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Analysis of Trans-Papua Logistics and Its Impact on Price Disparities in the Papua Highlands Region from the Perspective of Vehicle Operating Costs

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Abstract

This study analyzes the logistics system along the Trans-Papua corridor, focusing on the Jayapura–Wamena route, to assess its impact on regional price disparities in the Papua Highlands. The research examines the Vehicle Operating Costs (VOC) of two primary transport modes—Dump Trucks and Four-Wheel Drive (4WD) vehicles—under different operational conditions, namely with and without return loads. Using a qualitative approach complemented by quantitative calculations based on the Decree of the Director General of Land Transportation No. SK.687/AJ.206/DRJD/2002, data were collected through field observations, structured interviews, and questionnaires involving 30 respondents. The findings reveal that VOCs for Dump Trucks and 4WDs vary depending on load conditions, with averages of Rp 625,737.69/km and Rp 747,802.52/km without return loads, and Rp 656,506.92/km and Rp 848,782.91/km with return loads, respectively. The ideal tariff is determined at Rp 9,000 per kg for Dump Trucks and Rp 7,000–Rp 8,000 per kg for 4WDs. The study further identifies an imbalance between the existing vehicle fleet and optimal operational needs, leading to inefficiencies and higher logistics costs. Policy implications include the need for integrated coordination among government institutions, the optimization of fleet management, and the introduction of incentives to reduce transportation costs. Strengthening logistics governance along the Trans-Papua network is essential to enhance cost efficiency and mitigate regional price disparities in the Papua Highlands.

INTRODUCTION

The Papua Highlands Province, located in eastern Indonesia, faces significant challenges in infrastructure development and economic equality. One of the strategic programs designed to address these disparities and improve regional connectivity in Papua is the construction of the Trans-Papua road network. This initiative is expected to serve as a solution to accelerate equitable development, enhance interregional connectivity, and improve accessibility for communities in remote areas.

However, despite its great potential to support economic growth, the implementation of the Trans-Papua project faces several challenges. One of the most pressing issues is the widening price

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disparity in Papua, particularly in the Papua Highlands Province, due to inadequate infrastructure for the distribution of goods and services. The prices of basic necessities in remote regions are often much higher than in more accessible areas, contributing to increasing economic inequality between economic centers and peripheral regions.

Furthermore, the imbalance in the distribution of resources and infrastructure has also led to high inflation rates in several parts of the Papua Highlands. High inflation can further weaken the purchasing power of local communities, affecting their quality of life. The impact of these price fluctuations, combined with low local production levels, requires special attention in designing economic policies that promote price stability and inclusive economic growth.

This study aims to analyze vehicle operating costs along the Jayapura–Wamena route, identify the characteristics of logistics transportation on the Trans-Papua corridor connecting Jayapura and Wamena, and propose a conceptual framework for improving freight and logistics management along the Wamena–Jayapura route.

LITERATURE REVIEW

Definition of Transportation

According to Bowersox (1981), transportation is the movement of goods or passengers from one place to another, fulfilling spatial and temporal needs. Its key elements include people, goods, vehicles, infrastructure (roads and terminals), and management organizations. Nasution (2008) adds that transportation is fundamental to economic growth and industrialization, as it enables specialization and adds value by making goods useful across time and place. Transportation can be categorized into two main types: the movement of goods and the movement of passengers.

Benefits of Transportation

According to Adisasmita (2013), transportation creates place and time utility, increasing economic, social, and political value. In logistics, transportation enhances customer satisfaction by ensuring goods are available at the right place and time, thus supporting business profitability. Effective logistics also ensures efficient movement—delivering the right product, to the right place, at the right time, in the right condition, and at the right cost.

Vehicle Operating Costs

Based on SK/687/AJ.206/DRJD/2002, operating costs represent total expenditures required to produce one unit of transport service. These include direct and indirect costs.

Direct Costs

Direct costs are expenses directly related to service operations and include:

1. Fixed costs, such as vehicle depreciation, capital interest, taxes, inspections (KIR), and permits.
2. Variable costs, which change with service volume, including driver wages, fuel consumption, tire replacement, minor and major maintenance, oil, vehicle upkeep, and terminal fees.

Indirect Costs

Indirect costs are expenses not directly tied to service production, comprising both fixed and variable administrative or management-related expenditures.

METHOD

Research Approach

This study employs a qualitative approach through observation and in-depth interviews with several respondents, including logistics transport drivers and logistics service users along the Abepura–Elelim–Wamena route. A purposive sampling technique will be used to select informants who possess relevant experience and knowledge regarding logistics transport tariffs on the Abepura–Elelim–Wamena route. The study also utilizes previous research findings and available secondary data to strengthen the analysis.

Research Location

The research also applies a quantitative method with a literature review approach, examining various references related to the research topic. The study is conducted in Jayapura, Papua Province, and Wamena, Papua Highlands Province.

The research is conducted in Jayapura, focusing on individuals involved in transportation along the Jayapura–Elelim–Wamena route, particularly drivers of Strada-type vehicles and trucks. Interviews are carried out with drivers and operators to gather information on the components included in Vehicle Operating Costs (VOC) for round trips to and from Wamena. The interviews also cover the types of cargo transported. The results of these interviews are primarily used to determine the VOC based on the Decree of the Minister of Transportation of the Republic of Indonesia, Directorate General of Land Transportation No. SK.687/AJ.206/DRJD/2002, concerning technical guidelines for the operation of urban logistics transportation on fixed and regular routes.

RESULT AND DISCUSSION

Data Recapitulation Based on Questionnaire

The data recapitulation based on the questionnaire is a tabulation of responses collected from 30 samples, consisting of 15 dump truck drivers and 15 four-wheel-drive (4WD) drivers. The mode value from each question was used by the researcher as a reference for analysis.

Table 1. Guidelines for Questions to Respondents Based on the Questionnaire

No	Question	Unit
1	How many kilometers traveled there/back?	km per 1/2 trip
2	Renter Status/trip	Renter
3	How many operating days/trip	day/trip
4	How many trips/year	trip
5	How much is the new vehicle worth?	Rp.
6	How much is the deposit to the owner?	Rp.
7	How many drivers?	person
8	How much is the driver's salary/day/per trip?	Rp.
9	How much is the fuel cost?	Rp/liter
10	How much is the tire used?	unit
11	How long is the tire's lifespan?	km
12	How much is the tire cost/unit?	Rp.
13	How many minor services are performed every year?	km
14	How much is the engine oil?	liter
15	How much is the oil/liter?	Rp.
16	How much is the grease?	kg
17	How much is the grease/kg?	Rp.

18	How much is the brake fluid?	liter
19	How much is the brake fluid/liter?	Rp.
20	How much is the service fee?	Rp.
21	How many major services are performed every year?	km
22	How much is the transmission oil?	liter
23	How much is the oil/liter?	Rp.
24	How much is the air filter?	Rp.
25	How much is the brake lining?	Rp
26	Brake replacement cost?	Rp
27	How much is the clutch lining?	Rp
28	How much is the replacement cost? Clutch Service Fee	Rp
29	How Much Does an Overhaul Cost?	Rp.
30	How Much Does an Overhaul Cost?	km
31	How Much Does an Overhaul Cost?	Rp.
32	How Much Does an Overhaul Cost?	Rp.
33	How Much Does an Engine Oil Addition Cost?	liter
34	How Much Does a WMX Base Fee Cost?	Rp.
35	How Much Does a Vehicle Registration Certificate (STNK) Cost?	Rp.
36	How Much Does a Battery Change Cost?	km
37	How Much Does a Battery Cost?	Rp
38	How Much Does a Shock Absorber Cost?	km
39	How Much Does a Shock Absorber Cost?	Rp
40	How Much Does a Headlight Change Cost?	km
41	How Many LED Lights Cost?	fruit
42	How Many LED Lights Cost?	Rp
43	How Many Small Lights Cost?	fruit
44	How Many Small Lights Cost?	Rp
45	How Many Inspection Frequency?	times
46	Cost per Inspection?	Rp.
47	How Much Does a Route Permit Cost?	Rp.
48	How Much Does a Helper's Salary Cost?	Rp.
49	Roadside Fees?	Rp.
50	How Many Security Posts?	Unit
51	How Much Does a Cigarette Cost?	Rp.
52	How Much Does a Foodstuff Cost?	Rp.

Source: 2025 Question Recapitulation

From the list of 52 questions given to respondents operating along the Jayapura–Wamena route, various answers were obtained from 15 different respondents representing the truck transportation category. The most frequently occurring responses, or the mode, were then selected. The summarized data are presented in the following table.

Table 2. Summary of Questionnaire Data (Dump Truck)

Questions (Q)	Data				Modus
	a	b	c	d	
1	>600 km = 3	<600 km = 3	600 km = 8	600 km	600 km
2	8 renters = 1	6 renters = 2	7 tenants = 3	5 renters	5 renters
3	>2 months = 11	2 months = 4		>2 months	>2 months
4	7 trips = 1	5 trips = 2	6 rit = 12	6 trips	6 trips
5	600 million = 10	<600 million = 5		600 million	600 million
6	12 million = 1	10 million = 13	0 = 1	10 million	10 million
7	1 person = 15			1 person	1 person
8	319 thousand = 1	165 thousand = 3	135 thousand = 11	135,000	135,000
9	Rp 6,800 = 15				Rp6,800
10	6 tires = 15				6 tires
11	7,200 km = 15				7,200 km
12	2.167 million = 15				2.167 million
13	1,200 km = 15				1,200 km
14	8 liters = 15				8 liters
15	55 thousand = 15				55,000
16	1.5 kg = 15				1.5 kg
17	120 thousand = 15				120,000
18	1 liter = 15				1 liter
19	110 thousand = 15				110,000
20	0 = 5	115 thousand = 10			115,000
21	2,400 km = 15				2,400 km
22	7 liters = 15				7 liters
23	52 thousand = 15				52,000
24	400 thousand = 15				400,000
25	1.8 million = 15				1.8 million
26	0 = 15				0
27	2.1 million = 15				2.1 million
28	0 = 15				0
29	171,500 = 15				Rp171,500
30	72000 km = 15				72,000 km
31	350 thousand = 15				350,000
32	±8 million = 1	<8 million = 3		8 million = 11	8 million
33	0 = 15				0
34	3 million = 15				3 million
35	3.293 million = 15				3.293 million
36	7200 km = 15				7,200 km
37	1.9 million = 15				1.9 million
38	14400 km = 15				14,400 km
39	600 thousand = 15				600,000
40	7200 km = 15				7,200 km

41	2 lights = 15			2 lights
42	100 thousand = 15			100,000
43	8 lights = 15			8 lights
44	10 thousand = 15			10,000
45	2 times = 13	1 time = 1	0 = 1	2 times
46	500 thousand = 14	0 = 1		500,000
47	0 = 15			0
48	2.5 million = 15			2.5 million
49	2 million = 2	2.5 million = 10	>2 million = 3	2.5 million
50	±15 posts = 4	<15 items = 3	15 items = 8	15 points
51	37 thousand = 13	36 thousand = 2		37,000
52	2 million = 15			2 million

Source: Data Processing Results, 2024-2025

Subsequently, the same 52 questions were given to respondents operating smaller vehicles or four-wheel-drive (4WD) types. From the 15 respondents surveyed, the most frequent or identical responses were selected. The recapitulated results for this vehicle category are presented in the table below.

Table 3. Summary of Questionnaire Data (4 Wheel Drive)

Questions (Q)	Data			Modus
	a	b	c	
1	>600 km = 1	<600 km = 4	600 km = 10	600 km
2	3 renters = 3	2 renters = 8	1 tenant = 3	2 renters
3	<1 month = 10	1 month = 5		<1 month
4	12 trips = 11	11 trips = 2	13 rit = 1	12 trips
5	<600 million = 2	600 million = 10	>600 million = 3	600 million
6	2 million = 10	>2 million = 3	0 = 2	2 million
7	1 person = 15			1 person
8	288 thousand = 10	406 thousand = 3	524 thousand = 2	288 thousand
9	Rp 6,800 = 15			Rp6,800
10	4 tires = 15			4 tires
11	14,400 km = 15			14,400 km
12	1.7 million = 15			1.7 million
13	1,200 km = 15			1,200 km
14	7 liters = 15			7 liters
15	52 thousand = 15			52 thousand
16	1 kg = 15			1 kg
17	120 thousand = 15			120 thousand
18	1 liter = 15			1 liter
19	110 thousand = 15			110 thousand
20	110 thousand = 13	0 = 2		110 thousand
21	2,400 km = 15			2,400 km

22	5 liters = 15			5 liters
23	64 thousand = 15			64 thousand
24	150 thousand = 15			150 thousand
25	1.9 million = 15			1.9 million
26	0 = 15			0
27	2.1 million = 15			2.1 million
28	0 = 15			0
29	165,000 = 15			Rp165,000
30	144,000 km = 15			144,000 km
31	350,000 = 15			350 thousand
32	>5 million = 2	5 million = 12	±5 million = 1	5 million
33	0 = 15			0
34	0 = 15			0
35	2.753 million = 15			2.753 million
36	7,200 km = 15			7,200 km
37	1.5 million = 15			1.5 million
38	28,800 km = 15			28,800 km
39	1 million = 15			1 million
40	14,400 km = 15			14,400 km
41	2 lights = 15			2 lights
42	100,000 = 15			100 thousand
43	8 lights = 15			8 lights
44	10,000 = 15			10 thousand
45	0 = 2	1 time = 3	2 times = 10	2 times
46	400,000 = 13	0 = 2		400 thousand
47	0 = 15			0
48	0 = 15			0
49	2 million = 3	2.5 million = 9	>2 million = 3	2.5 million
50	<15 post = 3	15 items = 9	±15 items = 3	15 posts
51	37,000 = 12	36 thousand = 3		37 thousand
52	1 million = 15			1 million

Source: Data Processing Results, 2024-2025

Vehicle Operating Cost (VOC) Analysis

The Vehicle Operating Cost (VOC) analysis was conducted to determine the total cost incurred per kilometer by logistics transport operators along the Abepura–Elelim–Wamena route. Two types of vehicles were analyzed—Dump Truck Super HD (5-ton capacity) and Four-Wheel Drive (4WD, 2-ton capacity)—under two operational conditions: without return load (empty) and with return load (loaded backhaul). Data were obtained through questionnaires and direct interviews with 30 respondents, consisting of 15 truck drivers and 15 4WD drivers, as well as through supporting secondary data.

The VOC calculation referred to the Decree of the Director General of Land Transportation No. SK.687/AJ.206/DRJD/2002, which outlines the technical guidelines for determining cost components in freight transport operations. The components considered include direct costs (fixed

and variable) such as vehicle depreciation, fuel consumption, driver wages, tire wear, maintenance, and taxes; and indirect costs such as permits, allowances, and administrative expenses.

VOC Results for Different Vehicle Types

The analysis results show that the total VOC for Dump Trucks operating without return loads is Rp 31,744.13 per km, while the cost increases to Rp 33,510.80 per km when carrying return loads. For 4WD vehicles, the VOC is Rp 12,420.99 per km under the empty return condition.

The higher VOC for Dump Trucks is mainly due to their larger carrying capacity, higher maintenance requirements, and greater labor costs. In contrast, 4WD vehicles incur lower costs due to smaller capacity, better maneuverability on mountainous terrains, and lower operational intensity.

The breakdown of VOC components indicates that driver wages and setoran (revenue target payments) contribute the largest portion (30–45%) of total operating costs, followed by fuel consumption (10–15%) and maintenance costs (8–12%). Other components, such as taxes, KIR inspection, and terminal fees, contribute relatively less.

Comparison Between Operational Conditions

The results reveal that operating with return loads slightly increases total VOC by approximately 5.6% compared to the no-load condition. This rise is attributed to increased operational hours, higher vehicle wear and tear, and slightly greater fuel consumption. However, this condition also allows operators to generate additional income, reducing the proportion of non-productive (empty) trips and improving overall transport efficiency.

The difference in cost efficiency between vehicle types highlights the importance of vehicle selection based on terrain and cargo type. For instance, 4WD vehicles are more suitable for smaller loads and narrow mountain roads, while Dump Trucks are more efficient for bulk goods transport, despite their higher operating cost per kilometer.

Implications for Regional Logistics and Policy

The VOC findings have significant implications for logistics planning and policy-making in the Papua Highlands. First, the high transportation cost reflects the logistical challenges of the mountainous region, where limited road infrastructure and long distances increase the burden on vehicle operation and maintenance.

Second, the results emphasize the need for policy interventions to improve transport cost efficiency, such as:

1. Encouraging backhaul utilization to minimize empty return trips.
2. Providing fuel subsidies or logistical incentives for transport operators in remote areas.
3. Developing preventive maintenance programs to reduce vehicle breakdowns and high repair costs.

Supporting the use of appropriate vehicle types for specific terrain conditions to optimize cost per kilometer.

In summary, the VOC analysis shows that:

1. Dump Truck VOC ≈ Rp 31,700/km (empty return) and Rp 33,500/km (with load return).
2. 4WD VOC ≈ Rp 12,400/km (empty return).
3. The major cost components are driver wages, fuel, and maintenance.
4. Implementing efficient backhaul management can improve logistics cost-effectiveness and reduce price disparity in the Papua Highlands region.

These findings indicate that improving road infrastructure and logistical coordination on the Trans-Papua corridor will directly contribute to reducing the overall logistics cost and, consequently, the regional price disparity between urban centers and remote highland areas.

Recapitulation of BOK for the Abepura-Elelim-Wamena Route

Table 4. Recapitulation of BOK for the Abepura-Elelim-Wamena Route (For Dump Trucks without return cargo)

No.	Direct Costs	Rp./Vehicle- km	%
1	Depreciation	5000,00	14,75
2	Interest and Capital		
3	Crew Salaries and Allowances	15625,00	46,10
4	Fuel	3683,33	10,87
5	Tires	1805,56	5,33
6	Minor Service	704,17	2,08
7	Major Service	2341,63	6,91
8	General Inspection (Overhaul)	115,97	0,34
9	Engine Oil Top-Up	0,00	0,00
10	Wamena Base Fee	2500,00	7,38
11	Vehicle Registration/Vehicle Tax	457,36	1,35
12	KIR	138,89	0,41
13	Battery Replacement	263,89	0,78
14	Shock Absorber Replacement	41,67	0,12
15	Lights	38,89	0,11
	Total Direct Costs	32.716,35	96,53
No.	**Indirect Costs**	**Rp./Vehicle- km**	**%**
1	Route Permit Fee	0,00	0,00
2	Helper Salary	347,22	1,02
3	Roadside Fees	347,22	1,02
4	Cigarette Allowance for Security Posts	205,56	0,61
5	Food Costs	277,78	0,82
	Total Indirect Costs	1177,78	3,47
	Total Vehicle Operating Costs	33.894,13	100,0

Table 5. Recapitulation of BOK for the Abepura-Elelim-Wamena Route (For 4 Wheel Drive without return cargo)

No.	Direct Costs	Rp./Vehicle- km	%
1	Depreciation	1.756	16,58
2	Interest and Capital		
3	Angtik Crew Salaries and Allowances	4.083	38,54
4	Fuel	674,33	6,37
5	Tires	472,22	4,46
6	Minor Service	586,67	5,54
7	Major Service	2.198,58	20,75

8	General Inspection (Overhaul)	37,153	0,35
9	Engine Oil Top-Up	0,00	0,00
10	Wamena Base Fee	0,00	0,00
11	Vehicle Registration/Vehicle Tax	191,18	1,80
12	KIR	55,56	0,52
13	Battery Replacement	104,17	0,98
14	Shock Absorber Replacement	69,44	0,66
15	Lights	19,44	0,18
	Total Direct Costs	10.248,04	96,74
No.	**Indirect Costs**	**Rp./Vehicle- km**	**%**
1	Route Permit Fee	0,00	0,00
2	Helper Salary	0,00	0,00
3	Roadside Fees	173,61	1,64
4	Cigarette Allowance for Security Posts	102,78	0,97
5	Food Costs	69,44	0,66
	Total Indirect Costs	345,83	3,26
	Total Vehicle Operating Costs	10.593,87	100,0

Table 6. Recapitulation of BOK for the Abepura-Elelim-Wamena Route (For Dump Trucks with return loads)

No.	**Direct Costs**	**Rp./Vehicle- km**	**%**
1	Depreciation	5000,00	14,06
2	Interest and Capital		
3	Crew Salaries and Allowances	17291,67	48,63
4	Fuel	3683,33	10,36
5	Tires	1805,56	5,08
6	Minor Service	704,17	1,98
7	Major Service	2341,63	6,58
8	General Inspection (Overhaul)	115,97	0,33
9	Engine Oil Top-Up	0,00	0,00
10	Wamena Base Fee	2500,00	7,03
11	Vehicle Registration/Vehicle Tax	457,36	1,29
12	KIR	138,89	0,39
13	Battery Replacement	263,89	0,74
14	Shock Absorber Replacement	41,67	0,12
15	Lights	38,89	0,11
	Total Direct Costs	34.383,01	96,69
No.	**Indirect Costs**	**Rp./Vehicle- km**	**%**
1	Route Permit Fee	0,00	0,00
2	Helper Salary	347,22	0,98

3	Roadside Fees	347,22	0,98
4	Cigarette Allowance for Security Posts	205,56	0,58
5	Food Costs	277,78	0,78
	Total Indirect Costs	1177,78	3,31
	Total Vehicle Operating Costs	35.560,79	100,0

Table 7. Recapitulation of BOK for the Abepura-Elelim-Wamena Route (For 4 Wheel Drive if with return cargo)

No.	Direct Costs	Rp./Vehicle- km	%
1	Depreciation	1.756	14,60
2	Interest and Capital		
3	Angtik Crew Salaries and Allowances	5.750	47,82
4	Fuel	674,33	5,61
5	Tires	236,11	1,96
6	Minor Service	586,67	4,88
7	Major Service	2.198,58	18,28
8	General Inspection (Overhaul)	37,15	0,31
9	Engine Oil Top-Up	0,00	0,00
10	Wamena Base Fee	0,00	0,00
11	Vehicle Registration/Vehicle Tax	191,18	1,59
12	KIR	55,56	0,46
13	Battery Replacement	104,17	0,87
14	Shock Absorber Replacement	69,44	0,58
15	Lights	19,44	0,16
	Total Direct Costs	**11.678,59**	**97,12**
No.	**Indirect Costs**	**Rp./Vehicle- km**	**%**
1	Route Permit Fee	0,00	0,00
2	Helper Salary	0,00	0,00
3	Roadside Fees	173,61	1,44
4	Cigarette Allowance for Security Posts	102,78	0,85
5	Food Costs	69,44	0,58
	Total Indirect Costs	345,83	2,88
	Total Vehicle Operating Costs	12.024,42	100,0

Source: Data Processing Results, 2024

Number and Optimal Capacity of Logistics Transport on the Abepura–Elelim–Wamena Route

The logistics transport service operating on the Abepura–Elelim–Wamena route consists of 300 total vehicles, comprising 150 Dump Trucks and 150 Four-Wheel Drive (4WD) units. The analysis aimed to determine the optimal number of vehicles and their economic performance under two conditions: (1) without return load and (2) with return load.

Under the no-return-load condition, the average daily income for Dump Trucks is approximately Rp 2.69 million, while for 4WD vehicles it is around Rp 1.65 million. When return loads

are included, the income remains at a similar level due to balanced trip frequency and tariff application.

The Vehicle Operating Cost (VOC) per day-km was found to be Rp 625,737.69 for Dump Trucks and Rp 747,802.52 for 4WD vehicles (without return load), increasing slightly to Rp 656,506.92 and Rp 848,782.91, respectively, with return loads. Using the Break-Even Factor (FIBE) method, the optimal operation levels were determined.

The break-even occupancy factor (FIBE) was 23–24% for Dump Trucks and 45–52% for 4WD vehicles, meaning that only a portion of the total fleet is required to operate daily to achieve cost-efficiency. Consequently, the optimal number of operating vehicles is estimated at around 9–10 Dump Trucks and 17–19 4WD units per day, both on working and non-working days.

These results indicate that the existing number of logistics vehicles (300 units) exceeds the operational requirement for economic efficiency. Therefore, coordination of fleet scheduling and backhaul utilization is essential to reduce idle capacity and enhance cost-effectiveness along the Trans-Papua corridor.

Table 8. Optimal Calculation of Logistics Transportation for the Abepura-Elelim-Wamena Route (For Dump Trucks without return cargo)

Day	Number of KO Vehicles (Units)	Fill Factor (%)	PD	BOK	FIBE	KT (Unit)
Work	150	100	Rp 2.692.307,69	Rp 589.378,72	22	11
Holiday	150	100	Rp 2.692.307,69	Rp 589.378,72	22	11

Source: Data Processing Results, 2024

Table 9. Optimal Calculation of Logistics Transportation for the Abepura-Elelim-Wamena Route (For 4 Wheel Drive without return cargo)

Day	Number of KO Vehicles (Units)	Fill Factor (%)	PD	BOK	FIBE	KT (Unit)
Work	150	100	Rp 1.647.058,82	Rp 745.704,48	45	19
Holiday	150	100	Rp 1.647.058,82	Rp 745.704,48	45	19

Source: Data Processing Results, 2024

Table 10. Optimal Calculation of Logistics Transportation for the Abepura-Elelim-Wamena Route (For Dump Trucks with Return Loads)

Day	Number of KO Vehicles (Units)	Fill Factor (%)	PD	BOK	FIBE	KT (Unit)
Work	150	100	Rp 2.692.307,69	Rp 620.147,95	23	10
Holiday	150	100	Rp 2.692.307,69	Rp 620.147,95	23	10

Source: Data Processing Results, 2024

Table 11. Optimal Calculation of Logistics Transportation for the Abepura-Elelim-Wamena Route (For 4 Wheel Drive with return cargo)

Day	Number of KO Vehicles (Units)	Fill Factor (%)	PD	BOK	FIBE	KT (Unit)
Work	150	100	Rp 1.647.058,82	Rp 846.684,87	51	17
Holiday	150	100	Rp 1.647.058,82	Rp 846.684,87	51	17

Source: Data Processing Results, 2024

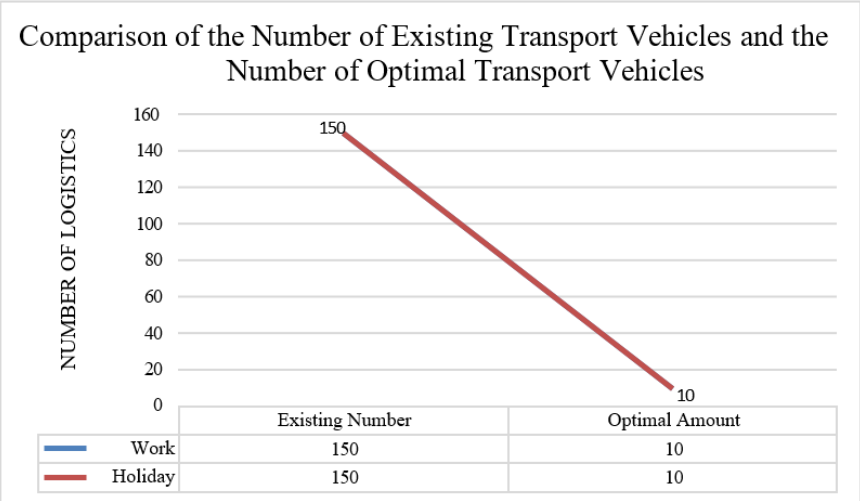

Figure 1. Number of operating fleets (Dump Trucks without return loads)

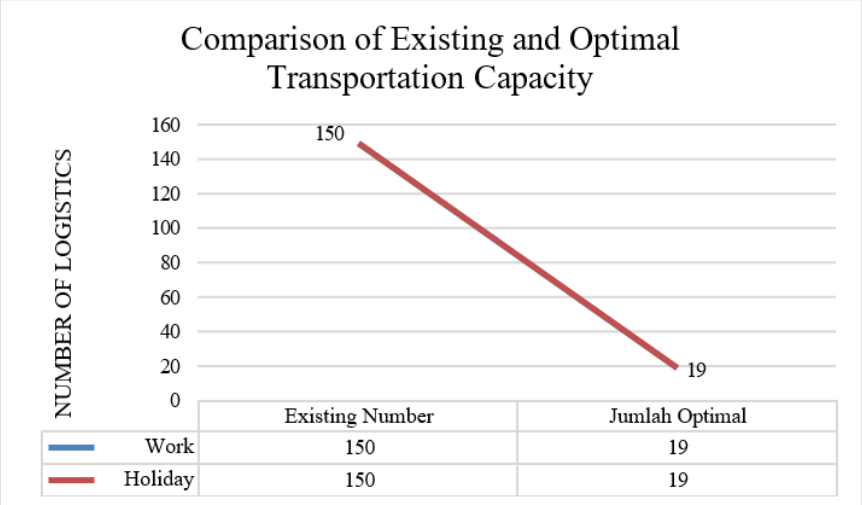

Figure 2. Number of fleets in operation (4 Wheel Drive without return load)

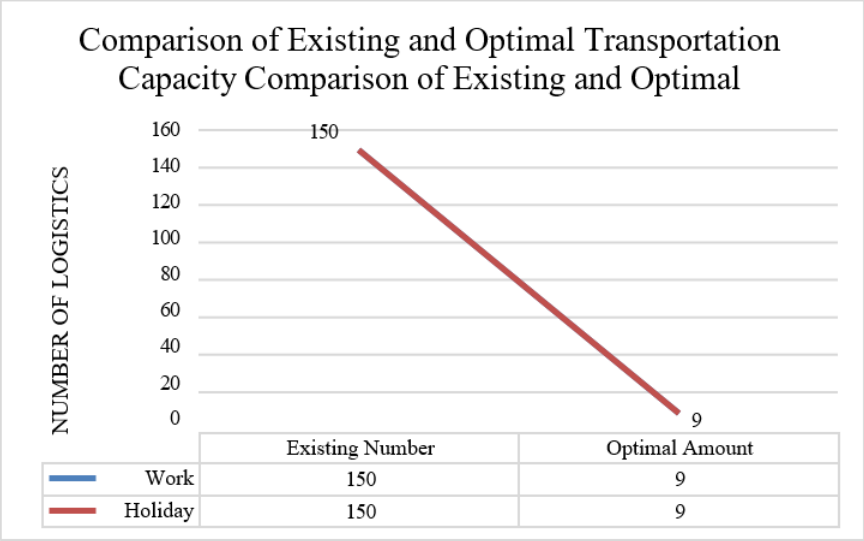

Figure 3. Number of operating fleets (Dump Trucks with return loads)

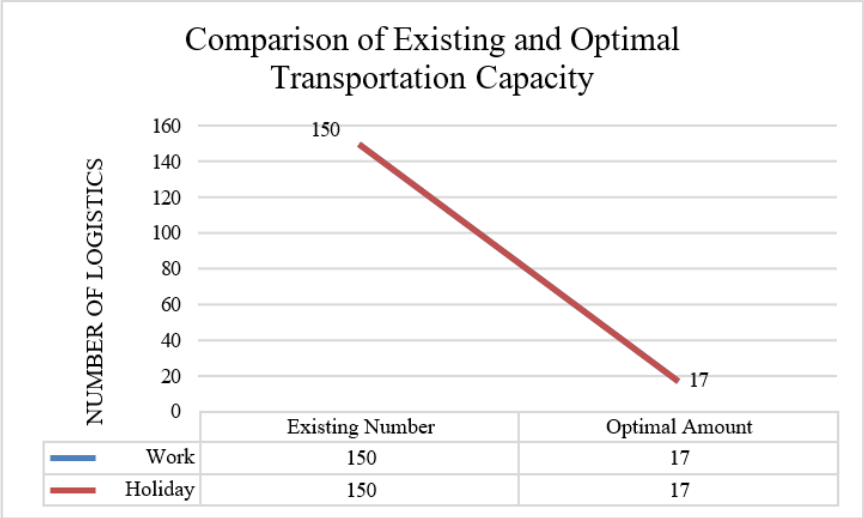

Figure 4. Number of fleets in operation (4 Wheel Drive with return loads)

Based on a seven-day field survey of logistics transport operations, the following findings were obtained:

1. Without Return Load

   The average number of logistics vehicles operating on weekdays is 150 Dump Trucks and 150 Four-Wheel Drive (4WD) units. Among them, the optimal number of operating vehicles is 10 Dump Trucks and 19 4WD units per day. On weekends or holidays, the same total number of vehicles (150 Dump Trucks and 150 4WD units) are active, with an optimal operation level of 10 Dump Trucks and 19 4WD units per day.

2. With Return Load

   The average number of logistics vehicles operating on weekdays is also 150 Dump Trucks and 150 4WD units. Of these, the optimal number of vehicles operating per day is 9 Dump Trucks and 17 4WD units. On weekends or holidays, the same total of 150 Dump Trucks and 150 4WD units operate, with an optimal operation level of 9 Dump Trucks and 17 4WD units per day.

Determination of Logistics Transportation Tariffs on the Abepura–Elelim–Wamena Route

Tariff calculations for logistics transport were conducted for two vehicle types — Dump Trucks and Four-Wheel Drives (4WD) — under two conditions: without return loads and with return loads. The calculations followed the guidelines of the Directorate General of Land Transportation (2002).

1. Without Return Load
   a. Dump Truck:
      The basic operating cost (BOK) was Rp 33,894.13 per vehicle-km, with a distance of 1,200 km per trip. The ideal tariff was Rp 9,000 per kg (≈ Rp 45,000,000 per trip), higher than the existing rate of Rp 7,000 per kg, meaning a required increase of Rp 2,000 per kg.
   b. 4 Wheel Drive:
      The BOK was Rp 10,593.87 per vehicle-km, with the same distance.
      The ideal tariff was Rp 7,000 per kg, equal to the existing rate, thus no increase needed.
2. With Return Load
   a. Dump Truck:
      The BOK increased to Rp 35,560.79 per vehicle-km. The ideal tariff remained Rp 9,000 per kg, requiring a Rp 2,000 per kg increase from the current rate.
   b. 4 Wheel Drive:
      The BOK was Rp 12,024.42 per vehicle-km, resulting in an ideal tariff of Rp 8,000 per kg, Rp 1,000 higher than the existing Rp 7,000 per kg rate.

Table 12. Summary

Vehicle Type	Return Load Condition	Ideal Tariff (Rp/kg)	Existing Tariff (Rp/kg)	Adjustment
Dump Truck	Without	9,000	7,000	+2,000
4WD	Without	7,000	7,000	–
Dump Truck	With	9,000	7,000	+2,000
4WD	With	8,000	7,000	+1,000

Overall, tariff adjustments are needed primarily for Dump Trucks and 4WDs carrying return loads, to ensure that revenues exceed operational costs and maintain financial viability.

CONCLUSION

The analysis of Vehicle Operating Costs (VOC) and rental tariffs for logistics transport using Dump Trucks and Four-Wheel Drive (4WD) vehicles shows that operational expenses vary depending on return load conditions. Without a return load, the total VOC is Rp 625,737.69 per vehicle-km for Dump Trucks and Rp 747,802.52 per vehicle-km for 4WDs. With a return load, the VOC increases to Rp 656,506.92 and Rp 848,782.91 per vehicle-km, respectively. Based on these results, the ideal tariff for Dump Trucks is Rp 9,000 per kg, regardless of return load, while for 4WDs, it is Rp 7,000 per kg without and Rp 8,000 per kg with a return load. To optimize logistics operations, it is essential to strengthen the management and coordination system of the Trans-Papua Jayapura–Wamena route by establishing an integrated logistics authority involving relevant ministries and both provincial governments.

Recommendations

The management of transportation and logistics along the Jayapura–Wamena route should be carried out through an integrated and coordinated approach involving the Papua and Papua Highlands provincial governments, as well as relevant central ministries such as Public Works, Transportation, Trade, Industry, Village Development, and Agriculture. Freight transport operations must comply with regulations allowing only yellow-plate vehicles for goods and service transport. To reduce price disparities, targeted interventions, subsidies, and investments from both the government and private sector are needed, emphasizing the active participation of local communities.

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