Eduvest – Journal of Universal Studies
Volume 6 Number 9, September, 2026, pp. 9733-9744
E-ISSN 2775-3727
DOI: 10.59188/eduvest.v6i9.53481

Analysis of Route Planning for the Pluit–Airport Toll Road from the Perspective of Technical Evaluation and Investment Feasibility

Dzaky Rizaldi*, Hermanto Dwiatmoko, Muhammad Isradi
Universitas Mercu Buana, Indonesia
Email: dzakyrizaldi09@gmail.com*, hermanto.dwiatmoko@mercubuana.ac.id, isradi@mercubuana.ac.id

Keywords:
pluit–airport toll road; trase planning; technical studies; mcdm; investment feasibility.

Abstract
This study aims to determine the optimal alternative route for the Pluit–Airport Toll Road based on technical evaluation and investment feasibility analysis. The research was motivated by the high level of congestion on the Prof. Dr. Ir. Sedyatmo Toll Road, which serves as the primary access route to Soekarno–Hatta International Airport, creating the need for an alternative corridor capable of improving connectivity, reducing travel time, and supporting the development of the urban toll road network. The research employed a descriptive quantitative approach using Multi-Criteria Decision Making (MCDM) to assess six alternative routes. The technical evaluation was conducted by examining road geometric design, structural requirements, geotechnical conditions, hydrology, route length, construction costs, road network integration, constructability, land acquisition risks, and environmental and social impacts. The selected alternative was further assessed through investment feasibility indicators, including Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP), along with sensitivity analysis. The technical analysis results showed that Alternative Route 4A achieved the highest technical score because it provided an optimal route alignment, more efficient structural requirements, lower land acquisition risks, better constructability, and superior connectivity with the Harbour Road II Toll Road and Sedyatmo Toll Road. Therefore, the construction of the Pluit–Airport Toll Road was considered feasible from both technical and financial perspectives and was expected to improve transportation connectivity and efficiency in the Jakarta metropolitan area.

INTRODUCTION

Infrastructure plays an important role as a key driver of economic growth and sustainable development because it encompasses technical and physical facilities, systems, hardware, and software required to provide services to the community (Presidential Decree of the Republic (Law of the Republic of Indonesia Number 38 of 2004 Concerning Roads, 2004) of Indonesia Number 38 of 2015, 2015) (Vikannanda, 2017). Toll road development in Indonesia began in 1978 with the operation of the Jagorawi Toll Road, and since then, toll roads have served not only to reduce congestion but also to facilitate economic growth through multiplier effects across other sectors (Pradhitasari, 2016). Based on data from the Toll Road Regulatory Agency (BPJT), as of mid-January 2024, the total length of toll roads in Indonesia had reached 2,816 km, comprising 1,782.47 km on Java, 865.43 km on Sumatra, 97.27 km on Kalimantan, 61.64 km on Sulawesi, and 10.07 km on Bali. Toll road development and operation are governed by Law No. 38 of 2004 concerning Roads and Government Regulation No. 15 of 2005 concerning Toll Roads, with authority vested in the Government and the Toll

Road Regulatory Agency (BPJT), while funding is provided by the Government and/or business entities for projects that meet economic and financial feasibility requirements (Wahyudia & Nahdalina, 2019).

The availability of infrastructure accelerates equitable development (Suroso, 2015), encourages new investment and job creation (Adwitiya, 2021), and increases income and interregional connectivity (Suroso, 2015). Investment feasibility can be assessed using several indicators, including Net Present Value (NPV), which represents the difference between the present values of cash inflows and outflows; Internal Rate of Return (IRR), which represents the discount rate at which NPV equals zero; and Payback Period (PP), which indicates the time required to recover the initial investment. In recent years, the development of North Jakarta and the surrounding area of Soekarno–Hatta International Airport has been accompanied by significant growth in economic, logistics, and mobility activities. Consequently, the Prof. Dr. Ir. Sedyatmo Toll Road corridor has experienced declining levels of service, particularly during peak hours, resulting in longer travel times, higher vehicle operating costs, and reduced reliability of national logistics distribution.

The Government, through the Ministry of Public Works (Stiglitz, 2000), the Toll Road Regulatory Agency (BPJT), and the DKI Jakarta Provincial Government, has encouraged the development of urban toll road networks (Christy Elisha, 2020) , including the proposed Pluit–Airport Toll Road as an alternative access route to Soekarno–Hatta International Airport and a means of reducing the traffic burden on the Sedyatmo Toll Road (Andrea & Ahyudanari, 2018) . However, the project faces several challenges, including determining the optimal route alignment, high investment costs associated with elevated structures, limited urban space, potential land acquisition requirements, and the need for integration with the Harbour Road II Toll Road, Jakarta Inner Urban Toll Road (JIUT), and Sedyatmo Toll Road (Adwitiya, 2021) . Selecting a suboptimal route alignment could increase construction and land acquisition costs and reduce the return on investment (Wibowo & Tiara, 2019), whereas an optimal alignment is expected to generate travel-time savings, reduce vehicle operating costs, and provide an acceptable return on investment. Therefore, evaluating alternative route alignments using the Multi-Criteria Decision Making (MCDM) method, combined with investment feasibility analysis based on NPV, IRR, and PP, is essential for identifying a recommended route alignment that satisfies technical, economic, and financial criteria (Zulfiqar, 2019).

Based on this background, the research questions are formulated as follows: 1) Which alternative route alignment is optimal for the construction of the Pluit–Airport Toll Road based on technical criteria evaluated using the Multi-Criteria Decision Making (MCDM) method? 2) What is the investment feasibility of the selected alternative route alignment based on Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP)? 3) Is the construction of the Pluit–Airport Toll Road feasible based on the economic and financial feasibility analysis of the selected alternative route?

The objectives of this study are as follows: 1) to determine the optimal alternative route alignment for the construction of the Pluit–Airport Toll Road based on technical feasibility criteria using the Multi-Criteria Decision Making (MCDM) method; 2) to analyze the investment feasibility of the selected alternative route alignment using Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP); and 3) to assess the feasibility of constructing the Pluit–Airport Toll Road based on the economic and financial analysis of the selected route and provide recommendations for relevant stakeholders (Adi Satria, 2017) .

This study is limited to six alternative route alignments designed for the Pluit–Airport Toll Road project. Investment feasibility is assessed using NPV, IRR, and PP as the primary indicators. The study does not address the legal aspects of toll road implementation or analyze traffic generation and attraction in the areas traversed by the proposed route alignments (Erza & Franita, 2018) .

METHODS

This study employed a descriptive quantitative method with a systematic, planned, and structured approach. The research combined technical evaluation and investment feasibility analysis of six alternative route alignments for the Pluit–Airport Toll Road. The feasibility assessment used Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP) indicators, supported by sensitivity analysis of changes in costs and benefits. The analysis utilized road network maps, hydrological maps, administrative boundary maps, and land condition maps. Microsoft Excel was used for financial calculations, Civil 3D was used for geometric analysis, and Google Earth was used to evaluate existing site conditions (Sukirman, 1999).

Data collection techniques

The data used consists of primary data and secondary data. Primary data was obtained through field observation of the existing conditions of the planned route location, identification of technical aspects such as soil conditions and potential physical obstacles, evaluation of existing traffic conditions, and documentation of photographs and recordings of geographical conditions. Secondary data was obtained from the Business Development and Investment division of PT Citra Marga Nusaphala Persada (Persero), in the form of business plan documents, technical documents, investment cost forecasts, traffic volume projections and toll revenues, operational and maintenance cost forecasts, balance sheet and profit and loss projections, cash flows, and calculations of IRR, NPV, and Payback Period.

Data Processing and Analysis

The determination of the optimal trajectory uses the Multi-Criteria Decision Making (MCDM) method with a guideline matrix of the Toll Road Business Feasibility Study Study No. 02/SE/Dp/2024, which considers technical (geometric, hydrology, structural, geotechnical, mileage, construction costs) and non-technical (environmental, social, regional development, economic and financial) criteria. The weight of each aspect was determined through a group discussion forum by the CMNP team consisting of the basic design team, the EIA team, and the DPPT team, with the highest weight on the environmental aspect (25%), followed by the geometric aspect (24%), the social aspect (16%), and other aspects (35%). The trase with the highest aggregate value is set as the most optimal alternative. Financial eligibility is calculated using the NPV, IRR, and Payback Period methods with the help of Microsoft Excel software.

Research Location

The research locations are in North Jakarta and West Jakarta, DKI Jakarta Province, and Tangerang Regency, Banten Province. The starting point of the toll road is at the coordinates of 6°7'58.64" LS, 106°47'32.97" E in Pejagalan Village, while the end point is at the coordinates of 6°6'14.72" LS, 106°41'55.78" E in Kamal Village. The project boundaries include the Sedyatmo Toll Road on the west side, the Harbour Road 2 (HBR2) Toll Road on the east side, the Pantai Indah Kapuk area on the north side, and the industrial/residential area on the south side.

Table 1. Location of Administration of Pluit – Airport Toll Road Construction Activity Plan

Yes	Province	Regency/City	Districts	Village
1	DKI Jakarta	North Jakarta	Screening	Kamal Muara, Kapuk Muara, Pejagalan
		West Jakarta	Kalideres	Kamal
2	Banten	Tangerang	Kosambi	Dadap

Source: Author's analysis

Figure 1. Overview of Pluit – Airport Toll Road Work Location
Source: Author's analysis

RESULTS AND DISCUSSION

The Pluit–Airport Toll Road is a continuation of the Harbour Road 2 Toll Road which starts at STA 10 + 654 and starts side by side with the Sedyatmo Toll Road at KM 25 + 100, with two crossings to the existing Sedyatmo Toll Road, namely at KM 23 + 600 for the main road and KM 29 + 600 for the ramp crossing. In addition to crossing with the Sedyatmo Toll Road, the track also intersects with the Kamal Junction/JORR W1 at KM 0+300 until finally merging with the Sedyatmo Toll Road at the exit of the Cengkareng Toll Gate plan at KM 30+300. The project is a collaboration between the government and business entities (PPP), with PT Citra Marga Nusaphala Persada Tbk (CMNP) appointed by the Ministry of PUPR to conduct a Feasibility Study (FS) and Basic Design (BD) initiative based on the Principle Permit dated January 26, 2024. The project is planned to operate from 2029 to 2075, with the end of the concession period in 2076.

Aspects and Weighting of Trase Selection

The trajectory selection matrix uses Appendix 10 (Example of Scoring Matrix for Determining Selected Trase) of the Guidelines for the Preparation of Toll Road Business Feasibility Study Study No. 02/SE/Dp/2024, with the addition of sub-aspects and weight modifications. In the geometric aspect, a sub-aspect of the number of special bridges, crossings with existing toll roads, and crossings with existing non-toll roads are added; In the environmental aspect, the categories of forest areas and non-forest areas (mangrove vegetation, non-mangrove vegetation, non-vegetation, and water bodies are added); As well as the social aspect, there are added obstacle sub-aspects such as mosques, cemeteries, pump houses, corporate offices, and schools (Arin, 2017) . Through a group discussion forum by the CMNP team, the highest weight was given to the environmental sub-aspect (25%) because the use of vegetation land, especially mangroves, has the potential to stop the project, followed by the geometric sub-aspect (24%) because it has an impact on investment and operational costs (CAPEX and OPEX), the social sub-aspect (16%) because the project passes through densely populated areas and several obstacles, as well as other sub-aspects (35%) which include topography and geotechnics.

Explanation of Trase Alternatives

The project connects Pluit with Soekarno-Hatta Airport with a total length of about 9–10 km, with the track being on the north/south side of the Sedyatmo Toll Road. Based on the identification of the FS and BD teams, there are six alternative trases analyzed, namely Alternative 1, Alternative 2, Alternative 3, Alternative 4A, Alternative 4B, and Alternative 4C, which are presented in whole in Figure 2.

Figure 2. All Alternative Trase Toll Road Pluit – Airport
Source: Author's analysis

Alternative 1 plans a main road on the south side of the Sedyatmo Toll Road from STA 10+654 to STA 20+695 with a construction cost of IDR 9.28 trillion and crosses 11 non-toll road crossings and 9 existing toll road crossings. Alternative 2 plans a main road on the south side of the Sedyatmo Toll Road and the north side of Jalan Pantai Indah Selatan (STA 10+654 to STA 20+687) with a construction cost of IDR 8.83 trillion. Alternative 3 plans the main road on the south side of Sedyatmo and north of Jalan Pantai Indah Selatan to STA 14+600, then the direction to the airport on the south side and the direction from the airport on the north side of Sedyatmo, with a construction cost of IDR 10 trillion as well as 14 non-toll road crossings and 13 existing toll road crossings. Alternatives 4A, 4B, and 4C have the same basic configuration, namely the main road on the south side of Sedyatmo and north of Jalan Pantai Indah Selatan to STA 14+600 and then continuously on the north side of Sedyatmo, with differences in the radius of ramp off to the airport and the end point of the main road, as well as the consecutive construction costs of IDR 9.98 trillion, IDR 9.31 trillion, and IDR 9.52 trillion, each crossing 9 non-toll road crossings and 10 existing toll road crossings.

Table 2. Configuration and Cost of Alternative Construction of the Pluit – Airport Toll Road Track

Trase Alternatives	Main Configuration	Non-Toll Crossing	Toll Crossing	Construction Cost (Trillion Rp)
Alternative 1	Main road south side of Sedyatmo, STA 10+654–20+695	11	9	9,28
Alternative 2	Main road south side Sedyatmo & north Jl. Pantai Indah Selatan, STA 10+654–20+687	11	9	8,83
Alternative 3	Main road on the south side to STA 14+600, then separate towards the airport/from the airport	14	13	10,00
Alternative 4A	Main road south side to STA 14+600, then north side Sedyatmo to STA 20+633	9	10	9,98
Alternative 4B	Same as 4A, ramp off radius 60 m, up to STA 19+525	9	10	9,31

Trase Alternatives	Main Configuration	Non-Toll Crossing	Toll Crossing	Construction Cost (Trillion Rp)
Alternative 4C	Same as 4A, ramp off radius 450 m, up to STA 19+525	9	10	9,52

Source: Author's analysis results, as of June 2024

Scoring and Selected Trase

The assessment of each alternative to the sub-aspect with a predetermined weight was carried out through a group discussion forum by the CMNP team. The resume of the assessment results is presented in Table 3.

Table 3. Alternative Assessment Resume According To FS Guideline Matrix

Alternatives	Score	Ranking (from scores)	Construction Cost as of June 2024 (Trillion Rp)
Alternative 1	72,8	5	9,28
Alternative 2	76,26	2	8,83
Alternative 3	64,55	6	10,00
Alternative 4A	82,74	1	9,98
Alternative 4B	74,27	3	9,31
Alternative 4C	74,22	4	9,51

Source: Author's analysis

Based on the scoring of the alternatives, Alternative 4A obtained the highest score of all alternatives with a construction cost of IDR 9.98 trillion. Alternative 4A only uses one obstacle, namely the Parking of the Environmental Maintenance Education Depot at STA 16+750, while other alternatives face more obstacles such as the Nuurussafar Mosque and the Kapuk Toll Gate Office (STA 12+700), PT. Grant Surya Multi Sarana (STA 18+300), PT. Kamal Jaya Abadi (STA 19+600), public cemeteries (STA 0+900), pump houses (STA 19+750), elementary schools and mosques in the ramp on segment. Alternative 4A also minimizes environmental impact, especially the use of mangrove vegetation land with a score of 21.54% from the weight of 25%. Although the construction cost of Alternative 4A is relatively high, the advantages in the social and environmental sub-aspects make it superior if the cost component is separated from the assessment system and the value formula is used in the Value Engineering Technical Implementation Guidelines No. 11/SE/Db/2022, as presented in Table 4.

Table 4. Alternative Assessment Resume with Value Formula Integration

Alternatives	Score (Function × Performance) at no cost	Construction Cost as of June 2024 (Trillion Rp)	Value Ratio
Alternative 1	61,38	9,28	6,61
Alternative 2	64,26	8,83	7,28
Alternative 3	53,95	10,00	5,40
Alternative 4A	72,12	9,98	7,23
Alternative 4B	62,88	9,31	6,75
Alternative 4C	63,08	9,51	6,63

Source: Author's analysis

A summary of the weighting of the scoring matrix on two main groups of aspects, namely the non-technical aspect and the technical aspect, is shown in Table 5. The non-technical aspect is given a total weight of 68% which includes economic and financial sub-aspects, ease of implementation, environmental impact, regional development, and social aspects, while the technical aspect is given a total weight of 32% which includes geometric, topography, and construction sub-aspects.

Table 5. Summary of Scoring Matrix Key Aspects of Trase Selection

Aspect Group	Weight	Alt. 1	Alt. 2	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Non-Technical Aspects	68%	50,14	53,35	48,56	61,53	53,66	54,27
Technical Aspects	32%	25,66	26,79	19,87	25,14	24,50	23,84
Total Weight	100%	75,80	80,14	68,43	86,68	78,16	78,11
Ranking	-	V	II	VI	I	III	IV

Source: Author's analysis

After weighting based on technical and non-technical aspects, the winner was obtained from the largest score, namely Alternative 4A, which was then determined as the selected trajectory to be further analyzed at the planning stage of the structure and feasibility of investment (Krisnananda & Kartika, 2021; Kurniadi, 2020; Noviastuti, 2023) .

Structural Building Analysis

The selection of the type of bridge structure refers to the Bridge Management System (BMS) of the Directorate General of Highways, with consideration of the strength and stability of the structure, long-term feasibility, ease of inspection and maintenance, comfort, economy, ease of implementation, aesthetics, and environmental impact. Primary data required in the preparation of Basic Design Documents for sub-aspects of structural buildings are presented in Table 6.

Table 6. Primary Data Needs for Structural Building Planning

Yes	Primary Data Types	Data Collection Method	Uses
1	Topographic Data	Topographic Survey	As reference data for the depiction of basemaps.
2	Geotechnical Data	Geotechnical Survey	As reference data for the study of soil conditions, it includes soil type and characteristics, soil carrying capacity, and hard soil depth.
3	Hydrological Data	Hydrological Survey	As reference data for the study of determining hydraulic requirements for river crossings and initial planning of structural buildings.

Source: Author's analysis

The selection of structure type takes into account the economic landscape, from reinforced concrete slabs (0–15 meters) to suspension/suspension structures (300–2000 meters), and considers whether the structure is on land or above aqueous areas. Once the Alternative 4A track is designated as the selected track, a superimposed is performed on the type of structure used at each location along the track, as presented in Figure 3.

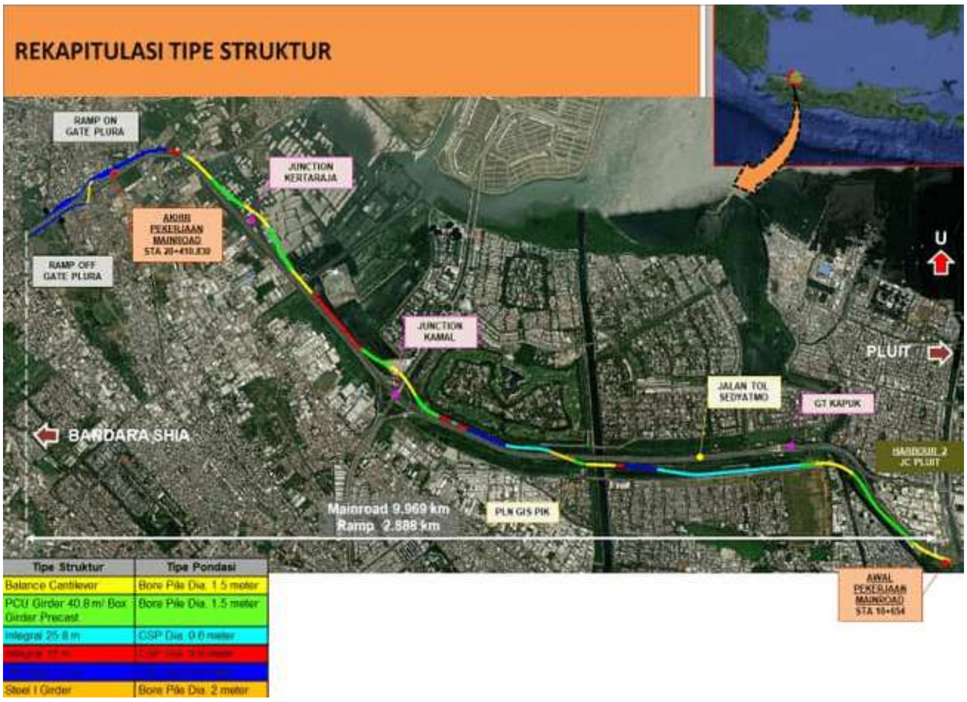

Figure 3. Recapitulation of Structure Type on Selected Trases (Alternative 4A)
Source: Author's analysis

Economic and Financial Feasibility Study

The economic feasibility evaluation is carried out assuming the base year 2024, the stages of activities in the form of land acquisition and Detailed Engineering Design in the 1st year, construction in the 2nd to 4th year (2026–2028), the start of operations in the 5th year (2029), the discount rate of 12%, and the analysis year for 50 years. The results of the economic analysis of the construction of the Pluit-Airport Toll Road show that the project is feasible, with an NPV of IDR 3,085,656,000,000, an IRR of 12.96%, and a Payback Period of 10 years.

The financial feasibility analysis focuses on the return on invested capital (private returns), with investment cost components consisting of land acquisition costs, construction service costs (consultants and contractors), escalation costs, overhead costs, financial costs (including VAT, upfront fees and recurring fees of PT PII, as well as interest during construction/IDC), and other costs. Details of the total investment costs are presented in Table 7.

Table 7. Total Investment Cost of Pluit – Airport Toll Road

Investment Cost Component	Amount (Million Rp)	Notes
Land Procurement	1.533.756	Utility costs not included
RTA Consultant	79.204	Once the Basic Design is approved
Construction	7.920.369	After land acquisition > 75%
Toll Equipment	19.801	-
Supervision Consultant	118.806	-
Project Cost Escalation	813.375	-
Overhead	79.204	-
Upfront Fee	17.500	PT PII
Recurring Fee	5.500	PT PII
Financial Cost	204.013	-

Investment Cost Component	Amount (Million Rp)	Notes
IDC	974.066	Interest During Construction
Total Investment Cost	12.835.978	-

Source: Author's analysis

The revenue projection in the preparation of the business plan proposal is focused on toll revenue only, while non-toll revenues such as advertising and rest areas have not been included in the business plan component. Sensitivity analysis was conducted to examine the effect of uncertainty on the increase in construction costs and the decrease in traffic volume (benefits) on the level of economic feasibility, with the results presented in Table 8.

Table 8. Results of Sensitivity Analysis to Benefits and Costs

Scenario	Cost Changes	EIRR	ENPV (thousand Rp)	BCR
Base Case Condition (discount rate 12%)	-	17,44%	7.407.545.344	2,20
Scenario 1: Demand drops 5%	Costs increase by 5%	16,20%	5.778.235.808	1,89
Scenario 1: Demand drops 5%	Fees increase by 10%	15,84%	5.470.447.279	1,81
Scenario 2: Demand drops 10%	Costs increase by 5%	15,38%	4.524.436.400	1,70
Scenario 2: Demand drops 10%	Fees increase by 10%	15,04%	4.216.647.872	1,62

Source: Author's analysis

The simulation results show that even in the worst-case scenario, namely a 10% increase in construction costs accompanied by a 10% decrease in demand, the project remains feasible with an EIRR of 15.04% and an ENPV of IDR 4,216,647,872 thousand, which means that this sensitivity does not change the conclusion of the overall feasibility of the project.

Vehicle Traffic and Operating Cost Analysis

The Daily Traffic Projection (LHR) is carried out by considering traffic growth and vehicle movement from alternative roads (splitting traffic). The comparison of section length and travel time between the Pluit–Airport Toll Road, the Sedyatmo Toll Road, and the existing arterial roads is presented in Table 9.

Table 9. Road Length and Travel Time Data Pluit – Airport

Yes	Field Name	Segment Length	Travel Time
1	Pluit-Airport Toll Road	13.4 km	14 minutes
2	Sedyatmo Toll Road	13.4 km	21 minutes
3	Jalan Arteri (Jl. Teluk Gong, Kapuk Raya, Kamal Raya, Benda Raya)	14.4 km	71 minutes

Source: Author's analysis

Based on this data, the use of the Pluit-Airport Toll Road provides significant travel time savings compared to existing arterial roads. The Vehicle Operating Cost Profit (BKBOK) is calculated based on the difference in vehicle operating costs and the time value between toll roads and arterial roads, provided that the proposed toll tariff is a maximum of 70% of the BKBOK, as presented in Table 10.

Table 10. BKBOK Against Sedyatmo Toll Road and Arterial Road

Yes	Field Name	BOK (Rp)	VoT (Rp)	BOK + VoT (Rp)	BKBOK (Rp)	70% BKBOK (Rp)
1	PLURA Toll Road	37.258	37.461	74.719	(not yet operational)	(not yet operational)
2	Sedyatmo Toll Road	45.608	56.191	101.799	27.080	18.956
3	Arterial Roads	111.737	189.979	301.716	226.997	158.898

Source: Author's analysis

The results of the BKBOK analysis between the Sedyatmo Toll Road and PLURA are estimated at IDR 27,080 or 70% of the BKBOK of IDR 18,956. The benefits of the project that can be quantified include improving the performance of the road network and increasing the pace of regional economic development, especially to support investment in Banten Province, especially Tangerang City. In addition to the benefits that can be quantified, there are also multiplier effects that cannot be directly quantified, such as easier public access to social facilities, increased regional accessibility, pollution reduction due to reduced congestion, and benefits in terms of politics and national security defense (Handayani et al., 2019; Hanumsari & Widyastuti, 2015; Justitia et al., 2020) .

The difference between vehicle operating costs and time value between the use of toll roads and arterial roads (BKBOK) shows a trend of increasing total savings throughout the 2029–2075 operating period in line with the growth in traffic volume, from around IDR 1.02 trillion in 2029 to stable at around IDR 22.68 trillion per year from 2063 until the end of the concession period, which confirms the sustainability of the project's economic benefits in the long term.

CONCLUSION

Based on the results of the study on the route planning analysis for the Pluit–Airport Toll Road from the perspective of technical evaluation and investment feasibility, it can be concluded that Alternative Route Alignment 4A was the most optimal alternative based on the Multi-Criteria Decision Making (MCDM) method. This alternative achieved the highest score due to its superior technical performance, minimal land acquisition conflicts and constraints, avoidance of mangrove areas, and more efficient structural requirements compared with the other five alternatives.

The investment feasibility analysis of Alternative Route Alignment 4A, assuming 2024 as the base year, a construction period from 2026 to 2028, an operational commencement in 2029, a discount rate of 12%, and an analysis period of 50 years, indicated that the project was financially feasible. The analysis resulted in an NPV of Rp3,085,656,000,000, an IRR of 12.96%, and a Payback Period of 10 years. These indicators exceeded the minimum feasibility criteria and remained feasible under various sensitivity analysis scenarios involving increased construction costs and reduced traffic volumes. Therefore, the construction of the Pluit–Airport Toll Road was considered feasible from both technical and financial perspectives, supporting connectivity within the Jakarta metropolitan area, reducing traffic pressure on the Sedyatmo Toll Road, and improving the efficiency of the transportation network to Soekarno–Hatta International Airport.

Based on these findings, investors and Toll Road Business Entities are recommended to use this study as an initial reference for investment feasibility assessment and to conduct further sensitivity analysis and risk management related to changes in traffic volume, construction costs, inflation, and interest rates. The government and relevant regulators are expected to accelerate licensing processes, route alignment approval, and land acquisition procedures, provide supportive public–private partnership (PPP) regulatory frameworks, and ensure alignment with the National Road Network General Plan. The Regional Governments of DKI Jakarta and Banten are expected to support spatial planning adjustments and mitigate social impacts arising from the development. Construction companies and planning consultants are encouraged to apply value engineering approaches and digital traffic modeling, while academics and researchers are encouraged to develop alternative Multi-Criteria Decision Making (MCDM) methods, such as Analytic Hierarchy Process (AHP), Analytic Network Process (ANP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE). Future studies may also incorporate traffic generation and attraction analysis, as well as broader macroeconomic impact assessments, which were beyond the scope of this research.

REFERENCES

Adi Satria, F. (2017). *Financial feasibility study of the Mojokerto-Kertosono Toll Road Section 3*.

Adwitiya, T. (2021). *Pandaan-Malang Toll Road Investment Evaluation Study*.

Andrea, K., & Ahyudanari, E. (2018). *Financial feasibility of New Yogyakarta International Airport trains with sensitivity analysis to changes in land needs*.

Arin, S. R. (2017). *The route selection model between the toll road and the Ngawi-Kertosono national road uses the diversion curve method*.

Christy Elisha, L. (2020). *Cost benefit analysis (CBA) of the infrastructure development of the Semarang-Solo Toll Road*.

Erza, O., & Franita, N. (2018). *Cost and benefit analysis of road infrastructure development in the capital city of DKI Jakarta and its supporting areas*.

Handayani, D., Amirotul, M. H. M., & Primasari, R. A. (2019). *Analysis of the variables of the selection of toll roads in the Bawen-Salati ga segment*.

Hanumsari, & Widyastuti. (2015). *Feasibility Study on the Construction of the Ngawi-Kertosono Toll Road*.

Justitia, R., Farhan, L. M., Djakfar, L., & Bowoputro, H. (2020). *Analysis of the planning of the Gempol-Mojokerto Toll Road*.

Krisnananda, J., & Kartika, A. A. G. (2021). *Analysis of the economic and financial feasibility of the construction of the Mengwi-Gilimanuk Toll Road*.

Kurniadi, Y. (2020). *Investment feasibility study on the Pekanbaru-Dumai Toll Road project*.

Law of the Republic of Indonesia Number 38 of 2004 concerning Roads. (2004). State Secretariat.

Noviastuti, D. (2023). *Analysis of the financial feasibility of the Government and Business Entity Cooperation (PPP) investment project for toll road infrastructure*.

Stiglitz, J. (2000). *Economics of the Public Sector*. W.W. Norton & Company.

Sukirman, S. (1999). *Geometric Planning of Highways*. Nova.

Suroso, E. (2015). *The Impact of Infrastructure on National Economic Growth*. Ministry of Public Works and Public Housing.

Vikannanda, I. M. (2017). *Analysis of the economic feasibility of the development of the Gresik West Ring Road*.

Wahyudia, R., & Nahdalina. (2019). *Analysis of the feasibility of toll road investment due to the risk of project delays and traffic prediction errors*.

Wibowo, & Tiara, D. A. (2019). *The trase planning for the construction of the Kertosono-Kediri Toll Road is reviewed from the economic and financial feasibility*.

Zulfiqar. (2019). *Analysis of the selection of coal mine transportation road routes using the fuzzy analytic hierarchy process method*.