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Modeling the Economic Impacts of Indonesia's Zero Over-Dimension Over-Load Policy: A Logistics System Governance Perspective

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Abstract: This study explores the macroeconomic impact of the Zero Over-Dimension Over-Load (ODOL) policy in Indonesia, especially its influence on logistics costs, inflation, and economic growth. The policy is not discussed here only as a matter of transport compliance, but also as a structural change in logistics governance that may affect the wider economy. A mixed-methods approach was used, based on primary survey data collected in 2025 from logistics stakeholders in DKI Jakarta and West Java. For the analysis, the Leontief Price Model was applied to estimate price transmission effects, while the dynamic Computable General Equilibrium (CGE) IndoTERM model was used to simulate cost shocks, investment adjustment, and fiscal reallocation. The findings show that the policy increases national logistics costs by 4.58% in the short term, which raises the logistics cost-to-GDP ratio to 14.94%. However, the longer-term results are more positive. The simulation suggests a 0.05% increase in GDP, equivalent to a net output gain of IDR 14.3 trillion. This result is associated with a 6.74% increase in fleet investment, estimated at IDR 42.4 trillion, as well as fiscal savings caused by lower infrastructure damage. These results suggest that stricter logistics regulation may bring broader economic benefits when the analysis goes beyond the immediate rise in transport costs. In practical terms, the policy should be supported by fiscal incentives for fleet modernization and by careful timing of enforcement, especially to limit inflationary pressure in food and construction-related sectors.

Keywords: Zero Over-Dimension Over-Load policy; Logistics governance; Computable General Equilibrium IndoTERM model; Logistics cost; Fleet investment; Inflation; Economic growth

1 Introduction

Robust logistics management is widely recognized as a critical determinant of supply chain efficiency, business performance, and broader economic competitiveness [1, 2]. The logistics and transportation industry acts as the fundamental pillar of both domestic and cross-border trade, dictating the efficiency of national supply chains [3]. In the context of global trade integration, the capacity to streamline goods movement is directly correlated with a nation's competitive advantage. High logistics costs relative to GDP are widely recognized in global literature as a primary barrier to a nation's trade competitiveness [4, 5]. However, Indonesia currently grapples with structural inefficiencies, evidenced by a logistics cost-to-GDP ratio of 14.29%, which significantly hampers national competitiveness [6]. Previous research suggests that sustainable logistics performance depends on coordinated governance across infrastructure, institutions, and transport operations [7], a framework supported by global logistics assessments [5], yet Indonesia faces challenges in optimizing this sector relative to its regional peers. This structural gap is also illustrated in Figure 1, which compares Indonesia's logistics performance and cost burden with those of selected ASEAN peers.

However, existing studies have largely examined logistics efficiency from operational, infrastructural, or transport-policy perspectives, while relatively limited attention has been paid to how compliance-oriented regulation reshapes the logistics system as a whole. As noted by the analysis [8], land transportation accounts for a substantial portion of domestic logistics expenses, meaning inefficiencies in this mode reverberate throughout the entire economy. This is consistent with macroeconomic measurements indicating that land transport inefficiencies reverberate throughout the entire economy as well [4]. Previous research suggests that logistics inefficiencies are often associated with weak institutional coordination, which reinforces broader structural weaknesses in the sector [9]. A prominent example is the widespread use of Over-Dimension Over-Load (ODOL) vehicles. From a transport economics perspective, while overloading reduces unit transport costs for private operators, it represents a market failure that transfers substantial external costs to the public sector through accelerated pavement degradation [10]. Although operators often use overloading to reduce unit transport costs, the practice imposes substantial external costs on infrastructure and road safety [11]. As a result, private cost savings are effectively sustained by losses borne by the public sector.

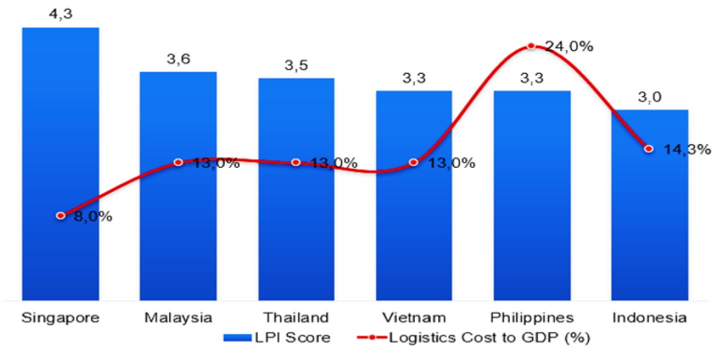

Figure 1. Benchmarking Indonesia's logistics performance and cost-efficiency against ASEAN peers (2023–2024)
Note: Indonesia exhibits a structural lag, characterized by the lowest Logistics Performance Index score (3.0) among the observed peers, while maintaining a high logistics cost burden (14.3% of GDP). This disparity underscores the urgency for structural reforms such as the Zero Over-Dimension Over-Load (ODOL) policy.

Source: Processed from Tim Kerja (2025) and World Bank Data.

The economic ramifications of these externalities are profound. Excessive loads cause infrastructure deterioration estimated to cost the state up to IDR 43 trillion annually and contribute to 22.4% of traffic accidents involving freight transport on key corridors. Studies on pavement engineering globally confirm that overloaded vehicles drastically reduce the technical lifespan of flexible pavements [12]. The study [13] found that ODOL vehicles drastically reduce the technical lifespan of roads from a planned 10 years to merely 3 years, imposing a perpetual fiscal burden for maintenance. Furthermore, recent statistics indicate that 73% of freight transport violations in 2024 were related to dimension and load infractions, signaling a systemic market failure where private gains are subsidized by public losses in safety and infrastructure [14].

In response to these challenges, the government has committed to a full implementation of the Zero ODOL policy as part of a comprehensive logistics reform. This initiative includes rigorous enforcement via Weigh-in-Motion (WIM) systems, regulatory harmonization, and digital supervision [15]. However, its implementation remains contested because the short-term economic burden on transport operators and commodity prices may be substantial [16]. On one hand, strict enforcement is predicted to escalate freight rates and trigger cost-push inflation due to reduced effective carrying capacity [17, 18]. On the other hand, the policy promises long-term efficiency gains through infrastructure preservation and enhanced safety [19].

Existing research on ODOL has mainly focused on transport regulation, WIM enforcement, and logistics efficiency [15, 20]. Less attention has been given to the wider economic effects of this type of regulation, particularly those related to rising transport costs, infrastructure burdens, and changes in fleet investment [21]. From this perspective, the logistics sector should not be viewed only as a transport service, since regulatory intervention can also influence capital renewal and public expenditure. To examine these broader effects, this study uses the CGE IndoTERM model together with Leontief price analysis and social cost estimation to assess whether the long-term economic benefits of compliance are sufficient to offset the short-term increase in logistics costs. This study tests two primary hypotheses:

H1: The implementation of the Zero ODOL policy is expected to increase logistics costs and short-term inflationary pressure [22, 23].

H2: In the long run, the Zero ODOL policy is expected to support GDP growth through fleet investment and lower social and infrastructure-related costs [24, 25].

2 Methodology

This study adopts a mixed-methods approach focused on DKI Jakarta and West Java, two of Indonesia's most important logistics regions. These provinces were selected as the main study area because they account for a large share of freight movement and make a substantial contribution to national GDP. While the concentration on Java limits direct generalization to archipelagic regions with different infrastructure disparities (e.g., Sumatra or Sulawesi), this sample serves as a robust proxy for the national logistics ecosystem's response to regulatory pressure. To ensure empirical validity and representativeness, primary data were gathered in 2025 using a stratified purposive sampling technique. The survey targeted 500 respondents, comprising logistics service providers, trucking operators, and cargo owners, including producers and traders, selected to cover various fleet scales ranging from owner-operators to corporate fleets. This stratification makes it possible to distinguish between small operators that may exit the market and corporate fleets with greater investment capacity. Data collection was conducted through online surveys and supplemented by Focus Group Discussions with logistics associations and regulators to refine assumptions regarding cost structures, trip patterns, and investment plans. The analysis also drew on secondary data, including the 2020 Indonesian Input-Output Table, regional GDP data, accident records from the National Police ($Korlantas$), and estimates of infrastructure losses from the Ministry of Public Works [6].

Quantitative analysis was conducted in three stages. First, the input-output analysis based on the Leontief price model was used to estimate the direct and indirect effects of rising transportation costs on the prices of 27 strategic commodities. The Leontief price model is expressed as follows:

$$p = (I - A')^{-1} \cdot v \tag{1}$$

where, p denotes the price vector, A represents the matrix of technical coefficients, and v is the value-added vector [26].

First, within this framework, changes in primary input costs such as transportation are propagated throughout the economic sectors [26]. The output of this model serves as an exogenous price shock for the CGE simulation, allowing the macroeconomic effects to be evaluated without endogenizing the initial transport cost adjustment. Second, social cost analysis based on the human capital approach was used to estimate the economic savings associated with fewer accidents, including vehicle repair costs, productivity losses, and medical expenses [27]. To ensure robustness, parameter ranges (e.g., productivity loss of 17–50 days) were used rather than single point estimates, as detailed in the Appendix. Third, the CGE IndoTERM model, a dynamic multi-regional model, was used to simulate full macroeconomic impacts. Computable General Equilibrium models are widely acknowledged as the standard for evaluating the wider economic impacts of transport policies and infrastructure investments [28, 29]. It integrates shocks from fleet investment, operational costs, and budget reallocation under a budget-neutral reallocation assumption [24]. In practice, bureaucratic delays may affect the timing of such reallocation; however, the model assumes an efficient transfer in order to estimate the maximum potential opportunity cost of the policy.

3 Results

3.1 Impact on Operational Costs

The survey data indicate that compliance with fleet capacity limits requires logistics operators to increase trip frequency in order to maintain distribution volumes. This operational shift precipitates a non-linear escalation in variable costs, as the restriction on overloading necessitates the utilization of additional fleet units or increased rotation for the same aggregate cargo. This pattern is illustrated in Figure 2.

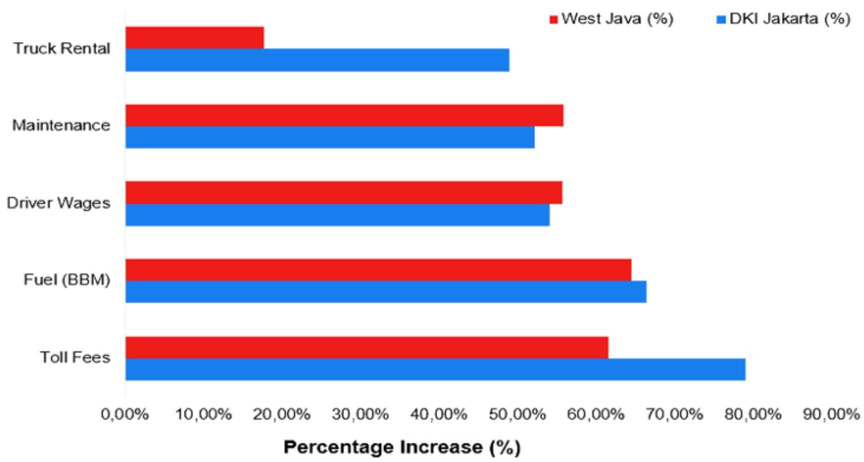

Figure 2. Projected changes in operational cost components following the implementation of the Zero Over-Dimension Over-Load (ODOL) policy in key logistics corridors

Note: The normalization of fleet capacity leads to a marked increase in variable costs. Toll fees and fuel consumption show the highest sensitivity to the policy due to increased trip frequency. The difference in truck rental costs suggests tighter fleet supply elasticity in DKI Jakarta than in West Java.

Source: Processed from Primary Survey Data (Tim Kerja, 2025).

Furthermore, the data indicate clear differences in how individual cost components respond to the policy. While fixed costs such as truck rental increase moderately, variable costs associated with vehicle movement, particularly fuel and toll expenses, account for most of the increase in logistics operating costs. Taken together, the weighted effect of these cost components results in an overall increase of approximately 7.73% in transport operating costs. This aggregated cost increase is then introduced into the macroeconomic model as the main operating-cost shock in the subsequent simulation.

3.2 Macroeconomic Impact

Despite these cost pressures, the IndoTERM simulation indicates a positive long-term macroeconomic outcome. The simulation shows that the policy increases GDP by 0.05% relative to the baseline, equivalent to a net output gain of IDR 14.3 trillion.

Although the policy raises national logistics costs by 4.58% and increases the logistics cost-to-GDP ratio from 14.29% to 14.94% in the short term, these effects are gradually moderated by higher fleet investment and lower road preservation costs. As shown in Table 1, fleet investment increases by 6.74%, equivalent to IDR 42.4 trillion, while road preservation savings amount to IDR 2.84 trillion. Together, these factors support a modest but positive increase in aggregate output.

Table 1. Long-term macroeconomic simulation results

Indicator	Impact/Change	Description
GDP growth	+0.05%	Aggregate economic growth
Net output	+IDR 14.3 trillion	Net increase relative to the baseline output of IDR 28,700 trillion
National logistics cost	+4.58%	Increase in aggregate logistics expenditure
Logistics cost to GDP ratio	14.29% → 14.94%	Short-term efficiency decline
Fleet investment	+6.74%	Equivalent to IDR 42.4 trillion
Road preservation savings	IDR 2.84 trillion	Fiscal saving available for reallocation to other sectors

Source: Computable General Equilibrium (CGE) IndoTERM simulation results.

4 Discussion

The findings support Hypothesis 1 (H1). The Zero ODOL policy generates a substantial cost shock, increasing operating costs by 7.73% and raising the logistics cost-to-GDP ratio to 14.94%. This is consistent with earlier concerns about the structural burden of logistics costs in Indonesia [17]. The results suggest that part of the sector's earlier cost efficiency was achieved by shifting infrastructure and safety-related costs to the public sector. Once these external costs are brought back into the cost structure, the apparent efficiency of overloading becomes less sustainable. The transmission of these cost increases is not uniform across sectors. In line with system-level economic analyses, sectors with strong intersectoral linkages are highly exposed to transport cost shocks [29]. In line with previous work on input-output price propagation [30], sectors with strong intersectoral linkages, such as construction and manufacturing, are more exposed to rising transport costs. This is particularly relevant for commodities such as beef, where earlier supply chain studies have shown high sensitivity to logistics conditions [31]. Operators respond to load restrictions by increasing the number of operating vehicles, which in turn raises fuel and toll expenses. The stronger price response observed in sand and cement also points to limited modal substitution for bulk commodities, which is consistent with earlier research on transport rigidities [32].

The CGE IndoTERM simulation also supports Hypothesis 2 (H2). Contrary to the concern that higher logistics costs would weaken overall economic performance, the simulation indicates a long-term GDP increase of 0.05%. This positive outcome appears to be driven by two main channels: stronger capital formation and the reallocation of fiscal resources, as illustrated in Figure 3.

First, the policy appears to accelerate fleet modernization, which is consistent with an investment-led adjustment process [33]. The results suggest that approximately 35% of operators, mainly larger corporate fleets with better access to capital, are prepared to modernize their operations. By contrast, smaller operators are more likely to delay adjustment or exit the market. This regulatory pressure encourages capital renewal, as reflected in the projected 6.74% increase in fleet investment, equivalent to IDR 42.4 trillion. This rise in investment may also create additional demand for the domestic automotive sector and related upstream industries.

Second, the simulation suggests an improvement in the allocation of public resources. Previous research has shown that, although infrastructure maintenance is essential for development, excessive spending on premature road damage represents an inefficient use of public funds [25]. Relocating these funds to productive investments fosters spatial equity and efficiency [29]. The results indicate that the Zero ODOL policy generates road preservation savings of IDR 2.84 trillion. This creates fiscal space that can be redirected from repair expenditure to more productive forms of infrastructure investment. When combined with lower social costs, particularly those associated with fewer traffic accidents [34], the overall effect is a positive net economic outcome. This result is also consistent with earlier evidence that infrastructure compliance can support regional economic growth [35].

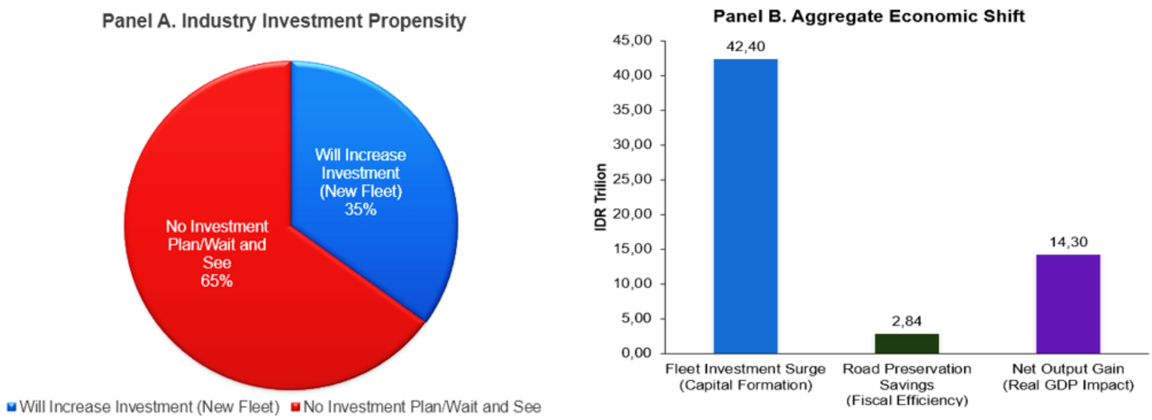

Figure 3. Fleet investment response and net macroeconomic effects under the Zero Over-Dimension Over-Load (ODOL) policy

Note: Panel A shows the industry response, with 35% of operators indicating an intention to modernize their fleets. Panel B presents the associated macroeconomic effect. The increase in capital formation (IDR 42.4 trillion), together with fiscal savings (IDR 2.84 trillion), contributes to a positive net output effect of IDR 14.3 trillion.

Source: Computable General Equilibrium (CGE) IndoTERM simulation results (Tim Kerja, 2025).

5 Implications

The findings have several practical implications for logistics governance and engineering management. First, the implementation of the Zero ODOL policy should be carefully timed to reduce short-term price pressures, particularly in food-related sectors such as rice [36]. This is important because the simulation results indicate that logistics cost pressures become more pronounced during periods of high demand. Second, the projected investment requirement of IDR 42.4 trillion suggests that fiscal incentives or concessional financing may be needed to support fleet renewal. Without such support, smaller operators may struggle to adjust and may postpone modernization or leave the market [16]. Third, the effectiveness of the policy will depend on reliable enforcement technologies, including WIM systems, to strengthen compliance and improve the allocation of enforcement resources [37].

6 Conclusions

This study finds that the Zero ODOL policy can generate a positive net economic effect despite short-term adjustment costs. The results indicate that implementation is likely to increase national logistics costs by 4.58% and create inflationary pressure in several sectors in the short term. At the same time, the CGE IndoTERM analysis suggests that the policy can support GDP growth by 0.05%, equivalent to IDR 14.3 trillion, through higher fleet investment, improved infrastructure efficiency, and lower social costs. In this sense, the transition to a compliant logistics system should be understood not only as a regulatory adjustment, but also as a longer-term investment in system efficiency and competitiveness. The findings also suggest that implementation should be carefully timed to avoid peak demand periods and accompanied by fiscal support for vulnerable operators.

This study has several limitations. First, the primary data are concentrated in DKI Jakarta and West Java. Although these provinces account for a substantial share of national GDP and truck activity, the results may not fully reflect the characteristics of inter-island transport in other regions, such as Sumatra or Sulawesi. Second, the inflation simulation applies a ceteris paribus assumption to provinces outside the study area, which may understate spillover effects across the archipelago. Third, the model assumes a stable global energy price environment. Given the large share of fuel in transport operating costs, volatility in global crude oil prices could affect the estimated economic balance of the policy. Future research could extend the analysis to Outer Java corridors in order to provide a broader picture of how the policy may affect Indonesia's archipelagic logistics system.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

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Conflicts of Interest

The author declares no conflict of interest.

Declaration on the Use of Generative AI and AI-assisted Technologies

The author used generative AI tools solely for limited language editing and formatting assistance during manuscript preparation. All scientific content, analysis, and conclusions were developed and verified by the author.

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Nomenclature

P	Price vector
I	Identity matrix
A	Matrix of technical coefficients
v	Value-added vector

Greek symbols

σ	Elasticity of substitution

Appendix

A. Research Data Overview

To ensure transparency and replicability of the simulation results presented in this study, the following tables detail the raw data and input parameters utilized in the CGE IndoTERM and Input-Output models. These parameters were derived from primary surveys conducted in 2025 involving logistics practitioners in DKI Jakarta and West Java, as well as secondary data obtained from authorized government agencies, including the Central BPS, Ministry of Transportation, and Korlantas.

B. CGE IndoTERM Model Specification and Closure

B.1. Model Structure and Substitution Assumptions

The IndoTERM model employed in this study operates as a dynamic multi-regional CGE framework. The core behavioral specifications rely on the CES and Armington functions to govern the substitution possibilities between domestic and imported goods, as well as inter-regional trade flows. Based on the technical specification of IndoTERM, the sourcing mechanism follows a nested structure:

1. International Substitution: At the top level, economic agents choose between domestic composite goods and imported goods based on the Armington elasticity assumption.

2. Inter-regional Substitution: For domestic goods, the model utilizes a CES function to allocate demand across different regions (e.g., sourcing vegetables from Java vs. Sumatra). The elasticity of substitution (σ) varies by commodity type:

$a.\ Tradeable\ Goods$: Assigned a high elasticity (σ = 5.0) reflecting high substitutability where regions with lower production costs can easily gain market share.

$b.\ Services$: Assigned a low elasticity (σ = 0.2) reflecting the localized nature of services and limited inter-regional tradeability.

$c.\ Margin\ Substitution$: The model allows for substitution in the production of transport margins. For instance, road transport margins (σ = 0.5) allow logistics providers to shift depots to lower-cost regions, whereas retail margins (σ = 0.1) are more rigid and tied to the destination region.

B.2. Macroeconomic Closure and Dynamic Mechanisms

This study adopts a dynamic closure that captures the transition from short-term rigidities to long-term equilibrium. The closure includes two primary dynamic mechanisms:

1. Capital Accumulation: Investment decisions are endogenous and driven by the expected rate of return. The model assumes a “gestation lag” of one year, where investment in period t adds to the capital stock in period t + 1. The investment-to-capital ratio adjusts partially toward a long-run normal rate of return (R_{normal}), ensuring that capital flows to sectors with higher profitability.

2. Labor Market Adjustment: The closure allows for real wage adjustments based on the deviation of employment from its trend (NAIRU—Non-Accelerating Inflation Rate of Unemployment). In the long run, real wages adjust to clear the labor market, allowing employment to return to its natural trend, while in the short run, wage rigidities may persist.

C. Supplementary Data Tables and Parameters

Table C1. Baseline macroeconomic and logistics parameters (2024)

Parameter/Indicator	Value	Original Source
Total economic output (baseline)	IDR 28,700 trillion	Statistics Indonesia (BPS), Input-Output Table 2020
National logistics cost ratio	14.29% of GDP	Bappenas calculation (2024)
Transportation cost share	59.27% of total logistics cost	Bappenas logistics study
Road transport modal share	50.00% of logistics activity	Ministry of Transportation
Regional road length ratio	6.53% (DKI Jakarta and West Java)	BPS
Annual road preservation loss	IDR 43.5 trillion (national)	Ministry of Public Works (PUPR)

Note: This table presents the initial economic conditions used as the baseline for the CGE IndoTERM simulation before the policy shock is applied.

Source: Compiled from secondary data (Tim Kerja, 2025).

Table C2. Operational cost structure and shock inputs (survey data)

Cost Component	Structure Weight (%)	Projected Price Increase (%)	Description
Fuel (BBM)	30.76%	65.39%	Increase due to higher trip frequency
Driver wages	18.66%	54.92%	Increase in labor hours due to more frequent trips
Maintenance & spare parts	14.03%	53.95%	Higher wear and tear utilization
Toll fees	8.40%	70.28%	Largest projected increase
Truck rental	6.62%	33.35%	Adjusted for fleet demand
Loading/unloading	6.44%	48.06%	Handling cost adjustment
Weighted average shock	100%	7.73%	Aggregate cost shock input

Note: Raw data derived from primary surveys of logistics operators in DKI Jakarta and West Java, used to calculate the cost-push shock in the model. BBM = Bahan Bakar Minyak.

Source: Primary survey data (2025).

Table C3. Fleet investment and capital formation inputs

Variable	Value/Unit	Description
Truck population (DKI Jakarta and West Java)	1,280,000 units	Equivalent to 20.3% of the national truck fleet (police registration data)
Average truck price	IDR 500,000,000	Assumed market price for a standard truck unit
Investment propensity	35% of operators	Share of survey respondents planning fleet renewal; higher among large corporate fleets and lower among small operators
Fleet addition rate	6.74%	Shock parameter applied to capital stock
Total investment value	IDR 42.4 trillion	Positive demand-side shock introduced into the model

Note: These data were used to estimate the magnitude of the investment shock on the demand side of the model. The investment response differs by operator type, with higher propensity among large corporate fleets and lower propensity among small operators.

Source: Calculated from primary data and police registration data (Korlantas).

Table C4. Social cost valuation parameters (human capital approach)

Parameter	Value/Coefficient	Data Source
Total accidents (freight)	3,849 cases (national)	Korlantas, 2024
ODOL-related accidents	22.4% on major corridors	Jasa Marga & toll operators
Productivity loss (fatal)	100% (permanent loss)	Bappenas & UGM study
Productivity loss (injury)	17–50 days (workdays lost)	Bappenas & UGM study (sensitivity range lower and upper bound)
Vehicle repair cost	0.57–5.25 × GDP per capita	Relative coefficient model
Admin & medical cost	IDR 0.5–1.2 million/case	Hospital & police data
Estimated social savings	IDR 1.40 trillion	Net benefit input

Note: Coefficients and raw statistics used to calculate the economic benefits of accident reduction. To ensure robustness, this study utilizes parameter ranges rather than single point estimates to calculate economic benefits. UGM = Gadjah Mada University.

Source: Processed from accident statistics and insurance data.