COST-BENEFIT ANALYSIS IN ASSESSING THE SUSTAINABILITY OF PROJECTS FINANCED FROM EUROPEAN FUNDS

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ABSTRACT: *Cost-Benefit Analysis (CBA) is an essential tool in the decision-making process regarding the financing of European projects. It allows a systematic assessment of the economic, social and environmental benefits, compared to the costs involved. This study explores the importance of the CBA method in the efficient allocation of resources, highlights applicable models, analyses the criteria used within European programs, with concrete examples from various fields. The paper focuses on the economic and social impact of applying the CBA method as well as the challenges and limitations of this approach.*

KEY WORDS: *cost-benefit analysis, European projects, economic impact, social impact, decision-making, selection criteria.*

JEL CLASSIFICATIONS: *H43, H83, O19, O22.*

1. INTRODUCTION

Projects financed from European Funds require rigorous evaluation to ensure the efficient use of resources. Cost-benefit analysis is a fundamental criterion for project selection, providing an objective methodology for justifying public investments. This analysis allows the identification of economic, social and environmental impacts, contributing to strategic decision-making (European Commission, 2023).

Public investments, including those made through European Funds, must meet strict efficiency and sustainability criteria. The European Union places particular emphasis on ensuring a positive return on the financed projects, and CBA is used as the main tool for economic justification. In this context, a detailed understanding of how CBA is applied and its impact on the selection and implementation of European projects is essential. (European Investment Bank, 2022).

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2. EXTENDING CBA BY INTEGRATING SOCIAL AND ENVIRONMENTAL BENEFITS

ACB involves several essential steps:

- Identifying the costs and benefits of the project;
- Determining the net present value (NPV);
- Calculation of the internal rate of return (IRR);
- Sensitivity analysis;
- Assessing the risks associated with the project.

A traditional limitation of CBA is its excessive focus on financial indicators, neglecting social and environmental benefits. For European projects, this aspect becomes essential as many initiatives target social objectives, such as social inclusion, education, health or environmental protection.

Since ACB uses the discounted cash flow technique to calculate the economic efficiency indicators of projects, a critical component of the method is the selection of an appropriate discount rate, which reflects the opportunity cost of the invested capital. This aspect is essential for comparing different projects and determining the economic feasibility of each investment.

The methods for integrating social and environmental benefits of projects used within the CBA framework are:

- *Quantifying social benefits*: assessing the impact of projects on quality of life through financial indicators, such as reduced medical costs due to lower pollution.
- *Qualitative indicators*: using multi-criteria methods to integrate factors that are difficult to quantify, such as the satisfaction of affected communities.
- *Comparative impact analysis*: creating alternative scenarios that highlight environmental impacts.

For example, for a wind project (from the category of renewable energy projects) financed through European Funds, the CBA analysis must include not only the installation and operating costs, but also the net environmental benefits, such as reducing CO2 emissions, reducing dependence on fossil fuels and creating sustainable jobs.

3. THE IMPACT OF EUROPEAN FUNDS ON REGIONAL ECONOMIC DEVELOPMENT THROUGH CBA

The main aspects that need to be mentioned here refer in particular to:

a) *Increasing economic competitiveness*

European funds support regional economic development through strategic investments in infrastructure, education, health and digitalization. The use of ACB allows the selection of projects with the highest economic impact, ensuring a positive return on investment (European Investment Bank, 2022).

These investments stimulate innovation and entrepreneurship, contributing to creating a favourable environment for local business development. Regions that benefit from European funds improve their accessibility and economic attractiveness, which leads to attracting investors and diversifying the local economy (Boardman et al., 2018).

Thus, European funds have had a significant impact on the economic development of the municipality of Alba Iulia in Romania. Investments in infrastructure and tourism have led to an increase in population, the number of tourists and general economic development.

Between 2007 and 2016, Alba Iulia accessed and used over 200 million euros in European Funds, almost half of which were allocated for the restoration of the Alba Carolina Citadel. These investments had the following effects (www.adevarul.ro):

- *Population growth*: The number of inhabitants increased from 63,536 in 2011 to 74,000 in 2016, representing an increase of approximately 11,000 people.
- *Tourism development*: The number of accommodation units increased to 42, and in 2016 there were 156,000 accommodations, compared to 32,000 in 2007.
- *Increase in the number of building permits*: In 2016, 946 permits were issued, compared to 400 in 2006.

b) *Job creation and labour market development*

Investments financed through European Funds generate direct and indirect jobs. Infrastructure projects, for example, not only improve regional connectivity, but also contribute to increasing employability in disadvantaged areas.

Two relevant examples in this regard from Romania are presented below:

1. Regeneration of the disadvantaged community in Târgu Mureș

Târgu Mureș Municipality implemented four projects financed by the Regio Programme 2014-2020, with a total value of over 33 million lei, of which almost 21 million lei represents non-reimbursable financing.

These projects aimed at the modernization of two streets, the construction of four social housing blocks and the energy efficiency of a secondary school. The main goal was to reduce the number of people at risk of poverty or social exclusion, improve their quality of life and increase social cohesion in the targeted area (www.fonduri-structurale.ro).

2. Modernization of the railway infrastructure in the port of Constanta

In October 2024, the Romanian government approved a plan to modernize the railway infrastructure in the port of Constanta, allocating over 750 million lei (approximately $162.5 million) for rehabilitation works.

This project aims to create a second railway access point in the port, part of broader investments stimulated by the regional geopolitical context. Modernization of the port infrastructure has the potential to increase employability in the area, by attracting new investments and creating jobs in the logistics and transport sector (www.reuters.com).

In addition to newly created jobs in various sectors, European funds support initiatives to retrain the workforce and adapt skills to modern market requirements (Mishan & Quah, 2020).

c) *Infrastructure development and improvement of living conditions*

European projects support the modernization of road, rail and energy infrastructure, leading to better mobility, reduced transport costs and a cleaner environment. These improvements have a positive effect on the quality of life of the population, reducing travel times and facilitating access to essential services.

Romania has benefited from numerous projects financed by European funds to modernize its railway, road and energy infrastructure. Here are some relevant examples:

1. *Modernization of railway infrastructure* (www.fonduri-structurale.ro):

- Bucharest North Railway Station – Henri Coandă International Airport Railway Link: This project aimed to create a direct connection between the capital's main railway station and the airport, encouraging the use of rail transport to the airport. The European Union allocated 48.4 million euros for this project.
- Coslariu – Cluj-Napoca railway line: The project included the development of a feasibility study for the modernization of this line, with the aim of identifying and remedying existing deficiencies. The EU funding for this study was 9.4 million euros.
- Modernization of the Bucharest – Craiova railway line: Similarly, this project involved a feasibility study for the modernization of the line, with funding of 17.4 million euros from the EU.

2. Modernization of road infrastructure:

Investments in 10 key transport projects: The European Union announced investments of almost 118 million euros in ten transport projects in Romania, aimed at building missing transport links, supporting sustainable transport and creating jobs.

3. Modernization of energy infrastructure:

- Carpathian Modernized Energy Network (CARMEN) Project: This is Romania's first cross-border smart infrastructure project, developed in partnership with operators from Hungary. The project, worth approximately EUR 150 million, aims to modernize and develop electricity transmission and distribution networks, as well as increase their interoperability at European level (www.transilvaniabusiness.ro)
- Interconnector for green energy: Romania, along with Azerbaijan, Georgia and Hungary, has formed a joint venture to build a 1,100 km submarine cable, with a capacity of 1,000 MW, that will connect future Azerbaijani wind farms to Europe. The project is based in Bucharest and is funded by the European Commission (www.ruters.com).

These projects demonstrate Romania's commitment to modernizing national infrastructure with the support of European funds, thus contributing to economic development and increasing the quality of life of citizens.

d) *Impact on social cohesion and sustainable development*

European investments promote regional equity by supporting disadvantaged areas, reducing economic disparities and increasing social cohesion (European Investment Bank, 2022).

Integrating environmental factors into CBA analysis helps implement sustainable projects, contributing to achieving sustainable development goals. It enables the identification and quantification of ecological impact, leading to the implementation of sustainable projects that promote energy efficiency, carbon emission reduction, and resource conservation, thus aligning with the European Union's sustainable development goals.

4. CALCULATION MODELS USED IN THE ANALYSIS OF SUSTAINABLE PROJECTS

The main models used in the analysis of sustainable projects are presented below (Boardman et al., 2018):

4.1. Net Present Value (NPV) Model

Net present value is one of the most widely used indicators for assessing the profitability of a sustainable project. It is calculated by discounting the cash flows generated by the project at a specified discount rate. The general formula is:

$$NPV = \sum \frac{B_t - C_t}{(1+r)^t} \quad (1)$$

where:
B_t represents the benefits generated in the year;
C_t represents the costs associated in the year;
r is the discount rate;
t is the year analysed.

For sustainable projects, benefits include not only economic revenues but also positive externalities, such as reduced CO_2 emissions and improved quality of life (Mishan & Quah, 2020).

4.2. Internal Rate of Return (IRR) Model

The internal rate of return is used to determine the discount rate at which the net present value becomes zero. A project is considered viable if the IRR is greater than the cost of capital used to finance it. The formula is:

$$0 = \sum \frac{B_t - C_t}{(1+RIR)^t} \quad (2)$$

In the case of sustainable projects, RIR must be interpreted carefully, as social and environmental benefits are difficult to quantify in monetary terms and can affect the results of the calculation.

4.3. Cost-Effectiveness Analysis (CEA)

This method is used when the benefits of a project cannot be expressed in clear monetary units. For example, in the case of a pollution reduction project, the benefits can be measured in tons of CO_2 saved. The general formula is:

$$CE = \frac{C_t}{B_t} \quad (3)$$

where:
C_t are the total project costs;

B_t is the impact of the project measured in physical units (e.g. km of road modernized, reduction in energy consumption).

This method is frequently used for green infrastructure and sustainable public transport projects.

4.4. Multi-Criteria Analysis (MCA)

Multi-criteria analysis allows for the consideration of multiple factors in the evaluation of a sustainable project, including economic, social, and environmental criteria. This involves assigning weights to each criterion and calculating an aggregate score. An example application is:

$$S_{total} = \sum w_i \, x \, S_i \quad (4)$$

where:
w_i is the weight of the criterion;
S_i is the score obtained for that criterion.

This method is frequently used for urban development and green infrastructure projects.

4.5. Positive Externalities Analysis Model

This model takes into account positive impacts on the environment and society, even if they do not generate direct profits. For example, a reforestation project financed by European funds may have indirect economic benefits through improved air quality and increased biodiversity. These benefits are included in the cost-benefit analysis through contingent valuation methods.

The calculation models used in the analysis of sustainable projects financed from European funds are essential for determining their feasibility and impact. The use of methods such as NPV, IRR, cost-effectiveness analysis and multi-criteria analysis allows a complete assessment of the economic, social and environmental impact. The choice of the appropriate method depends on the specifics of each project and the objectives pursued within the framework of the European Union's sustainability policies.

5. ADAPTING THE COST-BENEFIT ANALYSIS TO THE REQUIREMENTS OF EU COHESION POLICY

A. European Union cohesion policy – objectives and priorities

The European Union's cohesion policy aims to reduce economic and social disparities between European regions by financing projects that contribute to sustainable development and social inclusion (European Commission, 2023). The European Structural and Investment Funds (ESI) are the main source of funding for infrastructure, innovation and environmental projects.

B. Specific cohesion policy requirements for CBA

To receive funding, projects must comply with the following requirements set by the European Commission:

- **Regional impact assessment** – projects must demonstrate clear benefits on less developed regions;
- **Integrating sustainability criteria** – investments must contribute to the green transition and carbon emission reduction goals;
- **Risk and uncertainty analysis** – long-term economic, social and environmental risks must be considered.

C. Adapting cost-benefit analysis methods

a) Expansion of evaluation criteria

To meet EU requirements, the cost-benefit analysis must include (European Commission, 2023):

- *Indirect social benefits* (e.g. increased quality of life, improved public health);
- *Impact on employment*;
- *Long-term environmental effects*

b) Integration of multi-criteria analysis (MCA)

AMC allows for the evaluation of projects based on an expanded set of economic, social, and environmental factors. It complements CBA by providing a more comprehensive perspective on project feasibility (Mishan & Quah, 2020).

D. Case studies on the application of CBA in cohesion policy

Modernization of transport infrastructure in Romania

A relevant example is the project to modernise the railway network in Romania, financed by cohesion funds. The project was assessed by ACB and AMC to demonstrate the economic and environmental benefits. The benefits include reducing transport time and reducing CO_2 emissions by 15% (European Investment Bank, 2022).

Renewable energy development in Poland

Another example is the investment in wind farms in Poland, which has demonstrated a favourable cost-benefit ratio by reducing dependence on fossil fuels and creating over 5,000 jobs in disadvantaged regions (Boardman et al., 2018).

E. Challenges and limitations in adapting CBA to EU cohesion policy

One of the main challenges is the difficulty of quantifying social and environmental benefits. Many benefits are not easily monetizable, which complicates the economic evaluation process. Economic and political fluctuations can also influence the validity of the assumptions used in CBA. Another problematic aspect is the complexity of the data collection process, which requires extensive resources and technical expertise (Mishan & Quah, 2020).

In addition, regional variability affects the uniform applicability of CBA. Different regions have distinct economic and social structures, which requires specific adaptation of analysis models. Also, the discount rate used in CBA can significantly influence the results, especially for projects with long-term impact.

In conclusion, adapting CBA to EU cohesion policy requires flexible and integrated solutions to ensure efficient project evaluation and optimal allocation of available resources.

6. CONCLUSION

Cost-benefit analysis (CBA) is a crucial tool in assessing the efficiency and impact of projects funded by European funds, ensuring a rational allocation of resources and economic justification for investments. Modern approaches to CBA integrate not only financial indicators but also social and environmental benefits, making it a comprehensive evaluation method for sustainable projects.

European funds have played a significant role in regional economic development by supporting infrastructure, digitalization, education, and employment. Investments such as the modernization of Alba Iulia's infrastructure and the railway link between Gara de Nord and Henri Coandă Airport demonstrate how EU funding enhances mobility, attracts investors, and improves overall economic

However, applying CBA to EU projects comes with challenges, including difficulties in quantifying environmental and social benefits, data collection complexities, and economic uncertainties. Addressing these requires flexible methodologies like multi-criteria analysis and external impact assessments.

CBA remains an essential instrument for evaluating EU-funded projects. By adapting it to sustainability and cohesion policies, member states can maximize the benefits of European funds, fostering economic growth, social equity, and environmental protection.

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