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Biljana Runcevska
Protection and Rescue Directorate, biljana3848@gmail.com

Pece Nedanovski
Ss. Cyril and Methodius University in Skopje, pecen@eccf.ukim.edu.mk

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Biljana Runcevska[1], Pece Nedanovski [2]

[1] Protection and Rescue Directorate
e-mail: biljana3848@gmail.com,
[2] Ss. Cyril and Methodius University in Skopje,
Faculty of Economics – Skopje
e-mail: pecen@eccf.ukim.edu.mk

Abstract. In the framework of the public sector, the government has an obligation to take care of the rational use of the funds intended for investment. In order to determine the degree of rationality of individual programs and projects, or to make choice between potential programs and projects, the government should apply a methodology for their mutual comparison. Cost-benefit analysis is such a methodological approach for social optimization of policies, programs and projects. The project for improvement of energy efficiency and environmental protection in the case of secondary school in Resen municipality, Republic of Macedonia, is a relevant example for applying this kind of tools for economic analysis.

Key words: cost-benefit analysis, project, Republic of Macedonia, Resen municipality.

Introduction

Socio-economic development in the long run can only be achieved by investing. The expectations of the investments are to enable the achievement of the objectives set in the project through which the available funds can be more efficiently used.

Starting from the fact that any public project after its implementation can cause not only immediate effects for the investor, but also indirect effects (positive or negative) and felt in the wider community, the question arises how to measure these effects and how to incorporate the impact they have on the economic environment. In fact, it comes to the basic criterion for evaluating investments which is their socio-economic efficiency. In this sense, making investment decisions should be based on methods and techniques that will provide reliable bases for assessing the acceptability of certain solutions and the project as a whole. This approach for valuation of investments in economic science and literature is known as economic cost-benefit analysis.

The objective of the economic analysis of the projects is to guide the design of the project in direction of maximizing its social benefits in relation to social costs, that is, to assist in the design and selection of projects that contribute to increasing the welfare in the country. Accordingly, the implementation of the economic analysis is most useful at the very beginning of the development of a project.

The project for increasing the energy efficiency in the Central Municipal School "Tsar Samoil" in Resen Municipality, Republic of Macedonia is a part of the wider project for improvement of the environmental protection in the Resen Municipality. This project is adequate from the point of view of the research in this paper. On the basis of this example, an attempt will be made to calculate the costs needed for its realization, and then projections of the potential benefits using

existing information from the municipal database, as well as certain assumptions. The aim is to make an inventory of all costs and benefits relevant from a social point of view, and then to switch to the calculation of the eligibility criteria of the project.

Theoretical Basics of Cost-Benefit Analysis

Cost-benefit analysis is a methodological approach for assessing economic efficiency of projects. It is actually a practical application of Pareto criterion.

The first beginnings in the direction of creating a unified and sustained methodology for assessing the socio-economic efficiency of projects dated since 1969 when the first methodology was promoted within the Organization for Economic Cooperation and Development (OECD). This was followed by the methodologies of UNIDO in 1972 and the one of the World Bank in 1975.

The reasons that contributed to the creation of economic cost-benefit analysis and its further improvement for evaluating the effectiveness of investment projects in a wider social context are the following: increased volume of public investments especially in developing countries (infrastructure); high degree of development of techniques for assessing financial efficiency (at the same time there is a lack of methodology for assessing projects from a social aspect); the impact of international financial institutions (in order to grant funds for financial support to certain projects particularly in developing countries); development of information and communication technologies (especially the software support of the methodology), etc.

There is a difference between financial cost-benefit analysis and economic cost-benefit analysis. The financial analysis examines the project from the aspect of the investor: it identifies the net yield and estimates the project's ability for cash flow to offset its financial liabilities. The economic cost benefit analysis, in turn, considers a project from the perspective of the whole country, i.e. from the aspect of society, and measures the effects of the project on the economy as a whole (Belli and all, p. 39). Consequently, financial cost-benefit analysis is too narrow to successfully address the needs of evaluating public projects and to obtain sufficiently reliable indicators for justification for investing in a public project.

Relevant Procedures

According to the World Bank's approach, the cost-benefit analysis is implemented in the three stages: Cost Analysis, Benefit Analysis, and Project Valuation. Each of the above stages is implemented through several steps (Nestorovski, 2005).

The cost analysis can be performed through a systematic procedure in several steps: 1) Identification of all costs "with" and "without" the project; 2) Calculation of incremental costs that are direct result of the project (as a difference between the costs "with" and "without project"); 3) Non-economic items i.e. transfer payments, should be excluded from the overview of costs (interest, depreciation, customs and taxes); 4) Correct valuation of economic items (the financial costs stated in the list of costs need to be corrected so that they can express true economic value of the resources used; the economic costs are different from them because they represent the value the society would have if those goods were used for another purpose); 5) Assessment of external costs (for instance, all costs caused by the elimination of negative external effects of the project); and 6) Formation of the economic flow for the total life of the project (at this stage all costs are expressed at constant prices, which means that stated costs for each projected year should be corrected with a relevant price index).

The benefit analysis includes the following steps: 1) Identification of all benefits - "with project" and "without project"; 2) Calculation of incremental benefits of the project (as a difference between the benefits "with project" and "without project"; 3) Exclusion of non-economic items (firstly, identification of total revenues is to be carried out, and then non-economic revenues are excluded; from a social point of view, non-economic revenues are: interest on deposited savings in a bank generated by the project, government subsidies and similar transfer revenues); 4) Correct valuation of economic benefits (real value of benefits from social aspect); 5) Measurement of external benefits (for instance, maintenance of clean environment, providing healthy drinking water, etc.); 6) Establishing economic flow for the project's overall course (to express all benefits at constant prices).
Projects valuation is done in seven steps: 1) First step, net-benefits calculation, i.e. calculation of a difference between benefits and costs for each year of the project; 2) Second step, the discount rate (the opportunity cost of capital) is estimated and net-benefit discounting is made to the initial year of the project; 3) Third step, the universal criteria for evaluating the project are calculated (Net present value of the project - NPV; Internal rate of return - IRR; Benefit-cost coefficient - BCR; and Net benefit-cost coefficient - BCRN; 4) Fourth step, according to the obtained values of all criteria, the selection of the projects is carried out; 5) Fifth step, an assessment of the sensitivity of costs and benefits from changes is carried out; 6) Sixth step, the costs and benefits that can not be expressed in money, are considered; 7) Seventh step, a definitive decision is made to accept or reject the project.

Application – Case Study of Resen Municipality

The problem that is being treated with this project is the replacement of the old wooden construction of windows and doors with new aluminum construction in "Tsar Samuil" high school in the Municipality of Resen, Republic of Macedonia. Namely, it is about the fact that the wooden parts were so ruined that when closing the window sills, there is an empty space through which a part of the heat in the heating season was lost. This situation required purchasing of larger amounts of fuel for heating (oil) and this affects the increased costs for the warming of school building in which the teaching process is conducted.
This example is an appropriate case for applying cost-benefit analysis in order to research contemporary problems and challenges it faces. The analysis can be carried out through a systematic procedure in several steps. Firstly, cost identification, i.e. costs "without project" and costs "with project". In our case, the costs "without" project are following items: Annual maintenance costs; Salary and other costs for housekeeper; and Supply of fuel for heating - 30 tons of oil annually. The costs "with" project are consisted of: Compensation for the coordinators of the project activities (two persons); Preparation of technical documentation; Expert supervision; Dismantling of existing entrance doors and windows and installation of new ones; Purchase of fuel for heating - oil (20 tons per year); Salary and other costs for housekeeper; and Annual maintenance costs.
In the second phase, the incremental costs will be calculated. They represent the net effect of spending the resources involved in the project.

Table 1. Calculation of incremental costs in the project (in euro)

Cost Type	Amount
Coordinators of the project activities - four persons	1440
Preparation of technical documentation and expert supervision	1440
Dismantling of the existing and installation of new ones: 4 entrance doors, 1 skylight and 134 windows of different dimensions	49 000
Total	51880

Source: Resen Municipality.

The incremental costs do not take into account the costs of purchasing fuel, 30 tonnes of oil annually "with" and "without" the project, which means that the incremental costs for fuel supply in our calculation will be zero. The difference of -10 tonnes of oil (costs "with" minus costs "without" the project) will be taken into account when analyzing the benefits as a result of lower fuel consumption.

There are not any non-economic items in the list of costs. It means that in order to obtain the total cost of the project, it is left to make an assessment of the negative external effects. In this project, a potential negative external effect on the quality of environment would be the emergence of waste as a result of the dismantling old windows and doors. It would be good if the project had predicted whether the wooden window frames could be sold as firewood and the glass should be offered for recycling. In this way, the costs will be converted into benefits and they can be calculated in the benefit analysis. Having in mind all of the previous mentioned, now the economic flow of the entire lifetime of the project can be presented.

Table 2. Total Costs (in euro)

	Years of the Project									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Total Costs	51,880	0	0	0	0	0	0	0	0	0

Source: Resen Municipality.

When identifying the benefits, it is accessed in the same way as for costs. We made a difference between benefits "with" and "without" project. However, in the very analysis of the problem, it was found that there are no benefits "without" the existence of such a project. On the other hand, benefits of the project are multiple: financial benefits as a result of reducing heating costs; improved teaching conditions; and reducing the number of diseases among students and teachers. With a previously made cost analysis, we determined that annual heating will require 10 tons of oil less. School savings for 10 tons of oil annually represent a benefit worth: 10 tones (10,000 liters) x 0.73 cents per liter = 7,317 euro.

Now, total benefits for each year of the project are given in the following table:

Table 3. Total Benefits (in euro)

	Years of the Project									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Total Benefits	7,317	7,317	7,317	7,317	7,317	7,317	7,317	7,317	7,317	7,317

Source: Resen Municipality.

Other benefits that can not be expressed in money but affect the acceptance or rejection of the project and therefore should be included in this analysis are the following: the internal temperature will reach the optimum of 20-21 degrees Celsius; the conditions for the teaching process will be improved; the effectiveness and efficiency of teaching, which was previously difficult due to inadequate classroom conditions, will increase; the number of diseases (colds) among students will be reduced; the aesthetic appearance of the school building will improve, etc.

Once all the costs and benefits of the project have been determined, it can be transferred to determine the acceptability of the project from a social point of view. Admissibility can be determined on the basis of two criteria: social net-present value of the project and benefit-cost coefficient.

The eligibility criterion for the project is to have a social net-present value to be a positive size. The formula for calculating the social net present value is the following:

$$NPV_e = \sum_{t=1}^{n} \frac{NP_t}{(1+i)^t} \quad \textbf{(1)}$$

where "NPV_e" is a social net-present value, "NP" are net benefits, "n" is the length of the project's exploitation life, and "i" is the social rate of discounting (Nestorovski, 2005). Net benefits (Table 4) represent the difference between the total benefits (Table 3) and total costs (Table 2).

Table 4. Net benefits (in euro)

	Years of the project									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Benefits (B)	7317	7317	7317	7317	7317	7317	7317	7317	7317	7317
Costs (C)	51 880	-	-	-	-	-	-	-	-	-
Net Benefits=B-C	-44563	7317	7317	7317	7317	7317	7317	7317	7317	7317

Source: Resen Municipality.

The net benefits obtained are discounted with an appropriate discount factor. Although in practice a discount rate of 10% is usually taken, in this case eight scenarios have been calculated, i.e. four discount rates have been taken: 10%, 5%, 3%, and 1%, for a period of 7 or 10 years. As it can be seen from Table 4, the project is unacceptable in all four scenarios in which the time period is 7 years. In the latter case, when the calculation period is increased from 7 to 10 years, at a discount rate of 10%, the result is again negative, which means that the project is unwarranted. Positive value for NPV is obtained in scenarios where the duration of the project is 10 years, at a discount rate of 5%, 3% and 1%. This result speaks about the difficulties in finding economic justification for the implementation of this project.

Table 5. Sign of Net Present Value

Years of the project	**Discount rate**			
	10%	**5%**	**3%**	**1%**
7 years	**-**	**-**	**-**	**-**
10 years	**-**	+	+	+

Source: authors' calculations.

The acceptability of the project is determined by computing another criterion, which is a benefit-cost coefficient. This coefficient represents the ratio between discounted values of benefits (PVb)

and discounted values of costs (PVc). The eligibility criterion for the project is to have the value of the coefficient that is greater than 1. In this case, the discounting of the flows of costs and benefits was done according to the following formulas:

$$PV_b = \sum_{t=1}^{n} \frac{B_t}{(1+i)^t} \quad \textbf{(2)}$$

$$PV_c = \sum_{t=1}^{n} \frac{C_t}{(1+i)^t} \quad \textbf{(3)}$$

In our case, four scenarios are presented. Namely there are taken discount rates of 10% and 5% for periods of 7 and 10 years (Table 6).

Table 6. Benefit-cost coefficient

Years of the project	Discount rate	
	10%	5%
7 years	< 1	< 1
10 years	< 1	> 1

Source: authors' calculations.

As it can be seen from Table 6, in three scenarios, the result obtained is less than 1 (<1), making the project not justified from the economic point of view. Only the scenario with a discount rate of 5% and for a time period of 10 years, gave a result that is greater than 1 (> 1). It means that the project is acceptable in such conditions only. All of the previous, speaks in favor of the difficulties in implementing the project.

Conclusion

Cost benefit analysis is a methodological approach that helps to determine which programs or projects are more rational than others, or how to make a choice between potential programs and projects. Within this paper, only one alternative for achieving certain results through the implementation of the project was considered, i.e. the project that was subject of the analysis was not compared to other projects or other versions of the same project, although a key element of the economic analysis is to consider alternatives to the proposed project, including the alternative not to implement the project at all.

The results obtained are not a sufficient indicator for the implementation of this project, which is aimed at increasing the welfare of the part of the local community. Initially, the project was justified according to the school's strategy, i.e. to take action to rebuild the school every four years. The costs incurred for changing old wooden windows and doors with the new ones (aluminum), were to be justified by the fact that this activity generates more and multiple benefits. Benefits from this project activity were to be felt by future generations of students and teachers. Unfortunately, the conducted analysis did not give a positive assessment for the realization of the project. More precisely, this project is not eligible for realization according to the criteria of cost-benefit analysis, except when additional arguments are provided to guarantee sustainable development (reducing the discount rate and extending the duration of the project). Moreover, as a risk here one could mention the possible change in the price of oil and the difference in temperature from one heating season to another, which would lead to increased costs in the future.

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