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THE USE OF COST-BENEFIT ANALYSIS FOR ENVIRONMENTAL PROJECTS

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ABSTRACT
In research, we analysed the way cost-benefit analyses (CBA) were carried out in governmental and self-governmental projects which were partly financed by the European Union. The primary aim was to establish how the way these CBAs are carried out can be improved in the case of these institutions. By taking account of the environmental endowments and social factors, it became obvious that the quantity and presence of externalities is usually more significant than in the case of the assessment of economic factors. The presence of quantified benefits in the development documents could make it much easier for the decision makers to decide whether the investment possesses suitable characteristics in an economical, environmental and social sense too, in the case of projects and development concepts, or not. Therefore, its realization will certainly modify the welfare curve in a positive direction. In spite of this it can be stated that the incorrect methodical approach of the economic factors result many extern effects in the evaluation, which place the certain development programmes in the centre of the preferred economic decisions in a way that they cause many social and environmental damages.
Keywords: cost-benefit analysis, external effects, self-governmental projects, benchmarking, indicators

INTRODUCTION

Nowadays, because of the effects of the economic depression, it is more and more imperative to make the decisions concerning the planned investments be level-headed. Because of this, the European Union has a requirement that the CBAs be pre-emptively done for the higher cost investments. The goal of CBAs is, after all, to determine if the investment will produce an economically long-lived and sufficient result, while also helping to filter and quantify all the relevant external effects (TÓTH, 2008). I also made an effort to unveil how CBA was used for governmental, and self-governmental projects where European Union funds were used, which is important because it's becoming more imperative in this delicate and difficult economic situation to make the invested aid produce the highest level of efficiency, and generate the highest amount of positive impact. The actual process of my analysis can be divided into two main parts, first of which is the introduction and study of the actual CBA methodology. Our goal is to introduce the need and importance of doing this analysis in the preparatory planning phase, before the actual beginning of the execution of investment plans. The methodology provides a chance to examine the refunding of the investments in long-term, while not discarding the non-monetary and not easily quantified pros and cons. In this phase of the analysis, the document, made according to the criteria of the European Union on „general methodical know-how of making cost-benefit analyses" was of great help and benefit to me, which also covers the importance of the estimation of external effects in economical cost-benefit analyses (NFÜ, 2008). This stresses the importance of including the external effects in the highest possible detail (NFÜ 2009). The quantification methods however, vary from project to project. During the analyses, this text introduces different charts which summarize quantification methods of the effects, which help make the effect

quantifications and the interpretations easier. However, it might happen that some of the data can't be quantified, in which case it's important to comment on why that's the case, and at least give a qualitative explanation to the variable. The use and importance of this is that it shows that the non-monetary pros and cons have an overall lower importance during a decision-making phase than the monetary ones (SAMUELSON-NORDHAUS, 2000). During the actualization of the next segment of the analysis, we rate the CBAs of five chosen investments, by the strengths and weaknesses of their respective methodologies. The chosen five projects undertaken by different self-governments all include the use of partial financing from the European Union, for which the cost-benefit analyses were all made before the beginning of the projects, as part of actualization analyses. The professional documents have served as a baseline to choose the three projects for benchmarking analyses since further rating projects which were the methodically best CBAs. This is important, because when choosing the indicators of the benchmarking analyses, I strived to create a pointer-system which can be used to filter the CBAs by their applicability regarding external effects. The benchmarking analyses were made with three aspects, regarding three projects, after which were summarized the results.

MATERIAL AND METHOD

During the creation of analysis, we chosen the CBA documents of five self-governmental projects, by methodologies used, which are as follows: 1- The rehabilitation program of city central by the Self-government of Szentes and partners; 2- Area-plan for city central by Sárbogárd; 3- Creation of a Cycling Community Transportation System in Budapest"; 4- The project for sewage and canalisation of Tompa; 5- The establishment of a sewage farm in Nagykálló. We choosed these documents because they include CBAs made with different methodologies, and they have good examples of pros and cons of said methodologies. At first, we analysed the CBA documents of my chosen projects, and listed their methodological pros and cons. These results served as a base for the next part of my analysis, by choosing the three best as a sample for my benchmarking analysis. According to Champ (CHAMP 1998 and see more in COWI KFT 2010)), benchmarking in a newer interpretation means the finding and execution of so-called „best practice" elements, which are already proven and working exercises. Using the benchmark process, we analysed the aggregation of many externals, and defined the exact number of said externals.

The reason for this is simple – it is important to take note of all these externals, be it positive or negative, since the exclusion of them from the analysis may lead to incorrect assessments and decisions. These externals are also in a synergy; therefore we felt the need to summarize them. At the end of the analysis, the averages of these sums were used, since this is what defines the approximated average external-content of the systems, therefore, the average of the minimums and maximums would produce the optimum, in terms of the analysis. The „best" project will be chosen by process of elimination, leaving the one which has the number of externals closest to said optimum in its assessment. As a first step to this analysis, we created an indicator-group which may be used to assess the used methodology of the respective CBAs, meaning their applicability to the measurement and quantification of externals (*Table1*).

The indicators were grouped into three different categories: economical, environmental and social aspects. In all aspects, there are three indicators of status, and three indicators of performance. These were defined, and then used and evaluated on a -2 to +2 scale, then summarized the results.

Table 1. Indicators

Indicators of Status		**Indicators of Performance**	
Economical Aspects			
1.	Net Present Value (NPV)	1.	Change in Net Present Value (NPV)
2.	Economical Rate of Return (ERR)	2.	Change in proportions of Economical Rate of Return (ERR)
3.	Cost / Benefits Rate (CBR)	3.	Change of Cost / Benefits Rate (CBR)
Environmental Aspects			
1.	Effects on environmental characteristics	1.	Change in the quantified effects of environmental effect change
2.	The environmental effects of soon-to-be introduced technological systems	2.	Impact of the effects of soon-to-be introduced technological systems on the environment
3.	Effect on transportation and transport systems	3.	Change of the effect on transportation and transport systems
Social Aspects			
1.	Effects on health	1.	Change of effects on health
2.	Effect on employment and established workplaces	2.	Effects of the change of workplaces (both positive and negative)
3.	Effects on education	3.	Change of effects on education

Source: self-made and edited, 2012

RESULTS

The analyse of the results of evaluating the documents

The following three projects were used for the benchmarking: „Creation of a Cycling Community Transportation System in Budapest" (project 1), the project for sewage and canalisation of Tompa (project 2), and the establishment of a sewage farm in Nagykálló (project 3). The criteria for this decision was the evaluation of the methodologies of the various CBAs the projects used, because the choice of indicators was based on the ability to filter the applicability of the methodologies of each CBAs to external effects. At this point, both the amount, the applicability and the rateability of the information in the documents of the chosen projects was sufficient.

Evaluation of the results of the benchmarking analysis

During the evaluation, the numbers were various aspects, which were shown in the last row of the chart. To evaluate it, we used the average of the minimum and maximum numbers, and chose as an optimal value the one which was closest to this number.

Table 2. Evaluation of Economical Aspects

Code	**1. project**	**2. project**	**3. project**
1.	+2	-1	+2
2.	+1	0	+2
3.	+1	-2	+2
Sum	*(+)4*	*(-)3*	*(+)6*

Source: self-made and edited, 2012

While evaluating the economic aspects, the project which contained the least amount of externals was project one. Here, the average was 4,5. Even though, the positive externals in this case are less than the third project, the second project amasses the highest amount of negative externals in the economical indicators. However, the value closest to the average is the first project (see *Table 2 and Table 3*).

Table 3. Evaluation of Environmental Aspects

Code	1. project	2. project	3. project
1.	+1	+1	+2
2.	+1	+1	+1
3.	+2	+1	+1
Sum	*(+)4*	*(+)3*	*(+)4*

Source: self-made and edited, 2012

When evaluating the environmental aspects, all three projects produced a similar number, which are all relatively close to the defined optimum, in this case, 4. Fundamentally, all three projects have rather positive prospects, and their environmental load is relatively low. If we go by the change in state of the environmental elements, the third project is the best, since all three indicators are expected to change for the better. There is no shocking innovative positive impact regarding any of the technologies waiting to be implemented, however, the actual standard of previous technologies will probably improve either way. The load on transport systems is lowered by the first project the most; however, there is a positive change in three projects.

Examining the project from a social standpoint, all three are relatively close to the defined optimum, which in this case there is a 3.5. Therefore, in all three projects, the resulting externals are positive. If we take health care, the realisation of all three projects is important. There is also a distinct change for the better in terms of employment. In the first project, the chances of the unemployed get better, since they have better options of travelling to their respective workplaces, while the other two projects need new manpower and staff for both establishment and continued business. As for raising the level of education, the contribution of the third project is highest, since the new establishment requires specific technological studies from its workers (see *Table 4*).

Table 4. Evaluation of Social Aspects

Code	1. project	2. project	3. project
1.	+2	+2	+2
2.	+1	+1	+1
3.	0	0	+1
Sum	*(+)3*	*(+)3*	*(+)4*

Source: self-made and edited, 2012

CONCLUSIONS

When summarizing the results of the benchmarking analysis, the difference in externals is clearly visible (*Table 5*). When summarizing the results, we also defined the optimum in this case, which would be 8.5. The project closest to this optimum is project one, since for this project, there are the minimum expected externals (see *Figure 1*), therefore, it doesn't cause major problems in the market, even if they were disregarded during the financial planning. In case of projects having too many or too few externals however, disregarding them may cause a major problem, and through the improper data and results, it can

conclude in wrong decisions. It is visible from the results of the benchmarking analysis, that the projects show different values in terms of the economical effects, which differ in the methodologies examined, from simplified economic calculations to professional CBAs. Also, the evaluations shed light on the fact that the projects have many externals, which weren't properly quantified and included in the calculations of the CBAs. The environmental properties and the social indicators also clearly have more externals, then the economical indicators.

Table 5. Summary of benchmarking analysis results

1. project	2. project	3. project
(+)4	(-)3	(+)6
(+)4	(+)3	(+)4
(+)3	(+)3	(+)4
(+)11	**(+)3**	**(+)14**

Source: self-made and edited, 2012

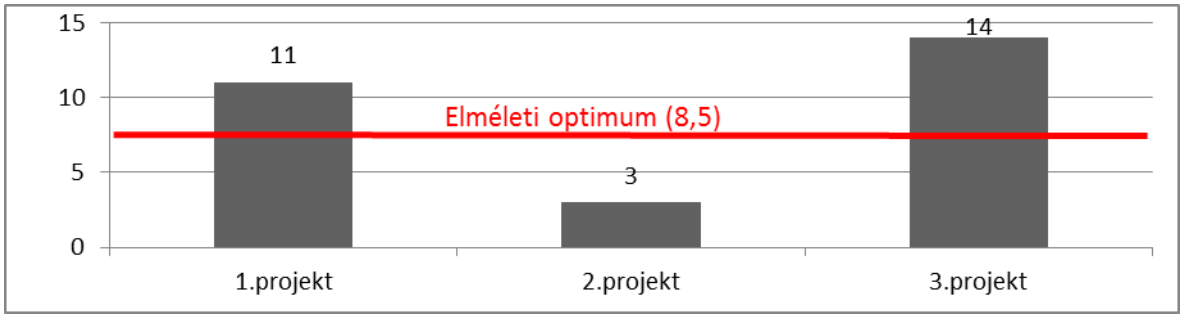

Figure 1. Summary of benchmarking analysis results
The red line shows the defined optimum
Source: self-made and edited, 2012

Some conclusions and suggestions, which are as follows: the goal of the cost-benefit analyses, or CBAs, is to monetarily define the benefits and costs of a project which raises the prosperity of the populace, and to make it obvious and clear to the ones making the decisions. It makes investment planning simpler, while also simplifying the continued actuation, since it reduces the many costs and benefits to a single dimension – in this case, money. Or at least, that would be the goal, if it were that easy. This is the double edge of the sword in our case – the main opportunity, and the main threat – because the pros and cons which can't be quantified in terms of money have less of an impact on the planning of a project than the ones which can be. Therefore, without their internalisation, the systems can't be displayed and evaluated in their true form, which concludes that it's necessary to both define and quantify these external effects to the utmost degree for the various investments and projects. It can be generally said regarding the evaluated projects, that no actually useful monetary and economic calculations were made by the ones doing the analyses (see *Table 5; Figure 1*).

Only the investment costs and the social values were properly calculated, but even the methodology of this was presented in an insufficient manner. It's quite common that there are no sensitivity analyses and risk analyses in the projects, and there were no maintainability calculations either. In essence, these important methodological bits are not present, these documents are therefore unable to provide the necessary assistance for the decision-makers to help them make a proper decision, even though after the NPV was calculated, they were given the green light. It is also clearly visible from the results of the

benchmarking analysis, that the evaluated systems of the projects show differing values and stats in terms of the economical effects, and this differentiation is irrelevant of us looking at it using either simplified economical calculations, or professional CBAs. Therefore, we can state that the incorrect assumptions made in the economical aspects result in many extreme effects that put the development programs in the centre of economical decisions, and in a way that they don't generate sufficient social, economical and environmental benefits.

The benchmark analysis revealed that the projects include many improperly handled externals. This causes a problem, because properly quantified benefits in the documentation of the project would lessen the burden on decision-makers, and make it easier for them to decide if the various projects and concepts hold sufficient economical, environmental and social benefits, or not, and if they have the required characteristics.

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