

WHAT ARE LEFT UNDERESTIMATED USING COST-BENEFIT ANALYSIS FOR PUBLIC PROJECT EVALUATION?

Jurgita Baranauskiene, Valdemaras Makutenas, Albina Novosinskiene

Aleksandras Stulginskis University,
Universiteto street 10, LT-53361, Akademija, Kaunas district, Lithuania

Abstract

Public projects don't generate enough income to be financially justified, but create social benefits. Every project should be evaluated in order to make the investment decision. The cost-benefit analysis is a common method for public project evaluation, but this method does not fully comply with the basic concept of public projects. This theoretical and empirical research disclosed limitations of the cost-benefit analysis, used for public projects evaluation and identified the problem field for improving the cost-benefit analysis or creating new methods for public project evaluation.

Key words: investment, public project, social benefits, cost-benefit analysis

1. INTRODUCTION

In most cases investments are considered to be free money which businessmen or state's government devote to implement some kind of idea expecting for positive changes in the future. Both private and public investments are significant. They both create welfare for the country: promote economy, reduce social gap, create competitive and favourable conditions to live and work. There are some areas in which business is not willing to invest due to unprofitableness, so these areas are funded from public funds while preparing and implementing public projects.

In many cases the public projects, unlike business, do not produce income, but provide economic and social benefits for the public. Investment projects, specifically aimed at reducing poverty, are related to the aspects of welfare, but not to income. Benefits derived from such projects are difficult to quantify (Van De Walle, 2002). Benefits brought by public projects are intended for satisfying public needs and they are generally referred to as social benefits. Investments in the public sector have to meet the social, economic and political criteria (Medaglia *et al.*, 2008)

In order the investments would positively affect various social areas and development of regions they must be used effectively. Investments are being allocated to fund investment projects thus if one wants to ensure the benefits of the investments, the effectiveness of the investment project must be properly evaluated. During the evaluation of public project the most important thing is to evaluate social benefits the project creates but this kind of evaluation is very complicated due to uncertainty of social benefits and the method cost-benefit analysis can only allow evaluating social benefits which are measurable in monetary units. A question arises – whether such evaluation of public projects is suitable and whether the decisions made are correct?

Object of research – evaluation of public projects using the method of cost - benefit analysis.

Goal of research – after revealing the differences of public and private investments, to analyse the evaluation of public projects the method of cost – benefit analysis and to explore the features, advantages and limitations of this method.

Tasks:

1. To reveal the importance of and differences between public and private investments;
2. To provide the methodology of cost-benefit analysis which is used to evaluate public projects;
3. To explore five case studies in which public projects are being evaluated using the method of cost-benefit analysis.

In order to achieve the goal defined and implement the tasks determined by it, the analysis and synthesis of the scientific literature, and the systematisation, comparison and summing-up of four Feasibility Studies information were used.

2. DIFFERENCES BETWEEN PUBLIC AND PRIVATE INVESTMENTS.

The term “investments” has many definitions. Some of them are given below:

- Investments are business activities in which the resources are being used while creating new real capital. In most common sense, investments mean activity whose benefits are revealed not immediately but in the future. Investor words, 2011.
- Investments are flows of revenue which is devoted to technologies of various products which are not directly used in the production processes. Pearce D. W., 2006
- Investment is a process during which the decisions are made based of an analysis of specific data and accepting the risk and uncertainty. Azzopardi P. V., 2010

The above given definitions of the term of investments more likely define investments which are made in business. These investments primary bring benefits for the company. Scientists state that investment is one of the most important factors influencing the financial status of the company, its business continuity, development and competitiveness. Regardless of that, in order to ensure the growth of the whole economy of the state some investments must be made for country’s economy seeking to promote economy, ensure social wellbeing of state’s citizens and protect the environment. In most cases such investments are funded by government institutions. Investments that are funded from state or public organizations and which goal is not related to financial benefits are called public investments.

Table 1 provides the differences and similarities between public and private investments, including investment source, object and investment goal.

Table 1. Comparison of public and private investments.

Factors	Investments	
	Public	Private
<i>Measures of investments</i>	• Cash	• Cash; • Material and non-material assets
<i>Funds of investments</i>	• Public funds	• Private funds
<i>Object of investments</i>	• Education; • Rural development; • Roads, water supply and other public infrastructure; • Health care; • Environmental protection; • Reducing social gap; • Other community services.	• Securities; • Material and non-material assets; • Management of company activities; • Qualification of employees
<i>Goal of investments</i>	• Reducing economic and social gap;	• Profit;

	• Implementation of state functions; • Reducing social differences; • Stimulation of economy.	• Increased value of assets; • Increased effectiveness of company's activities.
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The investors who invest in business most often seek for direct benefits which are gained from profits or increased value of invested assets. Although it is not the goal of investors, private investments indirectly impact state's economy: bigger profits lead to bigger profit taxes, the GDP is increased, increased effectiveness of company's activities leads to a bigger demand of employees which in turn reduce the level of unemployment.

Meanwhile, in most cases, the objects of public investments are social matters – education, environment protection, health care, etc. Today public investments are increasingly dedicated to reduce social and economic gaps between regions or separate countries. These goals are priority areas of the politics of EU and other countries.

The comparison of private and public investments based on the object and goal reveals the fundamental difference. Objects and goals of private investments are directly related with improving the financial status of the investors although reaching this goal indirectly affects the state's economy as well, on a minimum level. Public investments are made to improve the social and economic status of all state's residents, to protect the environment; the investments are made in order to achieve indirect benefits. While creating favourable social environment public investments indirectly affect the growth of state's economy.

The scientist A.M. Pereira (2000, 2001) has applied vector auto regression (VAR) model in USA in order to explore the impact of public investments for state's economy and has stated that public investments positively impact private investments, domestic production volumes and employment. It was concluded that public investments are productive and promote the economy growth.

The impact of public investments to state's economy is the field of scientific research. The results from some research confirmed the impact of public investments for state's economy, meanwhile the results of other research have contradicted this idea. Despite of that, there is an increasingly growing opinion and increasing number of research which confirm the positive impact of public investments for state's economy. Public investments promote the growth of economy through public goodness, i.e. education, scientific research; also, the investments can have indirect impact for the growth of economy – the investments create favourable environment to attract more investments from foreign countries which in turn stimulate the economy growth (Zang, Fan, 2002).

World Bank study (2007) showed that public investments make the significant positive influence on infrastructure, education and health sectors.

It is very important to see what the impact of public investments will be before making the investment decision. M. Marius, S. A. Gabriela and S. Cristian (2010) indicated three crucial factors which influence the impact scope and utility of public investments for state's economy and regional development:

1. The government making the investments must be assured that it will be able to provide sufficient funds in order to ensure non-interrupted implementation of the investment project;
2. Municipal governments investing into project of local significance must foresee if they can gain funds from the government if it faces the lack of investments allocated for its project;
3. The projects of public investments must be implemented transparently and without corruption.

These mentioned factors influence the impact scope of public investments. The states face with problem trying to choose the most suitable project for investment, which would ensure the biggest benefits for the society. Fundamental reason which leads to ineffectiveness of public investments is poor selection of projects. The scientists (Flyvbjerg 2003; Collier, Venables, 2008) agree that in order

to determine the marginal productiveness of investments and its effects to state's social environment and economy growth, it is crucial to investigate the effectiveness and quality of the investments, i.e. to properly evaluate all possible effects of the project including both benefits and damages.

The essential feature of public projects is that their goals are directed to the satisfaction of public needs but not to direct financial outcome. The cost-benefit analysis is a common method for public project evaluation, but this method does not fully comply with the basic concept of public projects. The most actual problem of the cost-benefit analysis is assessment of social benefits created by public projects.

3. THE MAIN STEPS OF COST-BENEFIT ANALYSIS

Cost-benefit analysis, applied in public projects' valuation, consists of 3 stages, which are described in Figure 1.

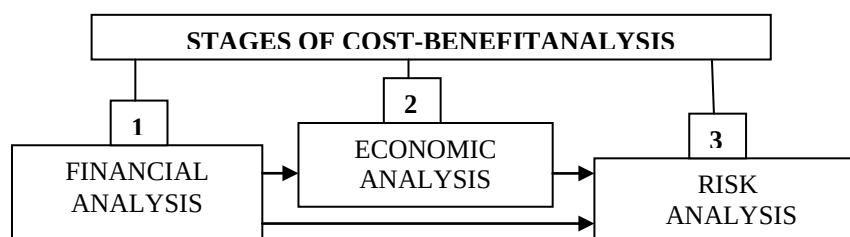


Fig.1. Stages of cost - benefit analysis (prepared by authors using Boardman et al., 2006; Guide..., 2008; Rosen, Gayer, 2008; Baranauskiene, Alekneviciene, 2013)

The financial analysis (Fig.2.) consists of stages in which the financial flows of investments, revenue and expenses of activities, investment sources are being calculated and cash flow analysis is conducted. The financial analysis is finalized by the calculation of NPV and internal rate of return (IRR).

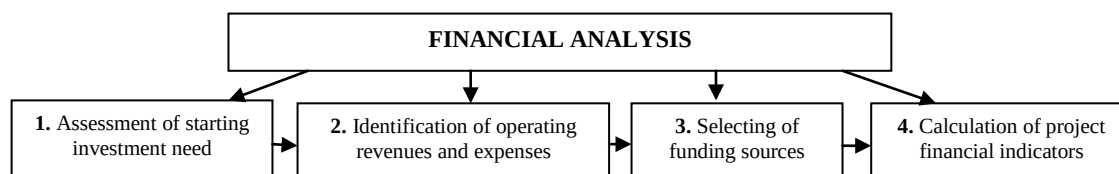


Fig.2. Steps of Financial analysis in cost-benefit analysis (prepared by authors using Boardman et al., 2006; Guide..., 2008; Rosen, Gayer, 2008; Baranauskiene, Alekneviciene, 2013)

IRR evaluates the capacity of net project revenue to cover investment costs in disregards to the funding source. NPV shows project's benefits expressed in today's money value: if the value of NPV is positive it means that the project ensures desirable financial annual return and is effective.

During the economic valuation (Fig.3.) of the project, if it is possible, it is being pursued to indicate economic IRR and NPV. These indicators are calculated while adjusting the financial cash flow, which is used to calculate financial IRR and NPV (if necessary): eliminating VAT and other indirect taxes (both in income and expenses); the costs are evaluated with all direct taxes; net taxes of employees (for example, social insurance) is eliminated (Baranauskiene, Alekneviciene, 2013).

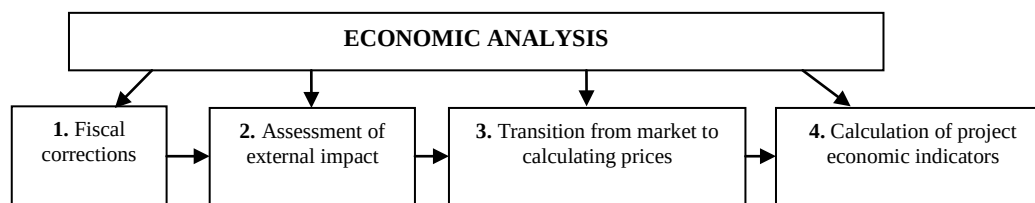


Fig.3. Steps of Economic analysis in cost-benefit analysis (prepared by authors using Boardman et al., 2006; Guide..., 2008; Rosen, Gayer, 2008; Baranauskiene, Alekneviciene, 2013)

The evaluation of social benefits, is one of the most important and the most difficult stages of cost-benefit analysis. In the calculation of project effects to all members of the society economic social benefits must be expressed in monetary units.

The transition from market to calculated prices is necessary when the real prices are distorted by imperfect market (custom taxes, quotes, limitations, public estate rent prices are smaller than market prices, etc.) or the wages are not directly related to work productivity (grants, payments to labour exchange, liability to save occupation places, etc.).

Social discount rate (SDR) used in calculation of project economic indicators.

In the risk analysis (Fig. 4.) at first all expected project-related risks are analysed and evaluated, including its reasons and reducing/neutralizing measures; necessary resources, expenses, management capabilities for applying these measures are evaluated as well.

Sensitivity analysis helps to determine how the results of the project are influenced by changes of specific factors, for example, increase of construction and machine prices, increase of exploitation expenses, social benefits, and changes in discount rate. Sensitivity analysis helps to indicate critical variables which have the biggest impact for the project results.

Scenario analysis shows how the deviations of one or more assumptions affect the results and evaluation criteria of public project under consideration. Scenario analysis is conducted while changing primary assumptions and evaluating the effect to project results. The investment is considered to be risky when small changes of analysed assumptions causes big changes in the results and the results obtained in separate options become disadvantageous from the economic point of view (Baranauskiene, Alekneviciene, 2013).

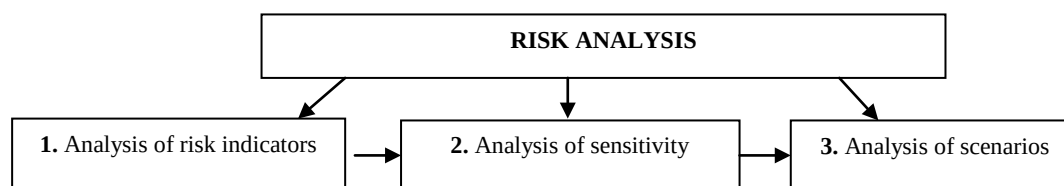


Fig.4. Steps of Risk analysis in cost-benefit analysis (prepared by authors using Boardman et al., 2006; Guide..., 2008; Rosen, Gayer, 2008; Baranauskiene, Alekneviciene, 2013)

The theoretical principles of cost-benefit analysis also were specified by R. Sugden, A. Williams. (1978); Ray (1984); Johansson (1993); Hanley, Spash (1993); Boardman et al (2006); Pearce et al (2006) and other authors.

Public projects do not generate sufficient financial flows but instead they provide social benefits to the society, which, as outer effects of the project, are being evaluated during cost-benefit analysis. That's

why economic analysis is the most important in cost-benefit analysis for public project evaluation. Indicators calculated during the economic analysis are crucial while selecting funding options for public projects, because outer project effects to the society – social benefits – are the main goal of public projects

Social discount rate (SDR) in calculation of valuation indicators raises many scientific disputes, but there is no unified opinion yet. SDR which scientists recommend to use in the valuation of public projects varies from 0 to 7% (Baranauskiene, 2013).

After evaluation of possible investment options for public project using the method of cost-benefit analysis, the most suitable investment option is chosen, the one which provides the biggest social and economic value, demands the smallest amount of investment costs and is the least risky.

The main advantage of cost-benefit analysis is that method is composed of systematic financial, economic and risk evaluation, therefore the investment decision is more justified. The most relevant problem of cost-benefit analysis used for public project evaluation is the expression of social benefits' qualitative indicators in quantitative units and use of monetary units in order to measure the indicators that are not measurable in monetary units (such as human life). The scientists (Jacoby, 2000; Nyborg, 2000; Huenemann, 2001; Glazer et al, 2002; Van de Walle, 2002) cannot find unified answers to the questions raised: how can we measure and evaluate social benefits to the society created by a public project?

4. EVALUATION OF PUBLIC INVESTMENT PROJECTS USING THE METHOD OF COST-BENEFIT ANALYSIS

In order to explore the advantages and disadvantages of the method cost-benefit analysis the empirical research were carries out. The research analyses four public investment projects which were evaluated using cost- benefit analysis before making an investment decision. The results of evaluation of public projects are provided below.

The four public projects were chosen for research:

1. Renovation of children's home and training of personnel;
2. Reconstruction of drainage system in rural area;
3. Establishment of rural community home;
4. Reconstruction of street

The main information about chosen public project options is summarized in Table 2.

Table 2. Short description of public projects

Project initiators and operators	Project goal	Description of planned infrastructure	Amount of investments, EUR
Renovation of children's home and training of personnel			
Institution of Municipality	Improvement of the quality and efficiency of social services in the children's home: improvement of the conditions of living and education of children living in the children's home.	Renovation of the whole building of three blocks, the total area of which is 1864.87 m ² , purchase the necessary equipment and organize training for pedagogues.	1.488.720

Reconstruction of drainage system in rural area			
Association of farmers	To create favourable conditions for development of infrastructure in rural areas and settlements that would improve the competitiveness of land and forest agriculture.	Reconstruction of 5.08 km of drainage selectors and 21.65 km of land reclamation equipment and 0.8 km of land reclamation trenches. Total serviceable area of reconstructable drainage systems is 140 ha.	333.333
Establishment of rural community home			
Rural community	To create favourable environment to work and live in settlement in rural area, while improving the status of public infrastructure.	To reconstruct the building in order to make it suitable for satisfying community's cultural and leisure needs: insulation of facade, change of roof coating, installation of lightning security, fire prevention systems, change of doors, building adaptation for people with infirmity, reconstruction of heating, electricity, water supply and rainfall systems.	90.354
Reconstruction of a street in a city			
Municipality	To improve traffic conditions in the city while reconstructing the street.	Reconstruction of street's coating, improvement of driving to the yards near the apartment buildings, creating conditions for people with infirmity, reconstruction of lighting system and installation of rain water drainage system.	720.633

As even four public projects are chosen the article provides the results of evaluation by using only the method of cost – benefit analysis.

Financial analysis. Chosen public projects evaluation period is 10 years. No revenue is expected from created infrastructure. Annual expenses of maintenance and exploitation amounts are the same, because all project initiators and operators are public institutions. The expenses of maintenance will be covered by the municipality or other public funds. Feasibility studies prepared seeking to fund the investment projects by a support from EU Structural Funds.

After forecasting the cash flows for a 10 years period, the financial indicators of public projects were calculated (Table 3). 5-6 % social discount rate was used in financial and economic analysis.

Table 3. The main indicators of financial analysis

Financial Indicators	Public projects			
	Renovation of children's home and training of personnel	Reconstruction of drainage system in rural area	Establishment of rural community home	Reconstruction of street in city
Financial internal	-31,63	-74,2	-69,4 %;	-3,12

rate of return (IRR), %				
Financial net present value (NPV), EUR	-1.264.577	-294.746	-87.581	-523.985
Period of analysis, year	10	10	10	10
Social discount rate (SDR), proc.	6	5	5	5,5

The financial indicators have a negative value because evaluated projects are public. They do not create net revenue, but rather provide social benefits for the society, thus economic analysis and evaluation of social benefits are the main evaluation stages of public projects.

Economic analysis. Indicators of social benefits of public projects can be measurable or immeasurable in monetary units. The indicators of social benefits analysed in Table 4.

Table 4. Indicators of social benefits of public projects

Public projects	Indicators of social benefits	
	Measurable in monetary units	Immeasurable in monetary units
Renovation of children's home and training of personnel	1. Increased added value created by the children who leave the children's home; 2. Decrease of social allowances for the children who leave the children's home.	1. Healthier living environment for children; 2. Aesthetic living and learning environment for children; 3. Better satisfaction of everyday household needs for children; 4. Stronger motivation to learn and achieve goals for children; 5. Improved self-feeling of children; 6. Decreased gap between children living in their homes and foster homes.
Reconstruction of drainage system in rural area	1. Elimination of yield losses; 2. Increase of land value in the market.	1. Positive effect for ecological conditions of soil and water; 2. Positive effect for landscape; 3. Reducing the risk of contaminating the environment; 4. Reducing the negative effects for residents and their living conditions; 5. Improvement conditions of communication for the residents; 6. Improved motivation to manage a farm and improve the wellbeing of rural community; 7. Less emigration from rural areas.
Establishment	1. Money savings for	1. Improvement of leisure quality for community

of rural community home	residents due to attending events: 1.1. transportation expenses; 1.2. tickets expenses.	members; 2. Possibilities to organize safe leisure activities for children and teenagers; 3. Promotion of citizens' communication and sociability; 4. Improvement of esthetical view; 5. Motivation to live in rural area and create for community; 6. Decreasing gap between urban and rural areas.
Reconstruction of street in city	1. Reduction of accident; 2. Reduction of car exploitation cost; 3. Savings of time costs.	1. Improved quality of living for local residents; 2. Improved image of the city; 3. Reduced social gap, adaptation for people with infirmity; 4. Protection of transportation means; 5. Saving time of residents; 6. Increased safety of traffic; 7. Promotion of economy growth; 8. Protection of the environment.

The main disadvantage of cost-benefit analysis is that the evaluation of public project is being influenced only by social benefits that are measurable in monetary units that are included into the cash flows. Only social benefit indicators measurable in monetary units make influence for economic analysis results and for final public project evaluation results.

Despite of this evaluation most indicators of social benefits created by public projects are not measurable by monetary units: decrease of social gap, ensuring the healthy environment, promotion of social communication and other values which are not estimated using monetary measurement units. Such indicators are simply left aside and do not affect the results of the evaluation of a public project while using the method of cost – benefit analysis. It must also be mentioned that some indicators of social benefit which are used in the evaluation are not directly related with the goals of the project.

In author's opinion it shows a very big disadvantage of the method of cost – benefit analysis when it is used to evaluate public projects: creation of social benefits is the main goal of a public project, unfortunately it is not reflected in the evaluation of such projects. It is very important because the decision regarding investment options must be chosen while having limited funding resources.

The calculated economic indicators presented in Table 5.

Table 5. The main indicators of economic analysis

Economic Indicators	Public projects			
	Renovation of children's home and training of personnel	Reconstruction of drainage system in rural area	Establishment of rural community home	Reconstruction of street in city
Economic internal rate of return (IRR), %	12.0	11.0	36.7	9.69

Economic net present value (NPV), EUR	758.459	87.003	261.099	293.480
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The results of economic analysis of the projects show that all projects are beneficial and the investments will provide high economic internal return rate.

Besides, it must be noted that some indicators of social benefits were left unevaluated.

Risk analysis. After conducting the risk analysis it can be stated that none of the projects is more risky. Risk factors are similar for all the projects analysed, they are related with the funding of investments, implementation of the project and expected results – effects. The above mentioned factors of project risks can be managed by responsibly planning and controlling the implementation of project activities, publicizing the project, promoting the use of the created infrastructure.

The sensitivity analysis estimated how the following risk factors change (investment amount, exploitations costs, and social benefits) would affect the economic project indicators. After conducting sensitivity analysis it was concluded the changes of any analysed factor does not substantially affect the results of project evaluation.

During the analysis of scenarios the pessimistic (worsening the assumptions by 10%) and optimistic (improving the assumptions by 10%) scenarios were evaluated. The scenario analysis shows that even in most pessimistic scenario all projects remain economically viable.

While summarizing the risk analysis it can be concluded that all the projects are not critically risky, the risks can be manageable, and thus the projects can be implemented.

The projects which were analysed during the research are not comparable with each other as investment options. The goal of the research was to reveal the problems of evaluation of public projects using the method of cost – benefit analysis.

In summary, the results of the research show that the method of cost – benefit analysis has some limitations when it is used to evaluate public projects. One of the most crucial limitations is that the whole effect of the project is not being evaluated, i.e. all social benefits which are created by the project stay unevaluated. Taking into account the fact that public projects are dedicated to create services, public goodness, satisfy the needs of the society, the method of cost- benefit analysis ignores the most significant expected result of the project. Thus it can be stated that evaluation of public projects using the method of cost – benefit analysis is unreliable. The investment decision cannot be made based solely on the results of evaluation using the method of cost – benefit analysis.

5. CONCLUSIONS

There are some areas in which the business is not willing to invest because it is not profitable. The goal of private investments is financial benefits. Reducing of social gap and creating favourable conditions to live and work is state's obligation and responsibility. Essential differences between public and private investments are the goal and object of the investment. Public investments do not buy off financially. Such investments are dedicated to ensure the wellbeing of the society. While creating favourable social environment public investments also indirectly affect the growth of the state's economy. It is very important to explore the expected effects of the public investments before making an investing, i.e. the public investment projects must be evaluated before making an investment decision.

Cost-benefit analysis is composed of systematic financial, economic and risk evaluation, therefore the investment decision is more justified. The most relevant problem of cost-benefit analysis is the expression of social benefits' qualitative indicators in quantitative units and use of monetary units in order to measure the indicators that are not measurable in monetary units.

After analysis of four public Investment projects where provided evaluation using a method of cost-benefit analysis, it can be concluded that all public projects are economically substantiated and provide social benefits for the society. Despite of that, there are some doubts if the evaluation results are correct, because the method of cost-benefit analysis did not include social benefits indicators immeasurable by monetary units, and some of indirect benefits which is measurable by monetary units, is not a goal of the public project. It reflects an obvious disadvantage of the method of cost-benefit analysis use for evaluating the public projects: main goals of public projects are to create the social benefits, but not all created benefits influence the evaluation results.

In summary, it can be stated that a quantitative evaluation is not sufficient for evaluating the results of public projects, it is proper to integrate a qualitative evaluation additionally, in order all the benefits or damages of the public project could be comprehensively explored, not only the ones which can be evaluated using monetary measurement units.

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