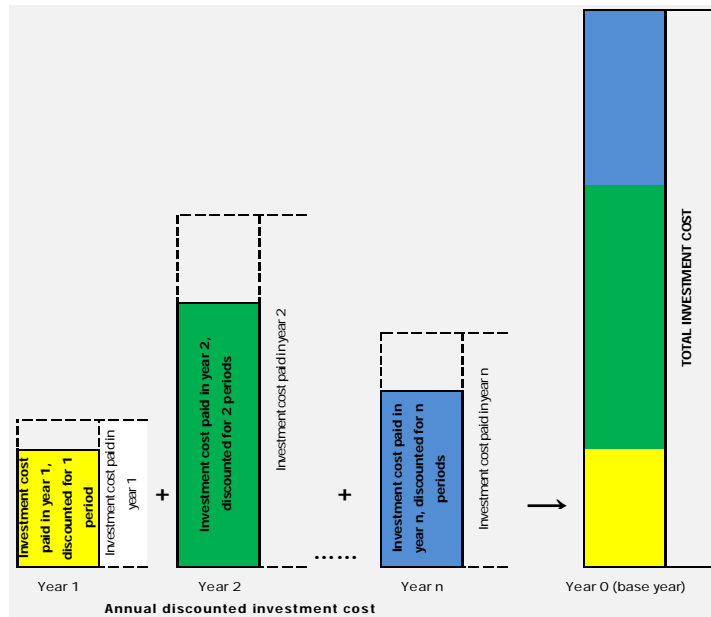
⁷ See Working Papers no. 9 and no. 10 regarding these issues



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The approach implying discounted costs is also applied to these capital expenditures or extraordinary maintenance costs during the operational phase. For example, the recommended reference period for a project in water and environment sector is 30 years. If some replacement of short-life equipment is needed during this time horizon, the replacement cost paid in year r (the year of replacement) must be also discounted for r periods. It is also the case for some non-routine maintenance costs (or extraordinary maintenance, which is not an operational cost), that must also be discounted.

Figure 02. Total investment cost when the project cost is spread over a number of n years



Source: Author's adaptation from European Union, *Guide to Cost Benefit Analysis of Investment Projects*, 2008

3.1.2 OPERATING COSTS

These are the costs incurred in the operation of an investment, including cost of routine maintenance but excluding depreciation or capital costs⁸.

The operating costs consist of all the disbursements forecasted for the purchase of goods and services (which are not considered as investments because they have a life period smaller than 1 year). The main categories of operating costs are:

- the direct production costs (materials and services, personnel, maintenance, general production costs)
- administrative and general expenditures

⁸ European Commission Working Document No. 4, *Guidance on the methodology for carrying out Cost-benefit analysis*, 2006.



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- sales and distribution expenditures

In the estimation of operating costs are included all expenditures included in Income Statement that are followed by cash payments. Those items that do not give rise to an effective monetary expenditure must be excluded, because they are not in accordance with DCF method. There is the case for:

- depreciation and amortization, as they are not effective cash payments
- any reserves for future replacement costs, because they do not correspond to a real consumption of goods or services
- any contingency reserves, because the uncertainty of future flows is taken into consideration in the risk analysis and not through estimated costs in the financial analysis

With regard to the categories of costs, the difference between variable and fixed costs should be emphasized.

Variable costs are those that change their value with volume of production or services or depend on the intensity with which infrastructure is used. If the activity ceases, these expenses are no longer registered. This category includes: material costs, salaries for directly productive personnel, energy, fuel and services for production of goods or services, the share of maintenance costs generated by the intensity of use of equipment or infrastructure.

Fixed costs are those that encounter even if goods or services are no longer produced. This category includes: that part of the cost of maintenance to be carried out even if equipment is not used or infrastructure is not operated, labor costs for administrative and indirect productive staff, materials and services required even if there is no activity in progress. The notion of fixed costs must be understood at the level of principle and refers mainly to the fact that their value is predictable and it is not influenced by uncertainty, as there is the case with variable costs. In the long run, even if the expenses are expressed in constant prices, strictly mathematically, all costs are variable, because their amount can vary from year to year of the reference period.

Operational costs could also be discussed as direct and indirect costs. Direct costs, such as direct labor and direct materials, are costs incurred in a process that is "hands on" and that directly produces the output. Indirect costs (often referred to as overhead costs) are incurred in a support role (all costs that are not direct). Typical overhead items are indirect labor, indirect material, and fixed costs such as rent, depreciation, advertising, taxes, utilities, and insurance.

3.2 CURRENT PRICES VERSUS CONSTANT PRICES

Costs estimation could be done in constant prices (analysis carried out in real terms), respectively current prices (analysis carried out in nominal terms).



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*Current prices*⁹ are the actual or estimated recorded monetary value for a variable over a defined period. The value expressed in current prices as actually observed at a given time (or nominal terms) refers to prices that include the effects of general inflation and should be contrasted with constant prices.

Sometimes, to remove the effects of inflation, the figures are expressed in *constant prices*¹⁰ (or real terms), being deflated by an appropriate price index based on prices prevailing in a given base year. In other words, the values for each time period are expressed in terms of the prices in some base period.

For most analysts, these definitions are clear and the concepts are well known. There is another issue that has to be clarified in this context: when is recommended to use in estimating cash flows (and thus costs) the current prices approach and when the constant prices approach?

The answer is in connection with the cost of capital (used as discount rate in DCF method – discounted cash flows) which may include a component related to expected inflation (in this case it is referred as being in nominal terms) or it can be expressed directly in real terms, meaning that the impact of inflation is removed.

Cash flow components are more or less affected by inflation, both cash inflows (revenues) and cash outflows (costs for the investment, especially if the project is implemented over several years, material costs, wages, other operational and maintenance costs). To remove these shortcomings, one of the following rules is adopted:

- *cash flows in current prices, which includes anticipated inflation, will be discounted with a nominal rate, which includes depreciation of purchasing power of money caused by inflation*
- *cash flows in constant prices of the year in which the project appraisal is done, that do not take account of inflation, will be discounted with a real rate*

Neglecting the impact of inflation when evaluating a project, may distort investment decision, resulting in a suboptimal allocation of capital.

It should be noted that *when using an estimation of costs in current prices, one must use the future, expected inflation rate, not the historical or the current one, for the currency used for cash flow estimation and payments generated by the project (RON, EUR, USD).*

Time stability of the inflation rate is a theoretical hypothesis, which makes extrapolation to generate significant estimation errors for the periods in which inflation has large variations from year to year (high inflation or deflation).

Therefore, it is recommended the estimation of revenues and costs in constant prices of the year in which assessment of the project is done (base year).

The relationship between the discount rate expressed in nominal and real terms is given by Fisher¹¹:

⁹ The definition is derived from statistical standards developed by international organisations such as the IMF, OECD, Eurostat etc. See: <http://stats.oecd.org/glossary>, http://www.statistics.gov.uk/about/glossary/economic_terms.asp, <http://unstats.un.org/unsd/>

¹⁰ *ibidem*

¹¹ Fisher, I, *The Theory of Interest*, The Macmillan Company, 1930 (reprinted: Augustum M Kelley Publishers, 1974, Clifton NJ)



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$$1 + \text{nominal discount rate} = (1 + \text{real discount rate}) \times (1 + \text{inflation rate})$$

For example, if the real discount rate is 5% and the expected inflation rate is 3%, the annual nominal rate used to discount the cash flows estimated in the same currency is 8.15%.

3.3 COSTS IN ECONOMIC ANALYSIS

The economic analysis appraises the project's contribution to the economic welfare of the region or country. First, the costs in economic analysis have different value because they are considered from another perspective than in the financial analysis: the whole of society instead of just the owners of the infrastructure. This is why economic costs are based on costs already estimated in financial analysis, but they are adjusted using some conversion factors¹². Second, considering that costs in CBA are seen as outflows¹³, economic costs are not quite outflows. There might be impacts, such as environmental, social or health effects, which are still significant in achieving the project's objective and thus need to be evaluated and included in the project appraisal. They are negative effects that do not influence the results of the project in financial analysis, but have to be considered from social and economic point of view. In fact, economic costs are negative externalities, which have to be estimated and monetized in the economic analysis¹⁴.

3.4 COSTS OF FINANCING THE PROJECT

Costs generated by financing decisions have to be also assessed, in order to accomplish the analysis of financial sustainability. This means that total outflows (investment costs, operating costs and costs with financing) are covered by all the inflows of the project (revenues and financing resources) and the risk of running out of cash in the future does not incur. Regarding the costs, the timing of cash payments is very important. In other words, sustainability occurs if the net flow of cumulated generated cash flow is positive for all the years considered.

For each type of investment, costs with financing are the same and consists of two categories: interest payments and reimbursements of loans. If we use the terms "costs" versus "outflows", only interests paid for using the lenders' capital are in fact costs. Reimbursements are not costs, but they are outflows that diminish the total cash flow of the year.

Examples for investment and operating costs on types of investments

The general framework for minimal cost categories that must be contained in the general estimation and also in financial analysis of CBA is set through in force legislation¹⁵. In the following subsections, we use a sectoral approach for costs that are not limited to the examples given below.

¹² See Working Paper no. 6 regarding Conversion Factors

¹³ See Introduction

¹⁴ See Working Paper no. 7 regarding Externalities

¹⁵ See HG 28/09.01.2008 and OMEF 863/02.07.2008



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- **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.
 - *investment costs*: costs with land acquisition and arrangement (all expenditures needed to prepare the land for civil works, expenditures for monitoring and decreasing the environment impact of the project); costs for preparing the projects, engineering (costs for traffic studies, testing, prefeasibility and feasibility studies, technical projects and specifications, evaluating the environment impact, studies for existing and needed utilities, expenditures for approval of the technical project in accordance with the quality in construction legislation and traffic safety legislation, preparation of all documents needed to obtain all authorizations and certificates, studies for archeological sites, historical monuments and cultural heritage objects); costs consisting in taxes and tariffs for obtaining all the needed legal approvals and certificates; costs for organizing the public acquisition procedures (costs for preparing/revising documentations, hiring external experts, organizing the assigning procedures); costs with consultancy services and technical assistance (costs regarding management services, monitoring and evaluation of the project, supervising services, verifying and approval the quality of works, mediation services, elaboration of business plan and market research, defining, projecting and supervising the measures for minimizing the negative effects on environment of transports, elaboration of plan, handbooks and procedures for maintenance and operating the infrastructure); costs for auditing services and archiving the documents of the project; cost for the core investment (costs of works, raw materials, equipments and actions in connection with the infrastructure, maintenance of the existing infrastructure during the works, testing the project, training the personnel and the users of the infrastructure, organizing the site and other services in connection with these items); commissions, taxes and legal fees in connection with the project; costs for the publicity of the project in accordance with the EU Regulations; costs for insurance and development of the institutional capacity of the beneficiary of the project (costs for acquisition of IT, communications and peripheral equipments, office furniture and supplies, software licenses, training or financial incentives for personnel that manage project's activities); costs related to visiting the construction sites, meetings for the purpose of the project; reinvestments/assets replacement costs
 - *operating costs* (e.g., road infrastructure): current maintenance costs (estimated based on the annual maintenance costs (EUR/m²), the number of current maintenance repairs that will take place during the analyzed period and the percent of the total area of the road that has to be repaired in each year); overhauling costs, depending on the type of infrastructure (the main attribute of these complex interventions is represented by their extremely high costs; this cost is estimated using: the cost for one overhauling operation, expressed as a percentage of the project's basic value, overhauling will be made every *N* years and no current maintenance repairs will be carried out in those years when overhauling is performed); specific costs related to the current and periodical repairs, in conformity with the Romanian in force legislation, such as: asphalt surface milling, surface seeding, warm asphalt concrete coverage etc.



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- **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
 - *investment costs*: costs with land arrangement, before starting the works; costs with land arrangement for environment protection purposes, bringing land to the initial state, including the landscape restoration after works completion; costs related to utilities networks for the investment objective; costs for preparing the projects and technical assistance (expenditures for land studies, obtaining all requested authorizations and certificates for construction, utilities, environment etc, engineering, prefeasibility and feasibility studies, technical projects and specifications, technical checking, preparation of all documents needed to obtain all the authorizations and approvals for investment, technical expertise, costs for organizing the public acquisition procedures, consultancy services, market research, technical assistance); costs for the core investment (costs of works, plant, machinery equipments, technological equipment assembling, other fixed assets, intangible assets, such as patents and licenses); costs for organizing/closing the construction site and other expenses connected with these activities; costs with legal fees in connection with the project; costs for technological testing, training of the personnel for a correct and efficient operating of the investment; costs for preparing the official documents needed for the application; costs for the publicity of the project in accordance with the EU Regulations; costs for acquisition of independent auditing services for the project; costs required for the purchase of goods for the project implementation units; technical assistance for improving the institutional capacity of the beneficiary of the project, salaries for personnel of the beneficiary in charge with managing the operations (for investments in water/wastewater infrastructure and waste management systems); land acquisition, land arrangements, including settlements moving, expenditures for elaborating the plans, measures and maps for flood risk prevention, audibility studies (for investments in protection against floods and prevention of coastal erosion); reinvestments/assets replacement costs
 - *operating costs*: technical and administrative personnel costs; maintenance costs; management and administrative costs; material costs; fuel, power and electricity costs; intermediate services and goods, commodities; other costs, depending on the type of investment (for example, costs with raw water are very important variable costs for projects in water and wastewater infrastructure¹⁶)
- **social infrastructure** (social services infrastructure, health and public safety, education infrastructure)
 - *investment costs*: costs with land acquisition or expropriation (only if it is needed), land arrangement in order to start the works, land arrangement for environment protection purposes, including the landscape restoration after works completion; costs related to utilities networks for

¹⁶ For details, see the Case Study below



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the investment objective (if needed); costs for preparing the projects and technical assistance (expenditures for land studies, obtaining all requested authorizations and approvals, engineering, technical projects, consultancy services); costs for the core investment, depending of the type of investment: construction works, plant, machinery, equipments, special equipments etc); costs for organizing the construction site and other expenses connected with these activities; costs with legal fees; other expenses; costs for the publicity and auditing services of the project; reinvestments/assets replacement costs; other costs

- *operating costs*: personnel costs; maintenance costs; management and administrative costs; costs with electricity and other needed utilities; other specific costs, depending on the type of investment (for example, medicines and special materials, outsourced medical services necessary to operate a health infrastructure)
- **development of regional and local business environment** (development of business support structures, rehabilitation of unused industrial sites, support for microenterprises)
- *investment costs*: costs with land acquisition or expropriation (if needed), land arrangement in order to start the works, land arrangement for environment protection purposes, including the landscape restoration after works completion; costs related to utilities networks; costs for the core investment, depending of the type of investment; costs for organizing the construction site and other expenses connected with these activities; reinvestments/assets replacement costs; other costs
 - *operating costs*: depends on the type of investment (business support structures: administrative costs with the structure, costs with utilities etc; microenterprises: raw materials and other materials, salaries for directly productive personnel, administrative costs etc; rehabilitation of unused industrial sites: the costs depends on the future use of the structure, after the rehabilitation
- **tourism** (restoration of cultural and historical heritage, tourism infrastructure)
- *investment costs*: costs with land acquisition or expropriation (if needed), land arrangement in order to start the works, land arrangement for environment protection purposes, including the landscape restoration after works completion; costs related to utilities networks for the investment objective; costs for preparing the projects and technical assistance; costs for the core investment (construction works, buildings, equipments etc.); costs for organizing the construction site and other expenses connected with these activities; costs with legal fees; costs for the publicity and auditing services of the project; reinvestments/assets replacement costs; other related costs
 - *operating costs*: personnel costs and maintenance costs are predominant in the long term; other costs may include: services, utilities, publicity addressed to the potential visitors/tourists for cultural/touristic unit



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- ***innovative and eco-efficient production systems*** (sustainable development of Romanian production system and enterprise development)
 - *investment costs*: costs with land acquisition; costs for consultancy and project management services, preparing the projects, expenditures needed to obtain requested authorizations and approvals, engineering, expertise and technical assistance; costs for acquisition of buildings, equipments and other tangible assets; costs for acquisition of intangible assets (software, licenses, patents, know-how etc); costs with special trainings for the personnel; reinvestments/assets replacement costs; other related costs
 - *operating costs*: raw materials; personnel costs; maintenance costs; electricity; administrative costs; costs for periodical certification and conforming with standards

- ***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)
 - *investment costs*: costs with land acquisition; costs with land arrangement for starting the works, land arrangement for environment protection purposes, including the landscape restoration after works completion; costs with networks for utilities; costs for consultancy and project management services, preparing the projects, expenditures needed to obtain requested authorizations and approvals, engineering, expertise and technical assistance; costs with civil works and installations; costs for acquisition of buildings, equipments and other tangible assets; costs for acquisition of intangible assets; costs for organizing the construction site and other expenses connected with these activities; costs with legal fees; costs for public acquisitions procedures; costs for the publicity and auditing services of the project; costs with technological testing; costs with general and administrative activities; reinvestments/assets replacement costs;
 - *operating costs*: costs with research personnel; materials; energy

- ***information technology and communications for public and private sectors***
 - *investment costs*: costs for consultancy and project management services, preparing the projects, expenditures needed to obtain requested authorizations and approvals, engineering, expertise and technical assistance; costs for acquisition of buildings, equipments and other tangible assets; costs for acquisition of intangible assets; expenditures for network configuration, and connection to broadband infrastructure; costs for public acquisitions procedures; costs with special trainings for the personnel; costs for the publicity and auditing services of the project; reinvestments/assets replacement costs;



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- *operating costs*: technical and administrative personnel costs; costs for the ordinary maintenance of the infrastructure; material costs; electricity and other utilities; subscription payment for the access to the broadband infrastructure
- **increasing energy efficiency and security of supplying energy** (sustainable and efficient energy, use of renewable sources of energy, diversifying energy interconnection networks)
 - *investment costs*: costs with land acquisition; costs with land arrangement for starting the works, land arrangement for environment protection purposes, including the landscape restoration after works completion; costs with networks for utilities; costs for consultancy and project management services, preparing the projects, expenditures needed to obtain requested authorizations and approvals, engineering, expertise and technical assistance; costs with civil works and installations; costs for acquisition of buildings, equipments and other tangible assets; costs for acquisition of intangible assets; costs for organizing the construction site and other expenses connected with these activities; costs with legal fees; costs for public acquisitions procedures; costs for the publicity and auditing services of the project; costs with technological testing; reinvestments/assets replacement costs;
 - *operating costs*: technical and administrative personnel costs; costs for the ordinary maintenance of the infrastructure; costs with goods and services for production; electricity and other utilities

3.5 OTHER IMPORTANT ISSUES FOR COSTS ESTIMATION

Some types of investments described above (for example, transport infrastructure, environment projects, research infrastructure etc.) could be developed as cross-border collaborations. These projects are proposed by two or more partners from neighbor countries (for example, Romania and Hungary). The partners are public authorities or institutions, which have to accomplish some particular conditions. The percentage of co-financing the project may be different for the two countries. Regarding categories of costs and costs forecast there are not specific particularities for cross-border investments. Costs estimation follows the methodology already described in this working paper, depending on the type of investment.

In Introduction we mentioned the general sources of data. But how can we get references regarding market prices for goods, services or works, as components of core investment? What benchmark can we use when estimating the investment costs for a project?

Because the types of investments we discuss in this paper are financed through public funds, these benchmarks must be established by public authorities who are responsible for each domain. They must elaborate and publish cost standards regarding at least the expenses for core investment. The cost standard must be a reference document, offering guidance in the promotion of investment financed from public funds. At the moment, there are such cost standards for only a few types of investments, such as:



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regional transport infrastructure, cultural infrastructure, health infrastructure, education infrastructure¹⁷, but also for investments in rural development and fishing, financed through SAPARD¹⁸.

We recommend that such cost standards, which must be used as references by all applicants, to be elaborated and published for all types of investments financed through public funds. Once elaborated, in order to contain reliable information, such a database must also be periodically revised (annually, if possible).

Another issue that has to be highlighted here is double counting of costs. An applicant must be very careful to avoid such a mistake. One expense must be counted only in one cost category, not twice or more than twice. For example, a study includes the cost of constructing a sound wall in the initial project costs, while also counting the disbenefit of noise from the project without a sound wall. This is a mistake of double-counting. Only the disbenefit of noise with the sound wall should be counted, since the rest of the noise impact is eliminated by the sound wall.

In some situations, particularly regulated sectors, the infrastructure landlord and the service provider are the same entity (e.g. a nationalised railway network or a port authority). In other situations, the infrastructure landlord and the service provider may be separate entities, but the service provider may pay the landlord for access to the infrastructure on variable basis (e.g. for trains on a per km of track travelled). This payment by the service provider would include a component for the maintenance of the infrastructure, but from the point of view of the service provider would be considered an operating cost of the service. In such situations, it may be difficult to distinguish between operating and maintenance costs and it may be easier to consider the two simultaneously, ensuring however that there is no double counting.

A financial analyst included the interest cost of the debt used to buy new machinery in the cash flows from a capital budgeting project. This is incorrect. The proposed project will be evaluated against a cost of capital after its estimated cash flows are summarized. To include interest in the project's cash flows risks double counting the cost of this capital. In addition, it is not clear which debt will be used to fund the project if it is accepted. Finance theory argues that it is better to wait and incorporate the cost of capital into the analysis after the project's projected non-financing cash flows and risks are summarized.

¹⁷ See HG 363/14.04.2010

¹⁸ See Database with reference prices for projects implemented through SAPARD, www.apdrp.ro



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4. CASE STUDIES

4.1 ESTIMATING COSTS FOR A MAJOR PROJECT: WATER SUPPLY INFRASTRUCTURE

Investment Costs

The categories of costs mentioned above as examples and the methodology used for forecasting are illustrated below. The project consists of the rehabilitation and extension of the water supply infrastructure for an urban community. To estimate the cash flows of the project, only costs generated by the project implementation are illustrated, using the incremental approach.

The estimated investment costs contain primarily the Project investment cost to be implemented during years 1 to 3 (part of the Long Term investment plan) and in addition replacement cost and additional investment cost as required up to the design horizon of 30 years.

The investment costs are estimated for extension, replacement, rehabilitation of water supply infrastructure (production, transmission, storage, distribution). For the purpose of the CBA the overall cost is split by the following categories: planning, design fees; land purchase; building and construction; plant and machinery / equipment /commissioning; contingencies; supervision during construction; technical assistance; publicity. The investment cost is allocated on an annual basis in line with the implementation schedule. For the cost category "plant and machinery" re-investment costs are considered after 15 years of utilization. All investment cost figures are stated in EUR at constant price level (see Table 01).

Table 01. Investment costs (constant prices of base year)¹⁹

¹⁹ The figures in the table are outflows and they have negative sign in the cash flow calculation; the negative numbers are in fact inflows (disinvestments).

Although the time horizon of the project is 30 years, because of space reasons, not all the years are illustrated in the table.



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COST CATEGORIES / YEARS	(thousands EUR)													
	1	2	3	4	5	6	7	8	9	10	15	20	25	30
Land	0	0	0											
Planning / design	100	50	50											
Site preparation	6,000	12,000	2,000											
Costs for the completion of the works	500	1,000	150											
Main works	100	200	50											
Plant and machinery	300	600	100								500			
TA & Training	300	600	100											
Costs for the PIU salaries	100	200	50											
Costs for the annually audit	7,500	15,000	2,500											
Supervision	100	150	50											
Public Relation	0	0	0											
Contingencies	6,000	12,000	2,000											
Tax/public levies	500	1,000	200											
Investment Costs	21,500	42,800	7,250	0	0	0	0	0	0	0	500	0	0	0
Current assets	200	300	400	400	500	500	500	500	500	500	500	500	500	500
Current liabilities	100	150	150	200	200	250	250	250	250	250	250	250	250	250
Net Working Capital	100	150	250	200	300	250	250	250	250	250	250	250	250	250
Changes in Net Working Capital	100	50	100	-50	100	-50	0	0	0	0	0	0	0	0
Total Investment Costs	21,600	42,850	7,350	-50	100	-50	0	0	0	0	500	0	0	0

Source: author's calculations

Operating Costs

The estimation of these costs is based on the data provided by the water utility for the base year (year 0, before the investment period) (in RON) and then projected on an annual basis in line with the implementation schedule for years 1–30 in EUR (constant prices). For each particular operating cost categories we assume annual increase rates in real terms, which are specified below (see Table O2).

- Variable cost items and consumables:
 - ✓ The raw water costs are estimated considering the following 2 main elements: the raw water quantity (forecast water production strictly related with the evolution of water consumption and the level of losses; the raw water quantity records an increase on medium term due to the connection rates increase as the entire population of the community is envisaged to be connected until year 4) and the raw water tariff (starting from the actual raw water tariff and considering a real term annual growth rate, as assumed in the macroeconomic scenario)
 - ✓ The material costs are forecasted starting from the actual levels and considering a real term increase for material costs as assumed in the macroeconomic scenario and proportionally with the evolution of the water production considering the level of losses and the level of water consumption)
 - ✓ The electricity costs are calculated starting from the actual levels and considering a real term increase for electricity costs as assumed in the macroeconomic scenario, proportionally with the



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evolution of the water production (considering the level of losses and the level of water consumption); the individual consumption of electricity per m³ of produced water is considered as a benchmark; the electricity costs is split on 2 categories: costs related to the existing systems and costs as result of project implementation

Table 02. Operating costs (constant prices of base year)²⁰

COST CATEGORIES / YEARS	(thousands EUR)													
	1	2	3	4	5	6	7	8	9	10	15	20	25	30
Annual growth rate for raw water consumption		2%	2%	1%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Raw water consumption (thousands m ³)	13,000	13,260	13,525	13,660	13,729	13,797	13,866	13,936	14,005	14,075	14,431	14,795	15,169	15,552
Annual growth rate for raw water price		3%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Price (EUR/m ³) (real terms)	0.0300	0.0309	0.0315	0.0318	0.0322	0.0325	0.0328	0.0331	0.0335	0.0338	0.0355	0.0373	0.0392	0.0412
Raw water costs	390	410	426	435	441	448	455	462	469	476	513	552	595	641
Annual growth rate for materials/chemicals		2%	2%	2%	1.5%	1.5%	1.5%	1%	1%	1%	1%	1%	1%	1%
Materials and chemicals costs	400	408	416	424	431	437	444	448	453	457	481	505	531	558
Electricity consumption (thousands Kwh)	10,400	10,741	11,091	11,338	11,532	11,728	11,925	12,124	12,325	12,527	13,565	14,647	15,776	16,952
Annual growth rate for electricity price		2%	2%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Price (EUR/Kwh) (real terms)	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.10	0.11
Electricity costs	728	767	808	838	865	893	922	951	981	1,013	1,181	1,374	1,594	1,845
Number of employees (persons)	200	220	250	250	250	250	250	250	250	250	250	250	250	250
Annual growth rate for net salary		1%	1%	2%	2%	3%	3%	4%	4%	5%	5%	5%	5%	5%
Average net salary / month (EUR)	215	217	219	224	228	235	242	252	262	275	348	444	566	723
Total annual net salaries (thousands EUR)	516	573	658	671	685	705	726	755	785	825	1,043	1,331	1,698	2,168
Total salaries (gross amount)	737	819	940	959	978	1,007	1,037	1,079	1,122	1,178	1,489	1,901	2,426	3,096
Social security	206	229	263	268	274	282	290	302	314	330	417	532	679	867
Personnel costs (including social security)	944	1,048	1,203	1,227	1,252	1,289	1,328	1,381	1,436	1,508	1,906	2,433	3,105	3,963
Annual growth rate for maintenance costs		2%	2%	2%	1.5%	1.5%	1.5%	1%	1%	1%	1%	1%	1%	1%
Maintenance/repairs costs	750	765	780	796	808	820	832	841	849	857	901	947	996	1,046
Annual growth rate for other costs		2%	2%	2%	1.5%	1.5%	1.5%	1%	1%	1%	1%	1%	1%	1%
Other costs (administrative costs etc.)	480	490	499	509	517	525	533	538	543	549	577	606	637	670
Total Operating Costs	3,692	3,887	4,133	4,230	4,314	4,413	4,513	4,621	4,732	4,860	5,559	6,418	7,458	8,724

Source: author's calculations

- Fixed cost items:
 - ✓ The personnel costs are estimated starting from the actual number of personnel and considering the impact of the investment project implementation on the number of personnel (increase or decrease) and the average salary forecasted starting from the actual salaries, considering a real term growth rate for average net salary/month as assumed in the macroeconomic scenario. Total salaries (gross amount) is calculated considering that net salaries represent 70% of gross salaries,

²⁰ All the figures in the table are outflows and they have negative sign in the cash flow calculation. Because of space reasons, not all the 30 years of the time horizon are illustrated in the table.



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the rest of 30% is represented by income tax and social contributions paid by the employees. Total personnel costs are computed as total salaries (gross amount) plus social security paid by the employer (they represent about 28% of gross amount for salaries).

- ✓ The maintenance costs are calculated starting from the actual levels and considering a real term increase for material costs as presented in the macroeconomic scenario; costs of maintenance related to new investments are set at a normative level, a percentage of main works, plant and machinery)
- ✓ Other operating costs (administrative costs are forecasted using data as provided for the base year and considering an increase in real terms, according to the real increase factor of material costs)

Project costs expressed in current prices

The estimate of the project investment costs actually to be spent at the time of implementation, but also operating costs, has to take into account the anticipated price increases (inflation) according to the macroeconomic scenario. We use the assumption that the anticipated inflation rate is 3%/year (see Table 03).

Table 03. Costs of the project in current prices

COST CATEGORIES / YEARS	(thousands EUR)													
	1	2	3	4	5	6	7	8	9	10	15	20	25	30
Estimated inflation rate (%/year)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Inflation Index (%)	103.0%	106.1%	109.3%	112.6%	115.9%	119.4%	123.0%	126.7%	130.5%	134.4%	155.8%	180.6%	209.4%	242.7%
Total Investment Costs	22,248	45,460	8,032	-56	116	-60	0	0	0	0	779	0	0	0
Total Operating Costs	3,802	4,124	4,516	4,761	5,001	5,269	5,551	5,853	6,174	6,531	8,660	11,592	15,616	21,176

Source: author's calculations

4.2 CASE STUDY: ESTIMATING COSTS FOR A NON-MAJOR PROJECT: INVESTMENT IN SURVEILLANCE EQUIPMENT FOR PUBLIC PLACES AND INSTITUTIONS IN A LOCAL COMMUNITY

Investment Costs

The project consists in installation of surveillance equipment in public places (streets, parks, markets) or public institutions (kinder gardens, schools, high schools, hospitals, churches, etc.) and also setting up a monitoring center. The time horizon of the project is 20 years. To estimate the cash flows of the project, only costs generated by the project implementation are illustrated, using the incremental approach.

The components of investment costs are presented in Table 04, including also equipment replacements needed after 10 years of operations. All investment cost figures are stated in EUR at constant price level (see Table 01).

Table 04. Investment costs (constant prices of base year)



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COST CATEGORIES / YEARS												(EUR)
	1	2	3	4	5	6	7	8	9	10	11	
Land and land preparation	0											
Utilities networks	0											
Legal fees	50											
Planning / design / engineering	6,000											
Technical assistance and consultancy	2,500											
Machinery & equipments	100,000											20,000
Technological equipment assembling	33,000											6,000
Furniture	800											
Contingencies	11,000											
Total Investment Costs & Replacements	153,350	0	0	0	0	0	0	0	0	0	0	26,000

Source: author's calculations

Operating Costs

The estimation of these costs is projected on an annual basis for years 1–20 in EUR (constant prices). Operating cost estimates were made by the beneficiary from the tariffs of these services in the market and the estimated average monthly consumption based on experience. For each particular operating cost categories we assume annual increase rates in real terms, which are specified below (see Table O5).

- The maintenance costs are calculated starting from the actual levels (80 Euros/month) and considering a annually increase rate of 1% in real terms
- The personnel costs are estimated considering that for operation of the project a number of 8 employees is required; the net average salary is 200 euros/employee/month, considering a real term growth rate for average net salary/month of 1–5%. Total salaries (gross amount) is calculated considering that net salaries represent 70% of gross salaries, the rest of 30% is represented by income tax and social contributions paid by the employees. Total personnel costs are computed as total salaries (gross amount) plus social security paid by the employer (they represent about 28% of gross amount for salaries).
- The utilities costs include electricity, water and other utilities; these expenditures are calculated using information about the number of hours of operation for the equipments and the monitoring center and the individual consumption (the monthly value of this cost is 30 euros); we also consider a real term rate of increase for utility costs of 2%/year
- The material costs (office and IT consumables, cleaning materials) are forecasted at the level of 60 Euros/month and considering a real term increase for material costs of 1%/year
- The publicity costs (BTL publicity, organizing events for promotion etc); the annual level of these costs is estimated to 12,000 Euros/year and the rate of increase is estimated to 1%/year
- Other operating costs (administrative costs, phone and internet services) are forecasted at a level of

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100 Euros/month and considering an increase in real terms of 1%/year

Table 05. Operating costs (constant prices of base year)

COST CATEGORIES / YEARS	(EUR)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Annual growth rate for maintenance costs		1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Maintenance costs	960	970	979	989	999	1,009	1,019	1,029	1,040	1,050	1,060	1,071	1,082	1,093	1,103	1,115	1,126	1,137	1,148	1,160
Number of employees (persons)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Annual growth rate for net salary		1%	1%	2%	2%	3%	3%	4%	4%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Average net salary / month (EUR)	200	202	204	208	212	219	225	234	244	256	269	282	296	311	326	343	360	378	397	417
Total annual net salaries	19,200	19,392	19,586	19,978	20,377	20,989	21,618	22,483	23,382	24,551	25,779	27,068	28,421	29,842	31,334	32,901	34,546	36,273	38,087	39,992
Total salaries (gross amount)	27,429	27,703	27,980	28,539	29,110	29,984	30,883	32,118	33,403	35,073	36,827	38,668	40,602	42,632	44,763	47,002	49,352	51,819	54,410	57,131
Social security	7,680	7,757	7,834	7,991	8,151	8,395	8,647	8,993	9,353	9,821	10,312	10,827	11,368	11,937	12,534	13,160	13,818	14,509	15,235	15,997
Personnel costs (including social security)	35,109	35,460	35,814	36,531	37,261	38,379	39,530	41,112	42,756	44,894	47,139	49,495	51,970	54,569	57,297	60,162	63,170	66,329	69,645	73,127
Annual growth rate for maintenance costs		2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Utilities costs	360	367	375	382	390	397	405	414	422	430	439	448	457	466	475	485	494	504	514	524
Annual growth rate for materials		1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Materials costs	720	727	734	742	749	757	764	772	780	787	795	803	811	819	828	836	844	853	861	870
Annual growth rate for maintenance costs		1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Maintenance/repairs costs	12,500	12,625	12,751	12,879	13,008	13,138	13,269	13,402	13,536	13,671	13,808	13,946	14,085	14,226	14,368	14,512	14,657	14,804	14,952	15,101
Annual growth rate for other costs		1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Other costs (administrative costs etc.)	1,200	1,212	1,224	1,236	1,249	1,261	1,274	1,287	1,299	1,312	1,326	1,339	1,352	1,366	1,379	1,393	1,407	1,421	1,435	1,450
Total Operating Costs	50,849	51,361	51,878	52,759	53,655	54,941	56,262	58,015	59,832	62,145	64,566	67,102	69,757	72,538	75,451	78,502	81,699	85,047	88,556	92,232

Source: author's calculations

Project costs expressed in current prices

The estimate of the project investment costs actually to be spent at the time of implementation, but also operating costs, has to take into account the anticipated price increases (inflation) according to the macroeconomic scenario. We use the assumption that the anticipated inflation rate is 3%/year (see Table 06).

Table 06. Costs of the project in current prices

COST CATEGORIES / YEARS	(EUR)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Estimated inflation rate (%/year)	0%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Inflation Index (%)	100.0%	103.0%	106.1%	109.3%	112.6%	115.9%	119.4%	123.0%	126.7%	130.5%	134.4%	138.4%	142.6%	146.9%	151.3%	155.8%	160.5%	165.3%	170.2%	175.4%
Total Investment Costs	153,350	0	0	0	0	0	0	0	0	0	34,942	0	0	0	0	0	0	0	0	0
Total Operating Costs	50,849	52,901	55,037	57,651	60,390	63,692	67,180	71,351	75,794	81,085	86,772	92,885	99,457	106,525	114,127	122,304	131,102	140,570	150,761	161,730

Source: author's calculations



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5. CONCLUSIONS

The first step in a CBA is to estimate, for each alternative scenario forecasted, all the investment costs and expenses for maintenance (ordinary and extraordinary) and for renewals. It is necessary to ensure that the project will include all the works required for its functioning. The estimates of costs and times need to be realistic and preferably 'on the safe side', given the uncertainties involved.

Estimating the costs involved in implementing the project is one of the most difficult steps in a CBA, but also one of the most important. The quality of analysis and the reliability for results depend on the quality of the cost data, as inputs in the model. Many factors must be considered during the process of estimating the costs associated with competing alternatives in a CBA: activities and resources, cost categories, personnel costs, direct and indirect costs (overhead), depreciation, and annual costs.

The forecast of costs for the entire reference period must take into account a very important rule: never combine nominal and real values in the same analysis. Logical consistency requires that the analysis is conducted either in constant prices or in terms of nominal values. This may require converting some nominal values to real values, or vice versa.



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Applicants' Guides for all Priority axes and Key areas of intervention under SOPT, SOP ENV, ROP and SOP IEC

Romanian legislation in force regarding the approval of the lists with eligible expenses for the operations financed through SOPT, SOP ENV, ROP and SOP IEC



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