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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

METHODS FOR EVALUATION OF PUBLIC INVESTMENT PROJECTS

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Applicant: **Hajiyev Elvin Aliman**

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The dissertation was completed at the Azerbaijan University.

Scientific supervisor: Doctor of Economic Sciences, Professor
Novruzov Vahid Tapdiq

Official opponents: Doctor of Economic Sciences, Professor
Mammadova Elnura Bunyat

Doctor of philosophy in economics, ass. prof.
Aliyev Teyyub Gani

Doctor of philosophy in economics
Nazarov Asif Abuzar

ED 2.46 Joint Dissertation Council of Azerbaijan Cooperation University and Baku Business University operating under the Azerbaijan Cooperation University of the Higher Attestation Commission under the President of the Republic of Azerbaijan.

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Scientific secretary of the Joint Dissertation Board: PhD in economic sciences, associate professor
Mammadova Samira Yashar

Chairman of the scientific seminar: Doctor of economic sciences, professor
Huseynov Mohubbat Musa

GENERAL CHARACTERISTICS OF THE RESEARCH

The Relevance of the Topic and Degree of Exploration. The research on the methods for evaluation public investment projects holds critical significance for a number of reasons. Public investments denote the allocation of government financial resources into the economy with the objective of fostering sustainable economic development and delivering long-term societal value. These investments are carried out with the aim of stimulating the economic development, enhancing public welfare, strengthening strategic sectors and implementing large-scale infrastructure projects. A number of characteristics of public investments can be identified, including their targeted nature, the coverage of various sectors (such as transportation, agriculture, education, healthcare, etc.), the involvement of diverse financial sources (government budget, public debt, financial aid, etc.), the systematic planning of project implementation and management, as well as their contribution to public utility. Public investment projects across various sectors not only mobilize substantial amounts of taxpayer funds, but they also exert a broad impact on economic growth, social welfare, and the environment.

The proper evaluation of public investment projects enables governments to make well-informed decisions, optimize the allocation of resources and ensure positive outcomes for society. There are several compelling reasons that underscore the importance of research in this field. These include enhancing the efficiency of resource allocation, ensuring the optimal management of public expenditures, strengthening accountability and transparency, supporting the achievement of the Sustainable Development Goals (SDGs), improving risk management, fostering stable economic growth, promoting social equity, encouraging innovation, and increasing public trust and participation, among others. Research into methods for evaluating public investment projects is essential to promote the efficient use of public funds, ensure accountability, and achieve social and economic goals. The continuous enhancement of evaluation methods, enables governments to amplify the positive outcomes of public investments and to contribute to growth, equity, and

sustainability.

The evaluation of public investment projects refers to the process of assessing the alignment of proposed government projects with their stated objectives, economic viability, financial sustainability, and potential social impacts. Such evaluations are conducted to ensure the optimal use of limited public resources, to accurately determine investment priorities, and to prevent the waste of public funds. The core objectives of evaluation include alignment with strategic goals, economic efficiency, financial sustainability, social impact, risk management, transparency and accountability, and the optimization of resource utilization.

In recent years, the scale of public investments in the Republic of Azerbaijan has increased significantly, particularly in areas aimed at promoting the socio-economic development of the regions, upgrading infrastructure, and supporting the reconstruction and reintegration of territories liberated from occupation. Alongside this trend, the efficient, purposeful, and transparent use of public funds has emerged as a key priority.

Recently adopted documents such as the "Strategic Roadmap for the National Economy Perspective", "Azerbaijan 2030: National Priorities for Socio-Economic Development", "Socio-Economic Development Strategy for 2022–2026" have identified the enhancement of public investment efficiency, the strengthening of transparency, and the improvement of project evaluation mechanisms as core policy objectives. At the same time, the dynamics of public investments across sectors and the selection of priority areas indicate that the proper evaluation and efficient management of projects hold critical importance within the framework of national public policy.

In particular, the large-scale investments allocated for the reconstruction and socio-economic development of the territories liberated from occupation necessitate the evaluation of the sustainability and impact of these projects. Proper evaluation of the economic efficiency of projects financed through various sources–such as the state budget, the State Oil Fund, government-guaranteed loans, and other funding mechanisms–ensures the result-oriented use of these funds.

Consequently, the study of methods for evaluating public

investment projects, the analysis of existing mechanisms and the identification of directions for their improvement–highlights the high relevance of the topic from both theoretical and practical perspectives. The choice of the topic fully corresponds to the priorities of the country's socio-economic policy, the goals of efficient management of public funds, and national development strategies.

Distinguished Azerbaijani scholars such as Z.A. Samadzade, E.A. Guliyev, I.M. Abbasov, B.Kh. Atashov, V.T. Novruzov, N.A. Novruzov, E.A. Ibrahimov, G.U. Aliyev, T.H. Huseynov, Z.T. Valiyev, S.Z. Isayev, I.G. Guliyev, S.I. Humbatova, I.H. Ibrahimov, K.S. Karimov, E.B. Mammadova, S.I. Valiyeva and others, as well as foreign scientists P.A. Anderson, A.E. Boardman, E.J. Mishan, G.D. Sanders, P.J. Neumann, R.E. Freeman, T. Aven, O. Renn, B.Flyvbjerg, P.Krugman, D.Hilson and others, have conducted numerous significant studies in the aforementioned areas. Valuable research has also been conducted in this area by the World Bank, the Organization for Economic Cooperation and Development, the Japan International Cooperation Agency, the United Nations Development Program, the Environmental Protection Agency and other international organizations.

In addition, although certain aspects of public investment evaluation have been explored to some extent, a comprehensive and systematic analysis of the full range of evaluation methods – including their respective strengths, common limitations, and applicability to real-world projects – has not yet been conducted in a sufficiently thorough and structured manner. Moreover, concrete policy proposals addressing these methodological gaps remain largely undeveloped. In light of these considerations, it is of critical importance to conduct extensive and multidisciplinary research in the direction of systematic analysis of public investment project evaluation methods, their comprehensive application and improvement. It is precisely for this reason, it is necessary to select the topic and study it as a dissertation work.

The Object and Subject of the Research. The object of the study is public investment projects, the system of methods for their evaluation, and the institutional frameworks associated with this process. The subject of the study is the economic relations and

regularities arising in connection with the compatibility, application, and improvement of methods for evaluating public investment projects.

The Purpose and Objectives of the Research. The primary purpose of this research is to conduct a comprehensive analysis of the theoretical and methodological foundations of public investment project evaluation methods; to explore the applicability of these methods to real-world projects; to assess and evaluate the current state of practice; to identify existing shortcomings; and to formulate scientifically grounded proposals and practical recommendations for the improvement of evaluation practices in this field. In order to achieve the stated purpose, it is essential to accomplish the following research objectives:

- to examine the strategic role of public investments in socio-economic development and to substantiate their importance in promoting economic growth, employment, and social welfare;
- to identify the key baseline indicators and evaluation tools essential for the evaluation of investment projects;
- to identify the performance indicators of public investment projects and to investigate the extent to which these indicators are useful for project evaluation;
- to investigate the theoretical and methodological approaches to the evaluation of public investment projects, and to assess their areas of application and current state through a systematic analysis;
- to analyze the methods used for risk assessment in public investment projects;
- to evaluate a public investment project implemented in the Republic of Azerbaijan in order to examine the possibilities of applying these assessment methods to projects;
- to analyze procedures on methods of evaluating public investment projects and prepare specific proposals for their optimization and improvement;
- to review international experience in order to identify effective mechanisms for the efficient management of public investment projects and to propose optimal solutions tailored to the national economy;

- to investigate the existing challenges in the evaluation and management of public investment projects in our country and to propose viable solutions for addressing them.

Research methods. The research employed a wide range of scientific methods, including empirical analysis, applied analysis, trend analysis, comparative analysis, the systems approach, expert evaluation, classification techniques, and other relevant methodologies.

The Main Provisions Submitted for Defense:

The economic mechanisms governing the evaluation and management of public investment projects in the Republic of Azerbaijan remain insufficiently developed. Specifically,

- the identification of performance indicators for investment projects and the consideration of these indicators at the proposal stage are of critical importance for achieving project objectives and ensuring the efficient use of resources;

- in order to make sound decisions regarding project selection, there is a need to apply various evaluation methods during planning stage, depending on the specific characteristics of the project and the sector to which it belongs;

- based on international experience, as a result of applying existing evaluation methods to the Project (Azerbaijan Second Rural Investment Project, AzRIP-2), it was determined that the project is economically and socially beneficial, which indicates the importance of applying evaluation methods;

- although feasibility studies (FS) documents combining the features of several existing evaluation methods can be particularly useful in complex project environments, it should be recognized that they are subject to a number of limitations, including high costs and time requirements, data constraints, unforeseen changes, and cognitive biases;

- an alternative method - Comprehensive Impact Analysis (CIA) which combines the strengths of various evaluation methods while addressing their shortcomings, can be effectively applied to analyze the social, economic, and environmental impacts of public investment projects in a holistic manner;

- the comprehensive conduct of pre-project studies, the preparation

of FS documents, the expansion of the methodological framework required for project justification, and the enhancement of evaluation coverage across sectors and funding sources are essential preconditions;

- the incorporation into the Public Investment Program (PIP) of investment-oriented projects embedded within one-off, purpose-specific expenditures across various expenditure categories of the state budget is necessary in terms of accounting for investment projects.

Scientific Novelty of the Research. The scientific innovations resulting from the conducted research can be summarized as follows:

- the applicability of multiple evaluation methods for public investment projects has been systematically analyzed, and their common limitations have been identified;
- taking into account the practical importance of evaluation methods, these methods were applied to the project (AzRIP-2) implemented in the Republic of Azerbaijan;
- a new evaluation method – the Comprehensive Impact Analysis (CIA) method – was proposed in order to improve the procedures for project evaluation;
- existing challenges in the evaluation and management of public investment projects within the national economy have been examined, and proposals for their resolution have been developed.
- advanced international practices in the efficient management of projects have been examined, and their applicability to the Azerbaijani context has been assessed, and based on this analysis, consistent and systematic procedures have been proposed in this direction;
- by conducting a structural analysis of the projects implemented in our country by years, funding sources and sectors, it was determined that investments are one of the main driving forces of socio-economic development.

Theoretical and Practical Significance of the Research. The theoretical findings derived from this research can be applied in the formulation and implementation of policies related to the planning, evaluation, and execution of public investment projects. They may also serve as a foundation for future scientific research in relevant fields and be incorporated into the teaching process of investment

related disciplines at various higher education institutions. The practical recommendations put forward in the dissertation can make a significant contribution to the planning and implementation of state programs and projects, particularly in advancing investment policy and improving the methods.

Approval and Application. The main scientific and theoretical provisions of the dissertation, along with its main findings and recommendations, have been reflected in 7 articles (2 of which are abroad) and 3 theses (1 of which is abroad) published in reputable journals and conference materials recommended by the Higher Attestation Commission under the President of the Republic of Azerbaijan.

Among the published scientific articles are the articles "Application of a Systemic Approach to the Public Investments Management" (Baku, 2020); "Public Investments as a Multiplier for Local Economic Development" (Baku, 2021); "Issues of Transparency and Accountability in Public Investment Projects" (Baku, 2023), "Internal Control over the Management of Public Investment Projects" (Baku, 2024), "Limitations of Public Investment Project Evaluation Methods and Opportunities for Improvement" (Moscow, 2025). Among the conference proceedings such as "Evaluation of Public Investment Projects: Cost-Benefit Analysis" (Baku, 2018), "The Importance of Rebuilding the Infrastructure of the Karabakh Region Based on the Smart City Concept" (Baku, 2021); "Public Investments in the Green Economy: Benefits and Challenges" (Amsterdam, 2024) be noted.

Name of the Institution Where the Dissertation Was Conducted. Azerbaijan University

Total Volume of the Dissertation with a Mark Indicating the Volume of the Structural Sections Separately. The dissertation consists of an introduction, three chapters, a conclusion and a list of used literature. Introduction (13248 characters), Chapter I (66028 characters), Chapter II (54270 characters), Chapter III (61067 characters), conclusion (12104 characters) and a list of used literature (29885 characters), the total volume is 256613 characters. The number of characters of the dissertation is 206717 characters, excluding tables, graphs and a list of used literature.

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MAIN CONTENT OF THE RESEARCH

The introduction of the dissertation outlines the relevance of the topic and degree of exploration, the object and subject of the research, the purpose and objectives of the research, the research methods, the main provisions submitted for defense, the scientific novelty of the study, its theoretical and practical significance, the approval and application, and the volume of the work.

In Chapter I of the dissertation, titled "Theoretical and Methodological Foundations of Public Investment Project Evaluation," the role and significance of public investments in socio-economic development are characterized; the theoretical and methodological approaches to investment project evaluation are examined from both scientific and practical perspectives; and the theoretical aspects of evaluating the efficiency of public investment projects are analyzed. Investment is the placement of financial resources or assets for the purpose of future income, value increase, or long-term economic benefit. Investment projects are structured processes that involve the planning, implementation, and management of these investments. Public investments are mainly aimed at the development of economic and social infrastructure, such as roads, airports, energy, telecommunications, schools, and hospitals. In addition, in some cases, investments are directed towards soft infrastructure areas such as innovation, research and development.

Public investments are one of the main driving forces of socio-economic development and hold strategic importance for enhancing societal welfare. At the macroeconomic level, public investment accelerates economic growth, creates jobs and contributes to the increase in gross domestic product (GDP) [1]. Building infrastructure, improving public services, and developing technologies are among the macroeconomic benefits of public investment. In addition, public investment supports economic stability, attracts foreign investment, and promotes interregional development, thereby reducing inequality.

[1] World Bank. Public Investment Management for Development / World Bank – World Bank Publications, – 2018.

At the microeconomic level, public investments contribute to increasing the quantity and quality of public goods and services, expanding employment opportunities, and improving the quality of life at both individual and household levels. At the same time, public investment supports the development of the private sector by expanding technological innovations and access to markets. It also plays an important role in ensuring socio-economic equality of regions and in more efficient use of resources. Public investment is one of the important cornerstones of economic development at both the macro and micro levels. Its proper direction and effective management are an important tool for increasing the social welfare of the country, ensuring economic growth, and strengthening equality.

Public investments are of great importance in the sustainable socio-economic development of Azerbaijan. In 2019-2023, the majority of public investment funds directed to various sectors fell under the share of state capital ınvestments (SCI). The following table shows the funds directed to the relevant sectors from the SBI during this period (Table 1).

As can be seen from Table 1, of the 19,017.1 million manats allocated in 2019-2023, 12,825.4 million manats (67.4%) were allocated to infrastructure-oriented projects, 3,117.7 million manats (16.4%) to social-oriented projects, 1,487.4 million manats (7.8%) to defense and law enforcement projects, and 787.7 million manats (4.1%) to other projects.

According to the opinions of the Chamber of Accounts on the implementation of the state budget for 2021-2023, a total of 9648.2 million manats were allocated for investment projects implemented for the reconstruction and restoration of the liberated territories in 2021-2023, in addition to the State Budget, for the reconstruction and restoration of the liberated territories. Also, 1644.9 million manats and 781.6 million manats more were allocated for the restoration of the liberated territories in 2022 and 2023 than for other budget expenditure items.

Investment projects financed by the State Oil Fund (SOF) play an important role in the social, economic and educational sectors of Azerbaijan.

Table 1.

Information on Funds Allocated through State Capital Investments (SCI) for the Years 2019–2023 (in million manats)

Directions (Sectors)	2019	2020	2021	2022	2023	2019-2023
Infrastructure projects	**4406.9**	**3204.3**	**1310.1**	**2209.8**	**1694.3**	**12825.4**
Transport	2532.6	2223.2	902.8	1533.5	973.7	8165.8
Communal infrastructure	863.8	498.0	216.6	243.6	402.8	2224.8
Land reclamation	301.1	173.1	94.0	159.1	172.7	900
Energy and industry	495.2	198.9	65.6	236.3	140.3	1136.3
Ecology	53.5	1.3	3.1	5.4	2.6	65.9
Agriculture	160.7	109.6	28.0	31.9	2.2	332.4
Socially oriented projects	**863.8**	**779.8**	**616.1**	**502.7**	**355.3**	**3117.7**
General and vocational education	259.9	217.7	206.9	211.7	187.7	1083.9
Higher education and science expenses	63.9	12.5		20.0	35.0	131.4
Health sector projects	74.6	76.9	48.0	41.2	18.5	259.2
Projects for vulnerable groups (families of the disabled and martyrs)	57.7	96.5	35.4	22.9	0.0	212.5
Construction, restoration and reconstruction of cultural and tourism facilities	46.9	32.6	31.9	20.6	22.9	154.9
Construction of sports facilities	201.2	42.4	24.0	39.3	51.4	358.3
Improving the conditions of internally displaced persons and refugees	45.8	164.9	113.7	28.7	16.7	369.8
Other social	113.7	136.3	156.3	118.4	23.1	547.8
Defense and law enforcement agencies	**331.3**	**630.1**	**113.4**	**99.2**	**313.4**	**1487.4**
Other projects	**211.6**	**133.5**	**124.4**	**213.2**	**105.0**	**787.7**
Co-financing with foreign creditor institutions			**346.6**	**259.7**	**192.3**	**798.6**
TOTAL:	**5813.6**	**4747.8**	**2510.6**	**3284.6**	**2660.4**	**19017.1**

Source: Prepared by the author based on data from the Chamber of Accounts. https://sai.gov.az/filter?type=rey

During the period 2019–2023, a number of investment-oriented projects were implemented that were not included in the Public

Investment Program but were financed through other expenditure items of the state budget. The main sources of funds during this period were the reserve fund of the President of the Republic of Azerbaijan, the reserve fund of the state budget, unallocated (block) expenses and other expenditure items.

Governments, taking into account budgetary constraints, should prioritize investment projects that deliver the greatest possible benefits relative to their costs[2]. Whether it is a project financed from the state budget, public-private partnership, or other sources, the economic evaluation of each project is important. This process covers the costs, revenues, social impacts, risks, and environmental impacts of the project. In international practice, methods such as cost-benefit, cost-effectiveness, cost-utility, and multi-criteria analysis are used, as well as methods specific to the specific sector. Evaluating projects in this way supports states in increasing socio-economic efficiency.

A number of key indicators are needed to calculate Cost-Benefit Analysis (CBA) and other evaluation methods. In order to correctly assess the costs and benefits of the project in the long term, factors such as an appropriate time frame, monetary expression of economic performance indicators, selection of discount rates, and social discount rate are important. At the same time, inflation, opportunity costs, risk and uncertainty, distributional impacts, environmental impacts, and intangible values should also be taken into account. All these indicators provide a comprehensive assessment of the social and economic impact of the project, comparing future costs and benefits with today's values, and clearly demonstrate the project's usefulness to society.

Traditional methods such as Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP) are preferred for their simplicity and ease of application for calculating costs and benefits. Alternative methods such as Modified Internal Rate of Return (MIRR), Profitability Index (PI), Discounted Payback Period (DPP), Equivalent Annual Annuity (EAA), Real Options Valuation (ROV), Adjusted Present Value (APV), Economic Value Added (EVA),

[2] OECD. Cost-Benefit Analysis and Public Investment / OECD – OECD Publishing, – 2021.

Accounting Rate of Return (ARR) and Terminal Value (TV) approach address the specific limitations of traditional approaches by being more specific and adaptable to different project types and market conditions. Thus, PI and NPV indicators provide more accurate results and ensure efficient allocation of capital. PI is suitable for projects with high uncertainty and flexibility, while EAA is an ideal approach for comparing projects with different durations. TV and APV support financial decisions in the long term. These methods, used together or separately, allow for a comprehensive and objective analysis of projects with different financial structures. As a result, the correct selection and application of these methods plays a significant role in optimizing investment decisions and more efficient use of resources.

Efficiency indicators of public investment projects play a key role in assessing economic, social and environmental impacts by ensuring the efficient use of resources[3]. Financial indicators such as Net Present Value, NPV, and Benefit-Cost Ratio (BCR) allow us to determine the economic viability of projects[4]. In addition, social and environmental impact indicators, such as job creation, poverty reduction and carbon emissions reduction, are important for assessing the broader impacts of projects. In public investment projects, the dynamics of these indicators should be monitored through continuous analysis. This approach, while ensuring the maintenance of the efficiency of projects over time, supports the optimization of potential delays, overuse of resources or social impacts. Thus, monitoring efficiency indicators at the planning and implementation stages of projects ensures the targeted and sustainable use of public resources, as well as contributing to long-term development goals.

An analysis of the "Form 1" and "Form 2" reports submitted by the contracting organizations for the works carried out in the Republic of Azerbaijan shows that these documents, while reflecting the basic information of the projects, do not cover some important indicators. In particular, financial justifications, FS, project risk management, socio-economic and environmental impact indicators are not presented in

[3] Furceri, D., & Mourougane, A. "The Effects of Public Investment on Jobs and Growth" // International Economics Journal, – 2016. 49(3), p. 87–100.

[4] Mishan, E.J. Cost-Benefit Analysis / E.J.Mishan, E.Quah – Routledge, – 2020.

sufficient detail. At the same time, the lack of allocation of specific indicators for transitional and new projects complicates the analysis and planning process.

It is important to include financial and social impact indicators (NPV, IRR, revenue multiplier), environmental impacts (carbon emissions, resource efficiency) and stakeholder satisfaction in project proposals. A more accurate and comprehensive presentation of indicators will contribute to the efficient use of public resources and the achievement of strategic objectives of investment projects. This is important for achieving the expected results of projects (especially completed projects) and managing potential risks.

Chapter II of the dissertation, entitled "Systematic analysis of methods for evaluating public investment projects in the Republic of Azerbaijan", examines the analysis of the analytical basis of methods for evaluating public investment projects, methods for assessing risks in evaluating public investment projects, and the application of investment project evaluation methods to projects in the Republic of Azerbaijan.

Decision-makers on projects should carefully select the evaluation method that best suits the specific characteristics of each project. In this way, they can increase their ability to make strategic investments that maximize value and support sustainable development. Ultimately, the choice of method depends not only on financial performance, but also on the organization's strategic priorities, risk tolerance, and the broader economic environment in which it operates. A number of methods are used to evaluate public investment projects.

Cost-Benefit Analysis (CBA) is a systematic approach that compares costs and benefits to assess the economic feasibility of programs, projects, and decisions[5]. A comprehensive review of the IRR was conducted, discussing the main components of the IRR and describing the step-by-step process for conducting it. The main formulas used to calculate the IRR are the calculation of the NPV and the NPV. The NPV aims to determine the IRR of a project by

[5] Boardman, A.E. Cost-Benefit Analysis: Concepts and Practice (4th ed.) / A.E. Boardman, D.H. Greenberg, A.R. Vining, D.L. Weimer – Cambridge University Press, – 2018.

discounting future costs and revenues (benefits) to their present value. A positive NPV indicates that the benefits outweigh the costs.

NPV is calculated using the following formula:

$$\text{NPV} = \sum_{t=0}^{n} \frac{B_t - C_t}{(1 + \text{r})^t} \quad (1)$$

here,

B_t = Benefit (at time t)

C_t = Cost (at time t)

r = discount rate

n = number of years

Calculating the Benefit-Cost Ratio (BCR):

$$\text{BCR} = \frac{\left(\sum_{t=0}^{n} \frac{B}{(1 + \text{r})^t}\right)}{\left(\sum_{t=0}^{n} \frac{C_t}{(1 + \text{r})^t}\right)} \quad (2)$$

A BCR greater than 1 indicates that the benefits outweigh the costs.

These measures (NPV and BCR) assess the economic efficiency of the project.

Cost-Effectiveness Analysis (CEA) is an important tool for decision-making in a variety of fields, particularly in public health, environmental policy, and education. By comparing the costs and outcomes of different projects, CEA helps determine the most efficient ways to allocate limited resources. However, it is important to be aware of its limitations and to use it in conjunction with other decision-making tools and ethical considerations.

Multi-Criteria Analysis (MCA) is an important tool for identifying, evaluating, and comparing multiple criteria in public investment projects. By providing a systematic approach to understanding and balancing different factors, MCA supports informed decision-making and promotes sustainable and equitable project outcomes. While MCA offers significant benefits, it also faces challenges related to data quality, complexity, and subjectivity.

Cost-Minimization Analysis (CMA) is an important tool for identifying, evaluating, and comparing the costs of alternatives with equivalent outcomes in public investment projects. While MCA offers significant benefits, it faces challenges related to the assumption of equivalence, data quality, and the exclusion of non-monetary factors.

Cost-Utility Analysis (CUA) offers a structured approach for

comparing costs and benefit outcomes, making it a vital tool for evaluating public investment projects. Despite its limitations, CUA provides a comprehensive framework for assessing the efficiency of public investments and for ensuring the optimal allocation of resources to projects that offer the greatest net benefit to society.

Cost of Illness Analysis (CIA) is an important tool for identifying, assessing, and quantifying the economic burden of diseases in public investment projects[6]. By providing a systematic approach to understanding and managing costs, HCA supports decision-making and increases cost efficiency. While HCA offers significant benefits, it also has limitations related to data quality, complexity, and exclusion of non-economic factors.

Health-Health Analysis (HHA) is an important tool for identifying, assessing, and comparing potential health impacts in public investment projects. By providing a systematic approach to understanding and reducing multiple health impacts, HHA promotes public health and well-being.

Life Cycle Analysis (LCA) is an important tool for assessing the environmental impacts of products, processes, and services. By providing a comprehensive view of environmental performance throughout the entire life cycle, LCA supports detailed decision-making and promotes sustainable development. While LCA offers significant benefits, it also has challenges such as data quality, complexity, and methodological choices.

Environmental Impact Assessment (EIA) is an important tool for promoting sustainable development and protecting the environment from the negative impacts of development projects. While the EIA process has proven benefits, there are significant challenges that need to be addressed to increase its effectiveness.

Strategic Environmental Assessment (SEA) is an important tool for integrating environmental considerations into public investment projects[7]. By adopting a proactive, transparent and participatory

[6] Bloom, D.E. The Economic Impact of Health Interventions / D.E. Bloom, D. Canning, J. Sevilla – Oxford University Press, – 2018.

[7] Glasson, J. Introduction to Environmental Impact Assessment (5th ed.) / J. Glasson, R. Therivel, A. Chadwick – Routledge, – 2019.

approach, SEA helps to reduce negative environmental impacts and promotes sustainable development. Despite challenges such as resource constraints, information constraints and barriers to stakeholder engagement, SEA has the potential to align public investments with broader sustainability goals.

Comparative Risk Assessment (CRA) is an important tool for identifying, assessing and comparing potential risks in public investment projects[8]. By providing a systematic approach to understanding and mitigating risks, RA supports decision-making and promotes safety and compliance. While RA offers significant benefits, it also faces challenges in terms of data quality and complexity.

Risk Assessment (RA) is an invaluable tool for managing public investment projects, offering multiple benefits in terms of risk reduction, resource management, and stakeholder trust. Despite challenges such as data limitations, resource requirements, and the presence of dynamic (evolving) risks, RA practices are increasingly being used.

Risk-Benefit Analysis (RBA) is a valuable tool for managing the complex trade-offs involved in public investment projects. By assessing the risks and benefits associated with these projects, RBA provides a structured framework to optimize resource allocation, increase transparency, and promote informed decision-making.

Risk-Risk Analysis (RRA) is a valuable approach for managing the complex and interrelated risks associated with public investment projects[9]. By assessing the trade-offs between different risk mitigation strategies, RRA provides a comprehensive framework for decision makers to optimize resource allocation, minimize overall risk exposure, and enhance project sustainability. There are also challenges such as data limitations, subjectivity, and balancing short-term and long-term risks.

There is an increasing need to develop analytical approaches to address complex issues in the areas of sustainable development, public welfare, and environmental balance. IRR provides a robust framework for comparing different projects and prioritizing those that offer the greatest net benefit. Improvements to methods such as IRR, CBA,

[8] Renn, O., Benighaus, C. Systemic Risks: Challenges and Opportunities / O.Renn, C.Benighaus – Routledge, – 2017.

[9] Aven, T. Risk Assessment and Risk Management/ T.Aven, Wiley – 2016. – 150 p.

CMA, RRA, and CEA ensure that public investment projects are implemented in a more efficient and balanced manner. At the same time, approaches such as RRA, IRR, SEA, and RRA support environmental sustainability. RA, EIA, LCA, and IRR are essential for analyzing risks and safety, enhancing long-term benefits, and increasing public trust. The application of these methods in a unified and developed framework contributes to the balanced achievement of social, economic and environmental goals on a global scale.

It has been established that the evaluation methods are applied across a wide range of sectors, including infrastructure, environment, healthcare, education, public policy, public service transformation, business investment projects, and other areas. The evaluation methods have been applied to the Azerbaijan Second Rural Investment Project (AzRIP-2), which is jointly financed by the World Bank and the Government of Azerbaijan. Information on the financing and costs of the project is reflected in the table [10] (table 2).

Table 2

Breakdown of project component costs by funding source (in million USD)

Components	Source of funding			Total
	World Bank	Government of Azerbaijan	Beneficiaries	
Component 1 (Rural Infrastructure Development)	63,9	46,7	11,5	122,1
Component 2 (Technical support to rural infrastructure)	4,0	0,7	0,0	4,7
Component 3 (Project Management and Monitoring)	12,1	2,0	0	14,1
Total:	**80,0**	**49,4**	**11,5**	**140,9**

Source: Prepared by the author based on World Bank data. https://documents1.worldbank.org/curated/en/893931586457355703/pdf/Azerbaijan-Second-Rural-Investment-Project.pdf

[10] World Bank. Implementation Completion and Results Report on Azerbaijan Second Rural Investment Project: [Electronic resource]/ World Bank – 2020.

The pre-project and post-project situation regarding project implementation were analyzed. The results of the analysis are shown in the table (Table 3).

Table 3.

Before/after analysis of project results

N	Results (indicators)	Actual before the project	Results after the project
1	Roads	70% of rural roads are in poor condition	85% of rural roads have been improved
2	Water supply	Only 40% have access to clean water	The share of access to clean water has exceeded 90%
3	Sanitation	30% of rural areas lack adequate sanitation	The share of rural areas with adequate sanitation has exceeded 85%
4	Community Infrastructure	50% of schools and health centers are substandard	95% of schools and health centers have been upgraded to standard level
5	Agricultural productivity	Average productivity is 30% below potential due to poor road conditions	Average productivity has increased by 50% due to improved road conditions
6	Health	Incidence of water-borne diseases is 25%	The incidence of water-borne diseases has decreased by 10%
7	Education	School dropout rate is 40%	The rate of school dropout has decreased by 15%
8	Living standards	60% of population living below the poverty line	Poverty rate has decreased by 40%

Source: Prepared by the author based on World Bank data.
https://documents1.worldbank.org/curated/en/893931586457355703/pdf/Azerbaijan-Second-Rural-Investment-Project.pdf

As a result of the evaluation of the project (AzRIP-2), cost-benefit, cost-effectiveness and cost-utility analyses showed that the economic and social benefits of the project outweighed the costs. The high NPV of the project confirmed the efficiency of the investment. The project demonstrated high efficiency in the direction of the development of CEA, water supply and sanitation, education, rural roads and

increasing economic opportunities. The Cost-Benefit (Value in Use) Analysis emphasized the importance of the project in terms of improving the quality of life, and the cost per QALY was determined. In addition, the environmental and social impacts of the project were assessed, proposals were made to minimize negative impacts, and continuous monitoring was recommended to reduce risks.

Chapter III of the dissertation is titled "Directions for Improving the Evaluation and Management of Public Investment Projects." This chapter examines the directions for improving procedures for the evaluation of public investment projects, international experience in the effective management of public investment projects and its use, and current problems in the evaluation and management of public investment projects in the national economy. The preparation of a Feasibility Study (FS) document, which combines many of the project evaluation methods or their elements, is widespread in international practice. FS are important tools for assessing the feasibility of a project and reducing risk, especially in a complex project environment [11]. By providing a multidimensional (technical, economic, legal, operational, etc.) assessment of a project's potential, IAs enable organizations to make informed, strategic decisions. Despite their costs and challenges, IAs significantly contribute to project success, helping organizations optimize resources and avoid unnecessary costs.

A new method, the Comprehensive Impact Analysis (CIA) method, is proposed to combine the strengths of existing assessment methods and overcome their common shortcomings [12]. The proposed formulas for calculating and applying the CIA are as follows:

Calculating Net Present Value (NPV) using multidimensional criteria:

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[11] Kloppenborg, T.J. Contemporary Project Management (3rd ed.) / T.J. Kloppenborg, V.S. Anantatmula, K.N. Wells – Cengage Learning, – 2014.

[12] Hajiyev E.A. Limitations of methods for assessing public investment projects and opportunities for improvement // Economic Bulletin. – Moscow−2025, №1, − p.102-112.

$$\text{NPV (multi} - \text{dimensional)} = \sum_{t=0}^{n} \left(\frac{B_t - C_t}{(1+r)^t} + \frac{U_t - D_t}{(1+r)^t} + \frac{E_t - F_t}{(1+r)^t} \right) \quad (3)$$

where,
B_t = economic benefits
C_t = economic costs
U_t = utility benefits
D_t = utility losses (costs)
E_t = environmental benefits
F_t = environmental losses (costs)
r = discount rate
n = number of years

Calculation of Benefit-Cost Ratio (BCR) with Weighted Criteria:

$$\text{BCR (weighted)} = \frac{\left(\sum_{t=0}^{n} \left(\frac{w_1 B_t + w_2 U_t + w_3 E_t}{(1+r)^t} \right) \right)}{\left(\sum_{t=0}^{n} \left(\frac{w_1 C_t + w_2 D_t + w_3 F_t}{(1+r)^t} \right) \right)} \quad (4)$$

where,
w1, w2, w3 = Weights. Weights assigned according to economic, utility and environmental criteria (benefits).

Calculation of Equity Adjusted Net Present Value (EANPV):

$$\text{EANPV} = \sum_{t=0}^{n} \left(\frac{B_t - C_t}{(1+r)^t} \right) * \left(1 - \frac{I_t}{I_{total}} \right) \quad (5)$$

where,
I_t = Income or benefit received by the disadvantaged group
I_{Total} = Total income or benefit

Calculation of Risk-Adjusted Net Present Value (RNPV):

$$\text{RNPV} = \sum_{t=0}^{n} \left(\frac{(B_t - C_t) * (1 - P_t)}{(1+r)^t} \right) \quad (6)$$

where,

R_t = Risk or probability of an adverse event
Calculation of the Ethical Adjustment Factor:

$$EAF = \sum_{t=0}^{m}(E_i * (\frac{V_i}{\sum_{i=1}^{m} V_i})) \quad (7)$$

where,
E_i = Outcome-oriented ethical value
D_i = Total value of outcome
m = Number of outcomes considered

By combining these variables and formulas, the CIA framework provides a comprehensive evaluation that encompasses economic, utility (use value), environmental, equity, risk, and ethical considerations. The effective management of public investment projects is of great importance in terms of sustainability of economic development, increasing the quality of public services and improving social welfare [13]. Effective management of public investment projects has a number of advantages, such as effective use of financial resources, ensuring project quality, transparency and accountability, maximizing social and economic impacts, risk management, and long-term strategic planning. In addition, mechanisms consistent with international practice should be implemented for the existence of appropriate guidance for projects, project evaluation, project selection and allocation of funds, project implementation and monitoring, asset maintenance, and impact assessment of completed projects [14]. This approach is important both for ensuring budgetary discipline and for increasing the socio-economic benefits of projects.

Diagnostic questions and basic principles for assessing the effectiveness of public investments play an important role in improving the procedures implemented in this area. This approach provides a sound framework for proper planning, implementation and evaluation of the results of public investments.

[13] World Bank. Public Investment Management Reference Guide / World Bank – World Bank Publications, – 2019.
[14] Hajiyev, E.A. Application of a systematic approach to public investment management// Baku: Silk Road, – 2020. №3, p. 58-70

Diagnostic questions include numerous questions on the presence of a strategic and legal framework, project appraisal, project selection and budget planning, implementation and monitoring, subsequent evaluation and exploitation directions [15]. Also, the main principles for public investment management include a strategy appropriate to different territories, coordination and coherence, assessment of long-term risks and impacts, stakeholder participation, transparency and accountability, capacity building, fiscal framework, optimization of public procurement, and ex-post evaluation [16]. These approaches aim to increase the efficiency of public investment processes, ensure transparency and contribute to the sustainable development of the national economy.

Important strategies and legal reforms have been implemented in the Republic of Azerbaijan to ensure the sustainability of economic development, as well as to increase the efficiency of public investments. Documents such as "Strategic Roadmap for the Perspective of the National Economy of the Republic of Azerbaijan", "Azerbaijan 2030: National Priorities for Socio-Economic Development", "Socio-Economic Development Strategy of the Republic of Azerbaijan for 2022–2026", while emphasizing the catalytic role of public investments, have also brought transparency, accountability and the key role of the private sector in economic development to the fore. Important steps have been taken in the direction of legislation on public-private partnership, prioritization of investment projects, ensuring their efficiency and monitoring. In addition, the regulatory and legal acts adopted for the management of the Public Investment Plan, and the rules for the selection, implementation and evaluation of projects have also been improved.

In the "Conclusion" section of the dissertation, the scientific innovations related to the evaluation of public investment projects are presented and their significance is substantiated. Additionally, the practical applicability of the research findings is discussed. Some of

[15] JICA. Guide for Management of Public Investment / JICA – 2018.
[16] OECD. Effective Public Investment across Levels of Government: Principles for Action / OECD – OECD Publishing, – 2014.

the results obtained on the basis of the research, new scientific approaches, and proposals and recommendations put forward are summarized as follows:

Public investments act as the main tool for stimulating economic growth, supporting the development of infrastructure and improving social welfare. The study shows that public investments, in addition to increasing productivity in economic activities, contribute to the development of human capital by being directed to infrastructure projects, education and healthcare. At the same time, public investments play an important role in reducing interregional socio-economic inequality and maintaining macroeconomic stability. However, the impact of investments is not only positive, but also negative consequences such as an increase in the tax burden and the suppression of the private sector, depending on the type of financing and economic conditions, are possible. Nevertheless, purposeful and efficient management of investments creates conditions for both increasing national savings and increasing overall economic welfare.

Significant progress has been made in infrastructure projects and the restoration of liberated territories in the Republic of Azerbaijan. At the same time, it is important to increase the efficiency of investment resources, pay more attention to socially oriented projects, and strengthen result-based evaluation mechanisms. The application of more strategic approaches to areas such as green economy, science, innovation, and nanotechnologies requires adapting state policy to global challenges. Clarifying priorities and increasing investments aimed at the development of the social and environmental sector is important for ensuring the future economic sustainability of Azerbaijan.

Although the project proposal process in our country is quite well structured, if a number of points are presented in a more comprehensive manner, the justifications required for the inclusion of the project in the PIP would be strengthened. Thus, the purpose of the project, financial justification, technical, social, and environmental impacts should be analyzed and presented in detail. Further improvement of these points will help provide stronger grounds for the inclusion of the project proposal in the PIP.

The various widely discussed evaluation methods have a number of similar characteristics (objective orientation, availability of quantitative and qualitative information, comparative nature, wide application areas) and different characteristics (different focus on monetary factors, different calculation of results, scope, consideration of risks).

In addition to the above, there are common shortcomings of valuation methods, including the difficulty in assigning monetary values to intangible assets (benefits), the lack of consideration of how costs and benefits are distributed among different population groups, the uncertainty regarding future projections of costs and benefits, the difficulty in monetizing human life and well-being, the weak ethical considerations, and the complexity and resource requirements of some methods for implementation.

The proposed Comprehensive Impact Analysis (CIA) method provides a comprehensive, robust and comprehensive framework for the evaluation of public investment projects across various sectors. It proposes to take into account all relevant factors, including economic, environmental, social and health impacts, and to explicitly incorporate equity, risk and ethical considerations into the decision-making process. This multidimensional approach allows for more informed, fair and sustainable decision-making and leads to the selection of projects that are not only economically viable, but also take into account social and environmental factors.

Along with the successes achieved in the field of public investments in the Republic of Azerbaijan, a number of shortcomings are observed. These shortcomings cover key areas such as project effectiveness assessment, preparation of TIAs and compliance with regulatory and legal acts. In particular, the failure to fully ensure the effectiveness of projects during the implementation of the PIP, the inefficient use of public funds due to long-term construction works, and problems in asset accounting are among the main issues. Also, the increase in disproportionate payments in budget execution in the last quarter of the year has led to economic imbalances. Along with the weakness of monitoring and evaluation mechanisms, the lack of clear definition of forecasting, justification and implementation priorities

affect the timely completion of projects. Such situations indicate the need for a more structured and efficient approach to the assessment and management of public investments. In this regard, the following proposals and recommendations are provided in summary form in order to improve the methods of assessing public investment projects and increase the efficiency of investment management:

- Preparation of guidelines for the evaluation and expert appraisal of the efficiency of public investment projects;
- Application of additional oversight mechanisms to ensure full compliance with legal requirements during the preparation and approval of project design and estimate documents and FS, and prioritization of projects with FS documents during the approval process of PIP;
- Submission of an expanded draft PIP, reflecting major investment projects for the upcoming fiscal year, to the Milli Majlis during the state budget approval process, in order to ensure the involvement of the legislative body and its committees in project selection procedures;
- Implementation of more optimal planning and financial management practices to enhance project efficiency, along with the adoption of measures to prevent monthly payment imbalances during the execution of public investment projects;
- Publication of information on the evaluation, selection, and implementation of projects included in the PIP, as well as on the completion rate of the PIP, in order to enhance transparency and accountability;
- Studying the methodologies applied in the evaluation and effective management of public investment projects in international practice and integrating them into local systems;
- Prioritizing transitional projects in the PIP for the efficient use of public funds, high-quality and timely execution of construction works, and correct accounting of the resulting assets, strengthening control over projects with a risk of delay and ensuring accountability, as well as reflecting assets and liabilities arising from investments in financial statements in accordance with accounting standards;

- Ensuring the reconciliation of these reports in order to eliminate discrepancies between the reports submitted by customer organizations to the relevant authorities on the use of funds allocated to public investment projects.

The following scientific articles and theses of the author have been published regarding the main provisions of the dissertation work, the results obtained, and the proposals:

1. Hajiyev E.A. Application of a systematic approach to public investment management// Silk Road. – Baku: −2020, No. 3, − pp. 58-70.

2. Hajiyev E.A. Performance Audit of Public Investment Projects // Audit. – Baku: −2021, No. 2, − pp. 15-27.

3. Hajiyev E.A. Public Investments: as a Multiplier in Local Economic Development// Silk Road. – Baku: −2021, No. 4, − pp. 31-39.

4. Hajiyev E.A. Issues of Transparency and Accountability in Public Investment Projects// "Tax Journal of Azerbaijan" magazine. – Baku: 2023, No. 2, − pp. 33-38.

5. Hajiyev E.A. Cryptocurrency as a New Investment Instrument: the Future of Finance// Economic Bulletin. – Moscow: −2024, No. 3, − pp. 36-42.

6. Hajiyev E.A. Internal Control over the Management of Public Investment Projects// Tikintinin iqtisadiyyatı və menecment. – Bakı: −2024, №3, − s. 136-146.

7. Hajiyev E.A. Limitations of Methods for Evaluation of Public Investment Projects and Opportunities for Improvement // Economic Bulletin. - Moscow: -2025, No. 1, - pp. 102-112.

8. Hajiyev E.A. Evaluation of Public Investment Projects: Cost-Benefit Analysis // Actual problems of sustainable development and humanities. Materials of the international scientific conference, – Baku: AU, May 14-15, – 2018, – pp. 65-67.

9. Hajiyev E.A. The Importance of Building the Infrastructure of the Karabakh Region based on the “Smart city” Concept // Problems of economic and social development of the Karabakh region. Materials of the Republican scientific-practical conference, – Baku:

MIU, March 30-31, – 2021, – pp. 321-326.

10. Hajiyev E.A. Public Investments in the Green Economy: Benefits and Challenges // International European Congress on Advanced Studies in Basic Sciences. Beynəlxalq elmi konfransının materialları, – Amsterdam, 26-28 İyul, – 2024, – s. 881-886.

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Address: AZ1106, Azerbaijan Republic, Baku city, Najaf Narimanov Street, 93.

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