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A METHODOLOGY FOR THE ECONOMIC ASSESSMENT OF ROAD, BRIDGE, AND OVERPASS CONSTRUCTION PROJECTS AIMED AT REDUCING TRAFFIC CONGESTION

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Abstract: This article examines a methodology for the economic assessment of the impact of constructing new roads, bridges, and overpasses on reducing traffic congestion. The study aims to develop an approach to determining the economic feasibility of road infrastructure projects by comparing their transport benefits, investment costs, and operating expenses. The methodology involves comparing baseline and project scenarios, assessing travel time savings and changes in vehicle operating costs, and calculating the net present value (NPV) and benefit–cost ratio (BCR). Particular attention is paid to induced travel demand and the need to evaluate changes across the entire road network. The practical significance of the study lies in the potential application of the proposed methodology to prioritize infrastructure projects in Uzbekistan and improve the justification of public investment decisions. The methodology requires further empirical validation using actual transport and economic data.

Keywords: traffic congestion, road infrastructure, roads, bridges, overpasses, economic efficiency, cost–benefit analysis, travel time savings, induced travel demand, investment projects, transport modelling, Uzbekistan.

International Experience in the Economic Assessment of Road Infrastructure Construction

International practice demonstrates that the construction of new roads, bridges, and overpasses should be evaluated in terms of their overall impact on the transport system, the economy, and quality of life. Leading countries use economic analysis and transport modelling to determine whether the expected reduction in traffic congestion justifies the costs of construction and subsequent infrastructure maintenance.

United Kingdom. The UK Department for Transport applies the Transport Analysis Guidance (TAG) framework to evaluate transport projects. It incorporates cost–benefit analysis, transport modelling, the assessment of travel time savings, and environmental impact evaluation. This framework enables decision-makers to compare alternative solutions to transport problems before making investment decisions.[1]

United States. US research places particular emphasis on induced travel demand, which refers to an increase in the number of vehicle trips resulting from the expansion of road capacity. Duranton and Turner (2011) found that increases in urban road lane-miles in US cities are associated with

[1] https://www.gov.uk/guidance/transport-analysis-guidance

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growth in vehicle travel. This finding highlights the importance of considering not only the initial reduction in traffic congestion but also long-term changes in travel demand when evaluating new road construction projects.[2]

Singapore. Singapore combines road infrastructure development with intelligent traffic management systems. The GLIDE system adjusts traffic signal timings according to traffic volumes and coordinates the operation of adjacent intersections. In addition, transport planning prioritises public transport development and the management of private vehicle use. This experience demonstrates that traffic congestion can be reduced not only through the construction of new infrastructure but also through more efficient use of the existing road network.[3]

The Netherlands. Cost–benefit analysis is used in the assessment of infrastructure projects to identify the direct and indirect economic impacts of construction. Methodological guidance published by Rijkswaterstaat provides for the monetary valuation of various effects and the consideration of the advantages and limitations of the methods applied. This approach provides a basis for comparing alternative infrastructure solutions in terms of their overall societal benefits and costs.[4]

World Bank Practice. The HDM-4 model is used to evaluate road investments, enabling the analysis of vehicle operating costs, road maintenance expenditures, and the economic outcomes of various road network development strategies. This tool helps compare alternative options for road construction, improvement, and maintenance in terms of their economic efficiency.[5]

Introduction.

Amid accelerating urbanisation, population growth in cities, and increasing levels of motorisation, traffic congestion has become one of the most significant socio-economic challenges facing contemporary urban development. Overloading of the urban road network leads to longer travel times, higher vehicle operating costs, additional fuel consumption, increased emissions of pollutants, and reduced labour productivity. Consequently, traffic congestion has a wide-ranging adverse impact on economic activity, environmental sustainability, and quality of life. In this context, the development of road infrastructure should be regarded not merely as an engineering and technical task, but also as a key means of improving the economic efficiency of urban economies.

One of the traditional approaches to addressing road network congestion is the construction of new roads, bridges, overpasses, interchanges, and additional traffic lanes. Such projects can alter the configuration of the transport network, eliminate specific bottlenecks, reduce the number of conflict points at intersections, and redistribute traffic flows across alternative routes. However, expanding road infrastructure requires substantial capital investment, expenditure on operation and maintenance, and the rational use of limited land resources. Decisions regarding the construction of new infrastructure must therefore be based not only on projected increases in road capacity but also on a comprehensive assessment of the economic, social, and environmental consequences.

A particular challenge lies in determining the actual impact of new road infrastructure on traffic conditions across the entire urban network. Improved traffic conditions on an individual road section do not necessarily translate into a proportional reduction in congestion across the city as a

[2] Duranton & Turner — The Fundamental Law of Road Congestion
https://www.aeaweb.org/articles?id=10.1257/aer.101.6.2616
[3] https://www.lta.gov.sg/content/ltagov/en/getting_around/driving_in_singapore
[4] https://open.rijkswaterstaat.nl/%40245209/evaluation-infrastructural-projects/
[5] https://www.worldbank.org/en/brief/2023/12/14/highway-development-and-management-model

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whole. The introduction of new road connections may lead to traffic redistribution, changes in route choice, and an increase in the attractiveness of travelling by private car. As a result, the initial reduction in travel time on specific sections may be partially offset by congestion emerging along other routes. Consequently, the evaluation of construction projects should account not only for local changes in traffic speed and volume but also for their overall effects on the transport system.

An important aspect of the economic appraisal of road projects is the valuation of time savings for road users. In international practice, this indicator is regarded as one of the key components of cost–benefit analysis (CBA). In addition to reductions in average journey times, the reliability of travel time should also be considered, since unpredictable journey durations complicate the planning of work activities, logistics operations, and goods deliveries. The International Transport Forum of the Organisation for Economic Co-operation and Development emphasises the importance of incorporating benefits associated with improved travel-time reliability into transport project appraisal.[6]

However, the construction of additional road capacity does not always lead to a sustained reduction in traffic congestion. One reason is the phenomenon of induced demand, whereby increased road capacity encourages additional trips, changes in route choice, and a redistribution of transport activity. An empirical study published in Transport Policy identified a strong relationship between road network expansion and increased vehicle travel in urban areas of the United States. The authors also highlighted the possibility that the initial congestion-reduction effect may gradually disappear.[7] This finding underscores the need to evaluate road projects not only in terms of their short-term outcomes but also in light of long-term changes in transport demand.

For Uzbekistan, investigating this issue is of particular practical importance given the need to improve urban transport infrastructure, enhance population mobility, and ensure the sustainable development of major cities. In particular, the development of Tashkent's transport system requires coordinated planning of road infrastructure, public transport, and traffic flow management mechanisms. A roadmap for improving public transport in the Tashkent region, published by the World Bank in January 2026, examines potential directions for reforming transport services and improving the efficiency of urban mobility.[8]

This further confirms the relevance of an integrated approach in which the construction of new road infrastructure is considered in conjunction with other components of the transport system.

Despite the availability of international approaches to transport investment appraisal, well-founded decision-making requires consideration of the characteristics of each urban area, including road network structure, traffic volumes, the spatial distribution of transport demand, infrastructure construction and maintenance costs, and the availability of reliable baseline data. The use of road capacity or average traffic speed as the sole performance indicators is insufficient to determine the overall economic efficiency of a project. There is therefore a need for a methodology that enables different infrastructure solutions to be compared using consistent economic criteria and projected outcomes for the entire transport network.

The aim of this study is to develop a methodology for the economic assessment of the impact of constructing new roads, bridges, and overpasses on traffic congestion, enabling the economic

[6] https://www.oecd.org/en/publications/what-is-the-value-of-saving-travel-time_eeb102ea-en.html
[7] https://www.sciencedirect.com/science/article/abs/pii/S0967070X18301720
[8] https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099010526101012841

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feasibility of the relevant investment projects to be determined while accounting for both direct and indirect effects.

To achieve this aim, the study addresses the following research objectives:

1. To systematise the main economic consequences of traffic congestion and existing approaches to evaluating the effectiveness of road infrastructure.

2. To identify a set of indicators for measuring changes in traffic conditions before and after the implementation of infrastructure projects.

3. To develop a methodological approach to the monetary valuation of travel-time savings, changes in vehicle operating costs, and other socio-economic effects.

4. To establish a framework for comparing capital expenditure, infrastructure maintenance costs, and the expected benefits of project implementation.

5. To provide for the assessment of long-term changes in transport demand and the potential redistribution of congestion across sections of the road network.

6. To identify opportunities for the practical application of the proposed methodology in planning the development of Uzbekistan's transport infrastructure.

The object of the study is the development of road infrastructure and changes in traffic flows under urban conditions.

The subject of the study comprises the economic relationships, methods, and analytical tools used to assess the impact of road, bridge, and overpass construction on traffic congestion and overall transport costs.

The anticipated scientific novelty lies in the development of a comprehensive methodology that integrates the assessment of changes in transport indicators, the monetary valuation of economic effects, and the comparison of the resulting benefits with the costs of constructing and operating road infrastructure. Unlike approaches focused primarily on local increases in road capacity, the proposed methodology provides for the evaluation of outcomes across an interconnected road network and allows for the consideration of long-term changes in transport demand.

The practical significance of the study lies in the potential use of the proposed methodology for the preliminary appraisal of investment projects, the ranking of alternative construction options, the identification of priority road network sections, and the more efficient allocation of public funds. Where the necessary data are available, the methodology can be applied to compare the construction of new roads, bridges, and overpasses with alternative solutions aimed at improving the utilisation of existing infrastructure.

Thus, this study seeks to establish a scientifically grounded analytical framework for evaluating road construction not only in terms of engineering characteristics but also in terms of its actual economic contribution to reducing traffic congestion, improving travel-time reliability, and enhancing the overall performance of urban transport systems.

Literature Review and Theoretical Foundations of the Economic Evaluation of Road Infrastructure

2.1. Main Scientific Approaches to Evaluating the Effectiveness of Road Projects

The economic assessment of road, bridge, and overpass construction is a comprehensive process that determines the relationship between the costs of transport infrastructure development and the overall benefits arising from changes in traffic conditions. In contemporary transport economics, one of the principal tools for such assessment is Cost–Benefit Analysis (CBA), which enables capital

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investment to be compared with travel-time savings, reductions in vehicle operating costs, and other socio-economic benefits.

The practical application of this approach is reflected in the World Bank's methodology, which provides for the evaluation of transport projects based on changes in road user costs, travel times, infrastructure maintenance expenditure, and environmental impacts. In particular, within the HDM-4 model, economic appraisal is based on a comparison of project and no-project scenarios, taking into account traffic flow characteristics, vehicle speeds, pavement conditions, and the composition of the vehicle fleet.[9]

An important advantage of cost–benefit analysis is its ability to translate the various impacts of road construction into comparable monetary values. For example, reductions in journey times make it possible to estimate time savings for passengers and drivers, while increased travel speeds may be accompanied by lower fuel consumption and reduced vehicle operating costs. At the same time, the calculations incorporate capital expenditure, as well as the costs of technical maintenance, repairs, and upkeep of the constructed infrastructure.

An and Casper propose an approach that integrates transport demand models with cost–benefit analysis to evaluate projects aimed at expanding road capacity. The authors use the reduction in the total time spent travelling by vehicles across a regional road network as one of the key indicators of economic benefits. This approach is particularly relevant to the present study because it enables the effects of project implementation to be assessed not only on a specific road section but also across an interconnected transport system.[10]

However, the application of conventional cost–benefit analysis requires caution when forecasting future traffic flows. If the assessment assumes that transport demand will remain unchanged following an increase in road capacity, the initial time savings may be overestimated. Therefore, a more objective assessment requires the integration of economic calculations with transport demand modelling and an analysis of potential changes in road users' behaviour.

2.2. he Effect of Induced Travel Demand and Its Implications for the Evaluation of Road Investments

One of the most significant theoretical issues in the economic evaluation of road infrastructure is the effect of induced travel demand. This concept refers to an increase in the volume of vehicle travel resulting from improved traffic conditions, reduced travel times, or enhanced accessibility to particular areas. This effect may manifest itself in changes in route choice, departure times, transport mode choice, trip frequency, and the long-term spatial distribution of population and economic activity.

A study by Duranton and Turner, published in the American Economic Review, identified a persistent relationship between increases in urban road lane-miles and growth in vehicle travel in US metropolitan areas. The findings indicate that the expansion of road infrastructure may be accompanied by increased traffic volumes, partially offsetting the initial reduction in road congestion.[11]

[9] https://documents1.worldbank.org/curated/en/099121923111542661/pdf
[10] https://journals.sagepub.com/doi/10.3141/2244-05
[11] https://www.sciencedirect.com/science/article/abs/pii/S0967070X18301720

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Further empirical evidence is provided by a study examining the impact of changes in bridge capacity in Budapest. An analysis of eight major changes in bridge capacity over an extended period found that the elasticity of induced travel demand with respect to changes in capacity averaged approximately 0.5 over a five-year horizon. This means that, in the cases examined, a 1% increase in capacity was associated with an approximately 0.5% increase in road traffic volume over five years. Although this finding relates to a specific transport system and cannot automatically be generalised to other cities, it demonstrates the importance of accounting for induced travel demand when evaluating bridges and other infrastructure projects.[12]

The study by Naess, Nicolaisen, and Strand examines how accounting for induced traffic affects the results of cost–benefit analyses of road projects. The authors demonstrate that excluding additional transport demand from the calculations may lead to an overestimation of expected travel-time savings and an underestimation of environmental impacts. Consequently, the economic attractiveness of a project may be overstated, creating a risk of inefficient allocation of public investment resources.[13]

For the purposes of the present study, the effect of induced demand is of fundamental importance. If the number of trips increases following the construction of a new road, bridge, or overpass, the initial reduction in travel time may not necessarily be sustained throughout the entire appraisal period. Therefore, project evaluation should incorporate at least two scenarios: the first, based on projected transport demand without additional trips; and the second, accounting for a potential increase in traffic volumes following improvements in road conditions.

At the same time, induced demand should not be regarded solely as a negative phenomenon. Additional trips may indicate improved transport accessibility to workplaces, educational institutions, healthcare facilities, and other destinations. The purpose of economic appraisal is to determine the extent to which the overall social benefits arising from improved accessibility exceed the additional costs, environmental impacts, and expenditures associated with increased traffic volumes.

Thus, accounting for induced demand makes it possible to move beyond a simplified assessment of the immediate increase in road capacity towards a more realistic analysis of the long-term outcomes of road construction.

2.3. Economic Valuation of Travel Time, Vehicle Operating Costs, and Travel-Time Reliability

A key component of the economic efficiency of road projects is the reduction in travel times. Under conditions of traffic congestion, longer journey times result in lost working hours, reduced predictability of arrival times, and additional costs for road users. Therefore, time savings should be assessed not only in physical units—minutes or hours—but also in monetary terms.

To determine the monetary value of time saved, specific valuation coefficients are used to reflect the economic value of time for different categories of road users. These coefficients may vary depending on the purpose of the trip, income levels, mode of transport, and other characteristics. Publications by the International Transport Forum of the OECD emphasise that the valuation of travel

[12] https://www.sciencedirect.com/science/article/pii/S096585642200026X
[13] https://journals.open.tudelft.nl/ejtir/article/view/2967

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time and travel-time reliability requires the application of appropriate monetary assessment methods, taking into account the available information on travel behaviour.[14]

Within the scope of this study, travel-time savings can be assessed by comparing journey durations under the baseline scenario with those observed following project implementation. This requires determining traffic flows, average journey times, the number of road users, and the monetary value of a unit of time. Where relevant data are available, calculations should be performed separately for passenger cars, public transport, and freight transport, since the economic consequences of delays differ across these categories.

The second significant component is vehicle operating costs. Driving under congested conditions involves frequent stops, acceleration, and braking, which may lead to additional fuel consumption and increased vehicle maintenance costs. Changes in travel speed and route characteristics following the construction of an infrastructure facility may alter the magnitude of these costs.

The third component is travel-time reliability. Even when the average journey time is relatively short, substantial fluctuations in travel duration make it more difficult to plan trips and freight deliveries. Therefore, where data on variations in traffic conditions are available, the assessment should account not only for average journey times but also for their variability. This approach enables a more comprehensive evaluation of the benefits arising from a reduced likelihood of substantial delays.[15]

Furthermore, the economic assessment should incorporate impacts on road safety and the environment. If a project contributes to a reduction in road traffic accidents, the corresponding social benefits can be included in the calculations. Similarly, changes in fuel consumption and pollutant emissions can be evaluated using well-founded monetary valuation coefficients. However, the direction of the environmental impact should be determined on the basis of actual or modelled changes in traffic flows, since an increase in road capacity does not, in itself, guarantee a reduction in emissions.

Therefore, a comprehensive assessment of road project effectiveness should be based on a set of interrelated indicators that make it possible to determine how changes in infrastructure affect time-related, operating, environmental, and social costs.

2.4. Comparison of Alternative Road Infrastructure Development Options

Choosing between the construction of a new road, the building of a bridge or overpass, and the improvement of the existing road network represents a distinct task in economic analysis. Each of these options has specific advantages, limitations, and cost structures.

The construction of a new road can provide an additional route, redistribute traffic flows, and improve accessibility to particular areas. However, its effectiveness depends on the spatial distribution of transport demand, the possibility of connecting it to the existing network, and the availability of a sufficient number of users. If the new road does not eliminate the main constraints on subsequent sections of the route, the expected reduction in travel times may be limited.

[14] https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/01/mobility-practices-value-of-time-and-transport-appraisal_6019ce7a/6915d856-en.pdf
[15] https://www.oecd.org/content/dam/oecd/en/publications/reports

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The construction of bridges and overpasses makes it possible to eliminate certain points of conflict between traffic flows, reduce delays at signalised intersections, and improve traffic continuity. However, such structures generally require substantial capital investment, engineering surveys, and subsequent maintenance expenditure. Their economic efficiency must be assessed by considering not only the capacity of the structure itself but also its impact on adjacent sections of the road network.

An alternative option is to optimise existing infrastructure. This may involve changes to traffic management, modernisation of traffic signal control, elimination of local bottlenecks, improvements to exits and road junctions, and the development of dedicated public transport lanes. In some cases, such measures can significantly improve traffic conditions at a lower capital cost than the construction of new infrastructure. However, their effectiveness depends on the nature of the existing constraints and must be substantiated through calculations.

International practice in the economic evaluation of road investments involves comparing the project scenario with a baseline scenario in which the project is not implemented. Traffic flows, vehicle operating costs, and users' travel-time costs are calculated for each scenario. The difference between the scenarios serves as the basis for determining the additional benefits attributable to the investment. This approach is applied, in particular, in the World Bank's tools for the economic evaluation of road projects.[16]

For the purposes of this study, it is advisable to use a common appraisal period and consistent assumptions regarding the development of transport demand. This will help avoid situations in which one project is evaluated on the basis of more favourable forecasts than another. In addition to the baseline scenario, alternative scenarios involving changes in traffic volumes, construction costs, and operating expenses should also be considered.

Thus, the selection of the most effective infrastructure solution should be based on a comparison of overall social benefits and costs, rather than solely on construction costs or the expected increase in road capacity.

2.5. Research Gap and Rationale for the Proposed Methodology

An analysis of the scientific literature identifies several key areas of research on the economic efficiency of road infrastructure: the application of cost–benefit analysis, the assessment of travel-time savings, transport demand modelling, the consideration of induced traffic, and the comparison of alternative road network development options.

Nevertheless, the studies reviewed indicate that assessment results depend to a considerable extent on the underlying assumptions, the forecasting horizon, and the range of effects taken into account. Ignoring induced demand may lead to an overestimation of expected benefits, while an assessment based exclusively on changes in average travel speed fails to capture the full economic picture. Furthermore, findings obtained for one transport system cannot be directly transferred to other cities without additional validation.

In the context of Uzbekistan, particular importance should be attached to developing an approach that accounts for the availability of baseline data, the characteristics of urban road networks, and the need to make well-founded choices between different types of infrastructure investment. The methodology should be sufficiently transparent to support the preliminary screening of projects while

[16] https://datacatalog.worldbank.org/search/dataset/0065668/roads-economic-decision-model-version-4-0

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also being comprehensive enough to reflect the long-term economic consequences of the decisions made.

Accordingly, this study proposes to develop an approach that integrates four interrelated components:

1. Transport impact — assessment of changes in travel times, traffic speeds, and delays across the road network.

2. Economic impact — monetary valuation of travel-time savings, changes in vehicle operating costs, and other benefits that can be measured reliably.

3. Investment costs — accounting for expenditure on the construction, reconstruction, maintenance, and repair of infrastructure facilities.

4. Long-term sustainability of outcomes — analysis of alternative transport demand scenarios, including the potential for induced traffic.

The integration of these components provides a foundation for developing a unified methodology for comparing road projects in terms of their expected economic effects. Its distinguishing feature should be the assessment not only of the immediate outcomes of construction but also of changes in overall transport costs across the road network under investigation.

At the same time, the proposed methodology is regarded as a framework for developing and validating an original analytical tool rather than as an already empirically validated model. Its practical validity must be established at the next stage of the research through the formalisation of indicators, the specification of calculation relationships, and the implementation of scenario-based calculations using reliable data.

3. Research Methodology and Economic Evaluation of Road Projects

3.1. General Research Approach

The research methodology is based on a comprehensive assessment of the impact of constructing new roads, bridges, and overpasses on traffic congestion and overall social costs. The underlying principle is to compare transport and economic indicators before and after project implementation, taking into account potential changes in transport demand.

The study considers three scenarios: maintaining the existing road network without constructing new infrastructure; implementing an infrastructure project; and improving the existing network through traffic management optimisation. Comparing these scenarios makes it possible to determine which option delivers the greatest economic benefit under comparable conditions.

The baseline data include traffic volumes, average travel speeds, journey times, vehicle operating costs, capital expenditure, and infrastructure maintenance costs. Where relevant data are available, road traffic accident rates, pollutant emissions, and changes in the accessibility of socio-economic facilities are also taken into account.

3.2. Assessment of Transport and Economic Impacts

First, the change in the total travel time of vehicles is determined by comparing the baseline and project scenarios:

$$\Delta T = T_0 - T_1$$

where:

ΔT — travel-time savings;;

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T_0 and T_1— total vehicle travel time before and after project implementation, respectively.

The calculations should cover not only the road section directly undergoing reconstruction but also other sections of the road network where traffic flows may change. This makes it possible to account for traffic redistribution and avoid overestimating the local impact.

The monetary value of travel-time savings is calculated as follows:

$$\beta_t = \Delta T_p * \text{VOT},$$

where:

β_t — economic benefit from travel-time savings;

ΔT_p — reduction in the time spent travelling by passengers and drivers, expressed in person-hours;

VOT — monetary value of one hour of travel time.

In addition, changes in vehicle operating costs are calculated as follows:

$$B_{voc}=C_0-C_1,$$

where:

B_{voc} – savings in vehicle operating costs;

C_0 and C_1 – total vehicle operating costs under the baseline and project scenarios, respectively.

Where reliable data are available, changes in fuel consumption, emissions, accident rates, and road infrastructure maintenance costs are also taken into account. To avoid double counting, each economic benefit or cost is included in the calculations only once.

3.3. Integrated Assessment of Economic Efficiency

To determine the economic feasibility of an investment, the net present value (NPV) indicator is proposed, as it enables discounted benefits and costs to be compared over the entire appraisal period:

$$NPV = \sum_{y=0}^{N} \frac{B_y - C_y}{(1+r)^y},$$

где:

B_y — otal economic benefits in year (y);

C_y — total economic costs in year;

r — discount rate;

N — project appraisal period.

The benefit–cost ratio (BCR) is also applied:

$$BCR = \frac{\sum_{y=0}^{N} \frac{B_y}{(1+r)^y}}{\sum_{y=0}^{N} \frac{C_y}{(1+r)^y}}.$$

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When *NPV > 0* and *BCR > 1*, the project generates a positive economic return under the adopted baseline assumptions. However, the final selection among alternatives requires all projects to be compared using a consistent methodology, since the most economically beneficial option does not necessarily have the highest traffic capacity.

3.4. Accounting for Uncertainty and Limitations

The results of the assessment depend on the accuracy of forecasts of transport demand, construction costs, operating expenses, and travel-time savings. The effect of induced demand is particularly important, as improvements in road conditions may lead to an increase in the number of car trips and partially offset the initial reduction in traffic congestion.

To test the robustness of the results, a sensitivity analysis is proposed using different values for key parameters, including construction costs and projected traffic volumes. Where the necessary data are available, optimistic, baseline, and adverse scenarios are developed.

The proposed methodology is intended to support the preliminary appraisal and comparison of infrastructure projects. The reliability of the final results should be ensured through the use of verifiable data, well-founded monetary valuation coefficients, and transport modelling wherever possible.

Thus, the methodology integrates the assessment of changes in traffic conditions, the monetary valuation of economic benefits, and the analysis of investment costs. It provides a basis for determining the conditions under which the construction of new roads, bridges, and overpasses is economically preferable to the modernisation of the existing road network.

Calculation of Economic Efficiency and Scenario Analysis

4.1. Comparison of Alternative Road Infrastructure Development Options

To determine the economic feasibility of road investments, three alternative options are proposed for comparison: the construction of a new road, the construction of a bridge or overpass, and the optimisation of the existing road network. The assessment is based on changes in travel times, vehicle operating costs, and investment expenditure.

The primary criterion is the overall economic benefit, defined as the difference between the benefits generated and the additional costs incurred:

$$E=B-C,$$

where:

E — economic benefit;

B— total economic benefits;

C — total costs of project implementation and maintenance over the selected period.

For a valid comparison, the same appraisal period must be used, and changes in transport demand must be taken into account. The assessment should cover not only the road section where construction takes place but also adjacent roads where traffic volumes may change.

4.2. Calculation of Key Efficiency Indicators

Three main indicators are proposed for evaluating the outcomes of project implementation.

1. Travel-time savings:

$$\Delta T=T_0-T_1$$

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where T_0 and T_1 — are the total travel times before and after project implementation, respectively.

2. Net Economic Benefit:

$$NPV=B-C$$

where:

B and C — re the total benefits and costs over the entire appraisal period, discounted to a common point in time..

A positive NPV indicates that the project is economically viable under the adopted assumptions.

3. Benefit–Cost Ratio (BCR):

$$BCR = \frac{B}{C}$$

If *BCR>1, the economic benefits exceed the costs. Discounted values of benefits and costs over the same appraisal period must be used in the calculation.*

4.3. Analysis of Alternative Scenarios

The following scenarios are proposed for comparison to identify the most effective solution.

Scenario	Expected Outcome	Primary Criterion
Construction of a New Road	Redistribution of Traffic Flows	Reduction in Total Delays
Construction of a Bridge or Overpass	Reduction of Delays at Intersections	Time and Cost Savings
Optimisation of Existing Roads	Improved Efficiency of the Existing Road Network	Benefits Relative to Costs

Source: Developed by the author.

It is also necessary to verify whether the project remains economically viable when construction costs increase and transport demand grows. To this end, the *NPV* and *BCR* indicators are calculated under both baseline and adverse scenarios.

It should be noted that the construction of a new road does not always ensure a sustained reduction in traffic congestion, as increased road capacity may stimulate additional trips. Therefore, the final outcome is determined by changes in transport indicators across the entire road network under investigation.

5. Practical Application of the Methodology in Uzbekistan

The proposed methodology can be applied in planning the development of road infrastructure in Tashkent and other major cities of Uzbekistan. Its use will improve the justification of decisions

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concerning the construction of new roads, bridges, and overpasses by taking into account traffic loads, investment costs, and the expected reduction in congestion.

At the first stage, road sections experiencing the highest traffic volumes and prolonged delays should be identified using traffic observation data. At the second stage, alternative solutions should be developed, including the construction of new infrastructure and the optimisation of the existing road network. At the third stage, the economic benefits, costs, and efficiency indicators of each option should be calculated.

The following criteria are recommended for practical application:

- Reduction in average journey times;
- Decrease in vehicle operating costs;
- Capital expenditure and infrastructure maintenance costs;
- Benefit–cost ratio;
- Sustainability of outcomes under projected growth in transport demand.

Particular attention should be paid to Tashkent's transport corridors, where the construction of individual infrastructure facilities may affect traffic flows across substantial sections of the road network. The specific locations for project implementation should be identified on the basis of actual traffic data and modelling results rather than visual observations of congestion alone.

Thus, applying the methodology will make it possible to establish a prioritised list of road projects, direct investment resources towards the most effective solutions, and compare the construction of new infrastructure with less costly measures to improve existing facilities. This will provide a foundation for enhancing the efficiency of public expenditure and promoting the sustainable development of Uzbekistan's urban transport system.

6. Conclusions and Recommendations

This study examines methodological approaches to the economic assessment of the impact of constructing new roads, bridges, and overpasses on reducing traffic congestion. It establishes that the effectiveness of such projects should be determined not only by increases in the capacity of individual road sections but also by overall changes in traffic flows, users' travel-time costs, and infrastructure maintenance expenditure.

The principal outcome of the study is the proposed methodology, which is based on comparing alternative road network development scenarios and applying the net present value (NPV) and benefit–cost ratio (BCR) indicators. This approach makes it possible to compare expected economic benefits with investment and operating costs, while also accounting for potential increases in transport demand following project implementation.

For the practical application of the methodology in Uzbekistan, the following recommendations are proposed:

1. Introduce a unified system for the economic evaluation of road, bridge, and overpass construction projects before investment decisions are made.
2. Compare alternative solutions, including new construction, reconstruction, and optimisation of the existing road network.
3. Use transport modelling to forecast changes in traffic volumes and identify the potential displacement of congestion to adjacent road sections.

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4. Account for the long-term consequences of projects, including operating costs, environmental impacts, and changes in transport demand.

5. Establish a prioritised list of projects based on their economic efficiency, technical feasibility, and social significance.

Thus, the proposed methodology can serve as a tool for improving the justification of investment decisions in road construction. Its application will enable infrastructure projects to be evaluated in terms of their overall economic efficiency and facilitate the selection of solutions that deliver the greatest social benefits while ensuring the rational use of public funds.

Nevertheless, the methodological provisions presented require further empirical validation using actual data on traffic flows and the construction and operating costs of road infrastructure in Uzbekistan. Conducting such calculations will make it possible to refine the model parameters and determine the conditions under which the methodology can be applied most effectively in practice.

References:

1. Duranton, G., Turner, M. A. (2011). The Fundamental Law of Road Congestion: Evidence from US Cities. American Economic Review, 101(6), 2616–2652. DOI: 10.1257/aer.101.6.2616.
2. Naess, P., Nicolaisen, M. S., Strand, A. (2012). Traffic Forecasts Ignoring Induced Demand: A Shaky Fundament for Cost-Benefit Analyses. European Journal of Transport and Infrastructure Research, 12(3). DOI: 10.18757/ejtir.2012.12.3.2967.
3. An, M., Casper, C. (2011). Integrating Travel Demand Model and Benefit–Cost Analysis for Evaluation of New Capacity Highway Projects. Transportation Research Record, 2244(1). DOI: 10.3141/2244-05.
4. Kucharski, R. (2020). Lewis–Mogridge Points: A Nonarbitrary Method to Include Induced Traffic in Cost-Benefit Analyses. Journal of Advanced Transportation, 2020, Article 3096260. DOI: 10.1155/2020/3096260.
5. OECD/International Transport Forum. (2020). Mobility Practices, Value of Time and Transport Appraisal. Paris: OECD Publishing. Official publication.
6. Long-term evidence on induced traffic: A case study on the relationship between road traffic and capacity of Budapest bridges. (2022). Transportation Research Part A: Policy and Practice, 157, 244–257. DOI: 10.1016/j.tra.2022.01.018.
7. World Bank. Roads Economic Decision Model (RED), Version 4.0. World Bank Data Catalog