JICE Journal Innovation of Civil Engineering

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

Evaluation of tourist transportation Fare in Kawasan Strategis Pariwisata Nasional of Indonesia (Case study: Kawah Ijen tourist transportation)

Tatang Maulana Maliq[1*], Akhmad Hasanuddin[1], Sonya Sulistyono[1], Willy Kriswardhana[1,2], Bisma Muhammad Agym Fawwazi[1]

[1]Department of Civil Engineering, Universitas Jember, Jember 68121, Indonesia
[2]Department of Transport Technology and Economics, Budapest University of Technology and Economics, 1111 Muegyetem ″ rkp. 3, Budapest, Hungary

e-mail: tatangmaulanamaliq@unej.ac.id

ABSTRACT
The National Tourism Strategic Area (KSPN) of Ijen, particularly Kawah Ijen, is served by tourism transport operated by Perum DAMRI on the Jember–Kawah Ijen and Banyuwangi–Kawah Ijen routes. In 2024, transport fares underwent three adjustments as part of a trial to gauge public response before establishing the final commercial fare. Therefore, an evaluation based on vehicle operating costs (VOC) and load factors is required to determine fares that reflect actual travel costs. This study applies the VOC calculation method stipulated in the Decree of the Minister of Transportation of the Republic of Indonesia No. KM 251 of 2022. Secondary data were obtained from the operator, including operational, direct cost, and indirect cost data. VOC calculations were conducted under both 100% load factor and existing load factor conditions. The results indicate that fares under a 100% load factor are IDR 60,826 for the Jember route and IDR 55,129 for the Banyuwangi route. Under existing load factor conditions, the fares increase to IDR 209,746 and IDR 98,444, respectively. These findings demonstrate that load factor and travel distance significantly affect public transport fares and provide a basis for operational planning and fare-setting policies in the Ijen Tourism Strategic Area.

Keywords: *KSPN Ijen; Kawah Ijen Public Transport; vehicle operating cost; Public Transport Fare.*

1. Introduction

Kawasan Strategis Pariwisata Nasional (KSPN) Kawah Ijen is a tourism region in East Java with great potential to attract both domestic and international tourists. The sustainability of the tourism sector heavily depends on the availability of an efficient, affordable, and high-quality transportation system [1]. KSPN Ijen, particularly the Kawah Ijen, is currently served by KSPN Ijen tourism transport, which operates routes from Jember Regency and Banyuwangi, namely the Jember–Kawah Ijen and Banyuwangi–Kawah Ijen routes. The type of vehicle used is a minibus.

One essential aspect of public transport management is determining fares that reflect the service provider's actual travel costs[2]. Based on interviews with the operator of Kawah Ijen tourism transport, the fare has been adjusted three times during 2024. Initially, the Jember–Kawah Ijen route fare was IDR 26,000, which changed to a subsidized fare of IDR 17,900 in July. It was then increased to IDR 75,000 in November. Meanwhile, the Banyuwangi–Kawah Ijen route fare, initially set at IDR 10,500, was adjusted to a subsidized fare of IDR 8,800 and later increased to IDR 60,000 in November. The transport operator implemented the fare changes as part of a trial method to assess public response before determining the final commercial fare. Based on Decree of the Transportation Minister of Indonesian Republic Number 83 of 2021 concerning non-economy

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

class public passenger transport fares in National Strategic Areas, fares are determined by the transport service company.

Fare adjustments can also be triggered by rising fuel prices [3]. In addition to fuel prices, fare adjustments are influenced by subsidy schemes [4] [5]. According to a literature review [2] fare adjustments intended to increase ridership may reduce service quality. Conversely, higher fares may lead to decreased ridership, although the quality of service may align with the fare. Therefore, it is essential to evaluate the fare for Kawah Ijen tourism transport to ensure it accurately reflects actual travel costs.

One approach that can be used in fare evaluation is calculating Vehicle Operating Costs (VOC). This method enables fare calculation based on the cost components incurred by transport operators, such as fuel, vehicle maintenance, insurance, taxes, and labor. By comprehensively analyzing VOC, a more transparent fare structure aligned with current economic conditions can be obtained [6]. Previous studies evaluating the fare of Kawah Ijen tourism transport on the Jember and Banyuwangi routes used the vehicle operating cost calculation method stipulated in SK.687AJ.206/DRJD/2002. The results of fare calculations for the Jember and Banyuwangi routes, assuming 100% seat occupancy,e IDR 65,419 [7] and IDR 29,000 [8], respectively.

Meanwhile, for special KSPN tourist transportation, the operational cost calculation standard is based on Decree of the Minister of Transportation of the Republic of Indonesia Number KM 251 of 2022. Therefore, this study aims to evaluate tourist transportation fares for the Jember-Banyuwangi route using the VOC calculation method, with a focus on load factor considerations. The VOC calculation in this study uses a special guideline for KSPN transportation, namely KM 251 of 2022.

2. Material and Method

The method used in this study involves calculating vehicle operating costs and determining fares in accordance with the VOC guidelines for KSPN transport, as outlined in the Decree of the Minister of Transportation of the Republic of Indonesia Number KM 251 of 2022.

VOC encompasses all expenses required to operate a vehicle during travel, based on the vehicle's usage and travel distance. These costs include fuel, oil, tires, maintenance, and repairs [9]. In addition, depreciation, taxes, insurance, parking fees, and toll fees are also included in VOC calculations [10].

The data used in this study are secondary data, which include route length (L), load factor (LF), operational transport data, transport components, and other supporting information necessary for calculating VOC. These data were obtained from the KSPN Ijen transport operator, namely Perum DAMRI. The collected data are used to calculate the total vehicle operating cost, which includes both direct and indirect costs. The components of direct and indirect costs are derived from operational transport data and investment costs.

Transport operations involve all activities related to the management and control of public transport services, including the number of operational minibuses, operational kilometers, and seat-kilometers per year. The components affecting transport operations include route length, seating capacity, and seat occupancy. Route length is a primary factor in calculating VOC, as it directly influences fuel consumption [11]. Besides fuel consumption, other factors, such as maintenance, tire costs, and vehicle depreciation, also affect operating costs. These factors vary across scenarios, including normal driving, urban (stop-start) driving, and poor pavement conditions. The operating cost results show that city driving increases costs by 3.9 cents per mile for private cars and 9.5 cents per mile for trucks. Poor pavement conditions increase costs by 2.7 cents per private car and 5.5 cents per truck[12].

Road geometry conditions also influence VOC. Geometric elements such as road gradients, curvature, and pavement condition affect fuel consumption, oil use, and tire wear. The steeper the road gradient, the greater the tire wear due to the additional traction needed to overcome slope resistance. Fuel consumption and engine maintenance costs for modern motor vehicles are affected

JICE Journal Innovation of Civil Engineering
Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

by the additional load on the engine during uphill operation, especially when this load requires lower gear levels [13].

Another important factor in VOC calculation is the load factor, which is the ratio of actual passengers to the vehicle's maximum seating capacity [14]. According to KM 251 of 2022, the load factor is the seat occupancy rate for a round trip (departure and return). Load factor data will be used in transport operation calculations and in determining the cost per passenger. As stated by evaluated public transport fare research [15], load factor values can be determined using observational data from both weekdays and weekends, averaged using the following formula:

$$LF_e = \frac{LF_{We} \times n + LF_{Wd} \times m}{(n+m)} \tag{1}$$

Definition

LF_e	=	Existing load factor
LF_{We}	=	Weekend load factor
LF_{Wd}	=	Weekday load factor
n	=	Number of weekend days in a week
m	=	Number of weekdays in a week

In addition to the observed load factor, the fare evaluation also considers the planned load factor as specified in the planning guidelines. The planned load factor in the SK.687AJ.206/DRJD/2002 guideline is set at 70%[16].

To compute direct costs, transport and investment operational data must be identified. Direct costs are those directly related to vehicle operations, including depreciation (if applicable), insurance, driver wages, fuel, maintenance, tires, and spare parts. According to KM 251 of 2022, direct cost components can be calculated using equations (2) through (9) as follows:

$$DC = \frac{VP-}{DP} \times N \tag{2}$$

Definition

DC	=	Depreciation Cost
VC	=	Vehicle Price
RV	=	Residual Value
DP	=	Depreciation period
N	=	Number of vehicles

$$VI = (T + I \times 2) \times N \tag{3}$$

Definition

VI	=	Vehicle tax and Inspection fee
T	=	Tax
I	=	Inspection
N	=	Number of vehicles

$$IC = IP \times N \tag{4}$$

Definition

IC	=	Insurance Cost
IP	=	Insurance Premium
N	=	Number of vehicles

$$FC = L \times FCR \times N \times FP \times RF \tag{5}$$

JICE Journal Innovation of Civil Engineering

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

Definition

FC	=	Fuel Cost
L	=	Route Length
FCR	=	Fuel Consumption Ratio
N	=	Number of vehicles
FP	=	Fuel Price
RF	=	Regional Factor

$$DC = AS + MA + I + T + HB \tag{6}$$

Definition

DC	=	Driver Cost
AS	=	Annual Salary
MA	=	Meal Allowance
I	=	Insurance
T	=	Training
HB	=	Holiday Bonus

$$MC = MCU \times N \times CEI \tag{7}$$

Definition

MC	=	Maintenance Cost
MCU	=	Maintenance Cost per Unit
N	=	Number of vehicles
CEI	=	Construction Expensiveness Index

$$PC = PF \times N \tag{8}$$

Definition

PC	=	Permit Cost
PF	=	Permit Fee
N	=	Number of vehicles

$$DPC = PF \times N \times Nt \times AOT \tag{9}$$

Definition

DPC	=	Destination Parking Cost
PF	=	Parking Fee
N	=	Number of vehicles
Nt	=	Number of Trips
AOT	=	Annual Operation Time

Indirect costs are those not directly associated with vehicle operation but still necessary for running the transport business. These include office staff salaries, publication costs, business travel, office and workshop operational expenses, and pool and workshop maintenance costs. The total of both direct and indirect costs constitutes the total vehicle operating cost. All cost components are expressed in IDR/year, aligned with annual data such as annual testing, insurance, and taxes.

To compute the cost per passenger per kilometer, or as mentioned in KM 251 of 2022 (*Biaya Penumpang Kilometer*), the following formula is used:

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

$$CP = \frac{TC}{S \times N} \tag{10}$$

Definition

CP	=	Cost per passenger per kilometer
TC	=	Total Cost
S	=	Seat km/year
N	=	Number of vehicles

Once the cost per kilometer is obtained, the fare can be calculated by multiplying this cost by the route length:

$$F = CP \times L \tag{11}$$

Definition

F	=	Fare
CP	=	Cost per Passanger per kilometer
L	=	Route length

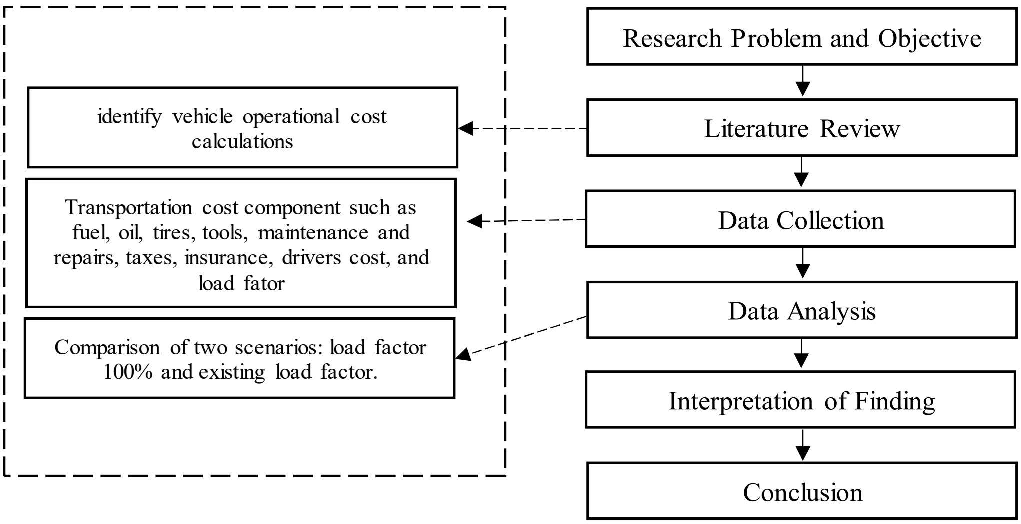

Figure 1. Flowchart of Research Methods

3. Result and Discussion

3.1. Kawah Ijen Public Transport Route

Kawah Ijen tourism transport provides public passenger service via two access points: Jember and Banyuwangi. The Kawah Ijen route passes through transfer nodes such as minibus terminals and train stations that facilitate modal shifts for tourists. A study on public transport connectivity and intercity tourist flows [17] examines how public transport connectivity, particularly air and rail modes, affects intercity tourist flows in China. The findings indicate that improving connectivity between major transport hubs significantly increased the number of tourists, highlighting the importance of routes that connect main terminals to facilitate modal integration for travelers.

The Kawah Ijen tourism transport route, both from Jember and Banyuwangi, passes through mountainous terrain. The Jember–Kawah Ijen route covers a distance of 115 km, starting from Tawang Alun Minibus Terminal in Jember, passing through Jember Train Station and the Bondowoso Tourist Information Center, and ending at Paltuding Ijen. The Banyuwangi–Kawah Ijen route spans 57 km, beginning from the central park of Banyuwangi Regency, passing through the Integrated Tourism Terminal and Banyuwangi City Station, and ending at Paltuding Ijen. The route from Jember is twice as long as the route from Banyuwangi. This distance is used in vehicle

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

operation calculations and as a basis for computing direct cost components. The Kawah Ijen tourism transport route is illustrated in **Figure 2**.

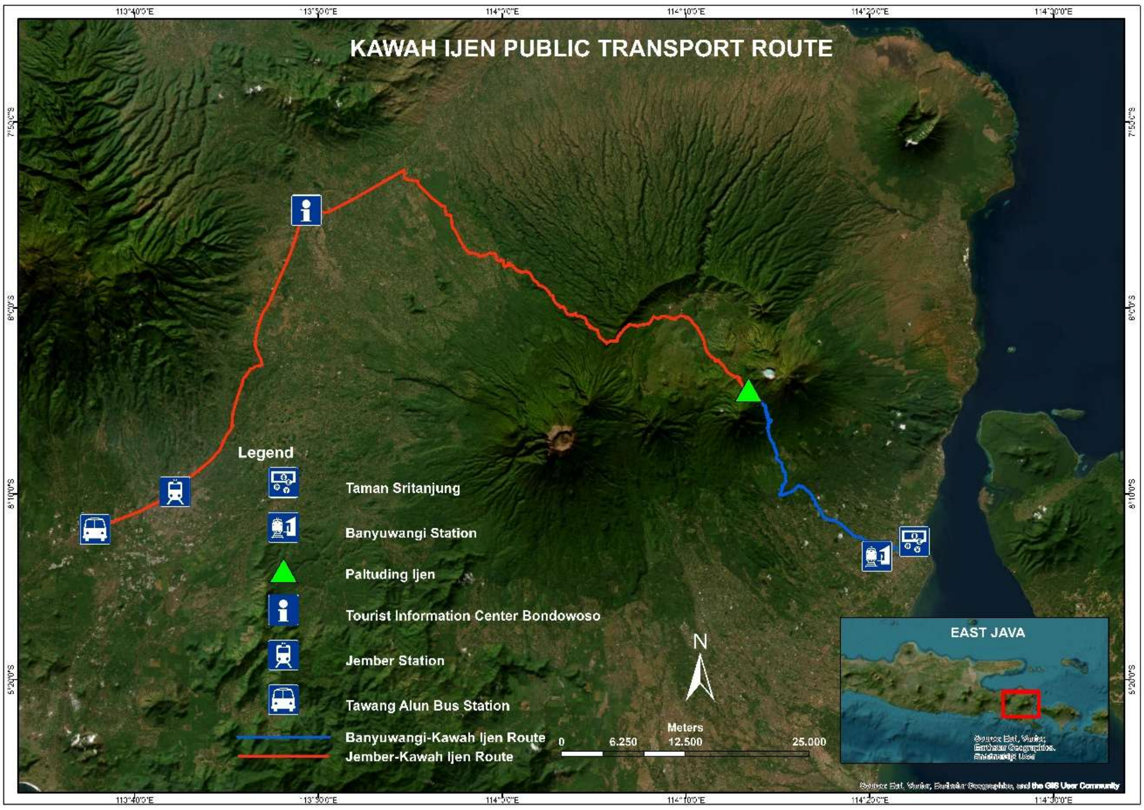

Figure 2. Kawah Ijen Public Transport Route

3.2. Load Factor

Load factor data for Kawah Ijen tourism transport, both for the Jember and Banyuwangi routes, were obtained from the transport operator. The data cover weekdays and weekends from August to November. Monthly average load factors are presented in **Table 1**.

Table 1. Average Load Factor on Weekdays and Weekends

Month	*Load Factor* Jember-Kawah Ijen		*Load Factor* Banyuwangi-Kawah Ijen	
	Weekdays	Weekends	Weekdays	Weekends
August	14%	44%	43%	46%
September	9%	72%	51%	76%
October	12%	88%	58%	90%
November	19%	65%	46%	73%
Average	14%	6%	49%	71%

Source : (DAMRI; 2024)

The weekday and weekend load factors in Table 1 reflect actual field conditions. The load factor of the Banyuwangi route is higher than that of the Jember route in both weekday and weekend conditions. The existing load factor can be calculated using Equation (1) by averaging over weekdays and weekends in a week. Using this formula, the existing load factors for the Jember and Banyuwangi routes are 29% and 56%, respectively. Converted to actual seats occupied,

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

the Jember route averages 4 seats per day (out of 15), while the Banyuwangi route averages 8 seats per day.

3.3. Operational Performance

Public transport operations include the types and characteristics of the vehicles used, the number of minibuses, the number of occupied seats, operational time, the number of trips, and travel kilometers. There are 2 operational minibuses on both the Jember and Banyuwangi routes, seating 15 each. The round-trip distances for Jember–Kawah Ijen and Banyuwangi–Kawah Ijen are 230 km and 114 km, respectively.

According to previous research [16], fare evaluations must consider two load factor conditions: the planned optimal load factor (100%) and the existing condition (29% for Jember, 56% for Banyuwangi).

Data such as the number of minibuses, occupied seats, operating days per month, and travel distance are used to calculate annual operational kilometers and seat-kilometers. Operational kilometers per minibus represent the total round-trip distance multiplied by the number of operating days in a year. Total route kilometers equal operational kilometers per minibus times the number of minibuses. Seat-kilometers per year reflect the number of seats occupied per kilometer annually and are used to calculate passenger travel cost per kilometer. Operational kilometers per minibus are represented in Table 2.

Table 2. Kawah Ijen Tourism Transport Operation

Operation Data	Jember- Kawah Ijen				Banyuwangi-Kawah Ijen			
	Load Factor = 100%		*Load Factor* = 29%		*Load Factor* = 100%		*Load Factor* = 56%	
Number of vehicles	2	units	2	units	2	units	2	units
Occupied Seats	15	seats	4	seats	15	seats	8	seats
Operating Time	30	days	30	days	30	days	30	days
Round-trip Distance	230	km/rit	230	km/rit	114	km/rit	114	km/rit
Trips per Day	1	trip/day	1	trip/day	1	trip/day	1	trip/day
Operational Km/Minibus	82,800	km/minibus/year	82,800	km/minibus/year	41,040	km/minibus/year	41,040	km/minibus/year
Operational Km/Route	165,600	km/ruote/year	165,600	km/ruote/year	82,080	km/ruote/year	82,080	km/ruote/year
Seat km/year	1,242,000	seat km/year	347,760	seat km/year	615,600	seat km/year	344,736	seat km/year

3.4. Transport Investment

Investment in public transport, according to the VOC calculation guidelines for KSPN transport, refers to the pricing components needed to calculate minibus operational costs, such as fuel prices, vehicle inspection costs, insurance, and vehicle taxes. These values are adjusted based on the characteristics and specifications of the vehicles used. The investment values for the Jember and Banyuwangi routes are identical, as both use the same vehicle type. Transport investment details are presented in **Table 3**.

Table 3. Investment in Kawah Ijen Tourism Transport

Investment Component	Price	Unit
Fuel Price	6,800	IDR/Liter
Vehicle Inspection (KIR)	100,000	IDR/inspection
Annual Insurance	840,000	IDR/year
Annual Motor Vehicle Tax	1,473,000	IDR/year

Source : (DAMRI; 2024)

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

3.5. Vehicle Operating Cost

The vehicle operating costs of Kawah Ijen tourism transport consist of direct and indirect costs, calculated under both 100% and existing load factor conditions. The direct cost components are derived from unit prices in Table 3, including fuel, insurance, taxes, and inspection costs, and multiplied by the number of vehicles (2 units per route). Depreciation is not included, as the vehicles are government assets in accordance with KM 251 of 2022.

Unit costs for fuel consumption ratio, driver wages, vehicle maintenance, permits, and parking fees were obtained from the transport operator. A summary of direct cost calculations using Equations (3) to (9) is shown in **Table 4**.

Table 4. Direct Cost of Kawah Ijen tourism Transport

Component		Jember-Kawah Ijen		Banyuwangi-Kawah Ijen	
		Load Factor = 100%	**Load Factor = 29%**	**Load Factor = 100%**	**Load Factor = 56%**
1	Motor Vehicle Tax + Inspection				
	Vehicle Tax + Inspection fee	3,346,000	IDR/year	3,346,000	IDR/year
	Insurance	1,680,000	IDR/year	1,680,000	IDR/year
2	Operational and Maintenance				
	Fuel	182,988,000	IDR/year	90,698,400	IDR/year
	Driver	75,926,016	IDR/year	75,186,858	IDR/year
	Maintenance	61,773,225	IDR/year	31,730,760	IDR/year
	Permit (Supervision Card)	60,000	IDR/year	60,000	IDR/year
	Parking	7,200,000	IDR/year	7,200,000	IDR/year
Total		332,973,241	IDR/year	209,902,018	IDR/year

The **indirect costs** for both routes are equal due to shared office and operational management. These costs are summarized in **Table 5**.

Table 5. Indirect Costs of Kawah Ijen Tourism Transport

Component		Value (IDR/year)
1.	Office HR Costs	921,503,800
2.	Business Travel	1,041,667
3.	Publication Costs	1,000,000
4.	Office and Workshop Operation	39,830,879
5.	Depreciation – Pool Equipment	7,500,000
6.	Depreciation – Pool Buildings	5,000,000
7.	Pool Building Maintenance	5,000,000
Total		**980,876,345**

3.6. Kawah Ijen Tourism Transport Fares

Fares based on vehicle operating costs are calculated by multiplying the cost per passenger per kilometer by the route length. The cost per passenger is obtained by dividing the total operational cost by seat-kilometers/year and the number of vehicles. Cost-per-passenger values for each route are presented in **Table 6**.

JICE Journal Innovation of Civil Engineering
Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

Table 6. Cost per passenger Values of Kawah Ijen Public Transport

Route	Load factor	Total Cost (IDR/Year)	Seat-km/tahun	Cost per passenger (IDR/pax.km)
Jember-Kawah Ijen	100%	1,313,849,586	1,242,000	529
	29%		347,760	1,824
Banyuwangi-Kawah Ijen	100%	1,190,778,363	615,600	967
	56%		344,736	1,727

From **Table 6**, the Cost per passenger for the Jember route is lower than for the Banyuwangi route under the 100% load factor scenario, due to higher seat-km/year values, which act as a cost divider. In the existing condition, the Banyuwangi route has a lower Cost per passenger due to higher occupancy. The larger the seat-km/year value, the lower the resulting Cost per passenger.

Fares are then calculated by multiplying the Cost per passenger values by the respective route lengths, as shown in **Table 7**.

Table 7. Fares Based on Load Factor and Cost per passenger

Route	Load factor	Seat Occupancy	Cost per passenger (Rp/pax.km)	Distance (Km)	Fare (Rp)
Jember-Kawah Ijen	100%	15 seats	529	115	60,826
	29%	4 seats	1,824		209,746
Banyuwangi-Kawah Ijen	100%	15 seats	967	57	55,129
	56%	8 seats	1,727		98,444

In the load factor = 100%, which assumes that all 15 seats in the vehicle are occupied. Under this condition, the VOC per passenger per kilometer is significantly lower—Rp 529 for the Jember route and Rp 967 for the Banyuwangi route. Consequently, the resulting fares are also more affordable, at Rp 60,826 and Rp 55,129, respectively. The fare difference between the two routes under 100% load factor is 9.36%, even though the Jember route is twice as long. This is due to the high seat-km/year on the Jember route, which lowers the Cost per passenger. Conversely, during actual observations, the load factor was 29% (4 seats occupied) for the Jember route and 56% (8 seats occupied) for the Banyuwangi route. These lower-occupancy fares result in substantially higher VOCs—Rp 1,824 and Rp 1,727, respectively—leading to higher fares of Rp 209,746 and Rp 98,444. Under existing conditions, the Banyuwangi fare is 53% lower due to a higher load factor. This supports findings in [18] dan [19] that low load factors increase per-passenger costs and reduce operator revenue.

The results of this study show a difference in fare values despite using the same 100% load factor and identical input variables as the previous study. This difference arises from the use of different regulatory frameworks. Previous research was based on SK.687/AJ.206/DRJD/2002, while this research uses a special calculation standard for operational costs for KSPN tourist transportation, namely KM 251 of 2022. That introduces updated formulas and cost structures, resulting in fare estimates that better align with current economic and operational conditions. With commercial fares and actual load factor levels, operators are unable to cover vehicle operating costs. Therefore, policies or strategies are needed to increase load factors and cover vehicle operating costs.

Based on case studies in Bogor City (Indonesia) [20] and Oyama City (Japan) [21], fare subsidy schemes and fare adjustment policies have been shownsignificantly increase public

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

transport usage. In Bogor, the ATP and WTP methods, which provide a subsidy of IDR 1,800 per passenger, enable operators to maintain operational sustainability despite offering a low passenger fare of IDR 3,500. This reflects the effectiveness of direct-per-passenger subsidy models in balancing the financial viability of public transport operators with fare affordability for the general public. Meanwhile, the case in Oyama City demonstrates that a fare reduction of up to 70%, combined with a well-planned public information campaign, successfully increased the number of users—particularly among former private car users—without adversely affecting operating revenue. The total number of users increased by approximately 10%, while season pass holders increased by 16%. These results suggest that the combination of a significant fare reduction and an appropriate public information campaign may increase bus ridership, without reducing operational revenues.

In addition to subsidy programs, Collaborative promotional strategies between the tourism and transport sectors have demonstrated substantial potential in increasing public transport usage among leisure travelers**.** Previous research [22] highlighted that intercity railway services in Malaysia experienced increased ridership through integrated marketing campaigns and bundled ticketing with tourism packages. These initiatives leveraged the tourism industry's appeal to enhance rail service attractiveness, particularly for domestic and regional tourists. Similarly, a spatial study in Bangkok emphasized the importance of awareness-driven programs in tourism transport planning. The study showed that improved accessibility to tourist destinations, combined with travel information tools such as maps, signage, and mobile applications, significantly encouraged tourists to use public transport rather than private vehicles [23].

To increase passenger numbers in KSPN Ijen, strategies may include providing fare subsidies to ensure affordability, integrating tourist transport with public modes such as stations and terminals to improve accessibility, and promoting the service to raise awareness and encourage use among tourists.

The purpose of setting fares by the government or public transportation operators is to ensure the continuity of public transportation operations, taking into account the purchasing power of public transportation users [24]. The resulting accessibility is meaningless if someone cannot afford transportation [25]. Therefore, further research is needed to determine fares based on user perceptions using ATP–WTP (Ability to Pay–Willingness to Pay) methods, in order to set fares aligned with user affordability, and to determine appropriate subsidy levels to cover VOC.

4. Conclusion

Based on the findings, the fare determination for Kawah Ijen tourism transport using the Vehicle Operating Cost (VOC) approach is significantly influenced by vehicle load factor and travel distance. Higher load factors reduce the fare burden per passenger, whereas longer travel distances increase fare levels. The analysis shows that fare calculations under the assumption of full vehicle occupancy yield lower values than the operator's current commercial fares. In contrast, fares calculated using actual occupancy conditions are substantially higher than the existing fares, indicating a mismatch between actual operating conditions and the current fare structure. These results suggest that the current unsubsidized fare system may not adequately cover operating costs, particularly during low-occupancy periods. Therefore, adjustments to the fare-setting mechanism or appropriate policy interventions are necessary to ensure the financial sustainability of tourism transport services while maintaining service accessibility in the Kawah Ijen Tourism Strategic Area.

Acknowledgements
The authors would like to express their gratitude to the Lembaga Penelitian dan Pengabdian Kepada Masyarakat (LP2M) of the University of Jember for the financial support provided through the 2024 Research Grant Program.

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

References

[1] A. Fathoni and Y. Lanrong, "Transportation Policy Toward Sustainable Tourism Development: Province of East Java, Indonesia Ali," *International journal of social sciences*, vol. 4, no. 1, pp. 1–8, 2021, doi: 10.31295/ijss.v4n1.350.

[2] A. Karakurt and I. Yasar, "Evaluation of User Costs in Terms of Public Transportation Fare: A Literature Review," *Journal of Operations Intelligence*, vol. 2, no. 1, pp. 285–299, 2024, doi: 10.31181/jopi21202426.

[3] U. Gunawan, E. Tri Mukti, and S. Basalim, "Analisis Dampak Kenaikan BBM Terhadap Tarif Angkutan Umum Antar Kota Rute Pontianak-Putussibau," *JeLAST : Jurnal Teknik Kelautan, PWK, Sipil, dan Tambang*, vol. 10, no. 4, pp. 1–8, 2023, doi: https://doi.org/10.26418/jelast.v10i4.74469.

[4] R. Puspitasari, "Analisis Subsidi Angkutan Umum Perdesaan Bagi Pelajar di Kabupaten Pasuruan," *Jurnal Penelitian Transportasi Darat*, vol. 20, no. 1, pp. 93–106, 2018, doi: https://doi.org/10.25104/jptd.v20i2.918.

[5] . Marjanto, "Analisis Subsidi Angkutan Perdesaan Melalui Biaya Operasi Kendaraan (BOK) Di Kabupaten Sleman," *Jurnal Teknik Sipil*, vol. 13, no. 4, pp. 291–300, 2017, doi: 10.24002/jts.v13i4.936.

[6] W. N. Wari, I. K. H. Wiryasuta, A. Masniarahma, and E. Suryani, "Penentuan Tarif Efektif Angkutan Umum Berdasarkan Biaya Operasional Kendaraan Studi Kasus Bus Minto Trayek Situbondo-Banyuwangi," in *Seminar Nasional Terapan Riset Inovatif (SENTRINOV) Ke-6 ISAS Publishing Series: Engineering and Science*, 2020, pp. 694–701.

[7] B. M. A. Fawwazi, T. M. Maliq, and A. Hasanuddin, "Evaluasi Tarif dan Penilaian Kualitas Pelayanan Angkutan KSPN Ijen Trayek Jember – Kawah Ijen," in *Prosiding Seminar Nasional Teknologi Industri, Lingkungan dan Infrastruktur (SENTIKUIN)*, 2024, pp. 1–14.

[8] H. D. Syaputra, T. M. Maliq, and S. Sulistyono, "Evaluasi Tarif dan Kinerja Pelayanan Angkutan Umum KSPN Banyuwangi – Kawah Ijen," in *Prosiding Seminar Nasional Teknologi Industri, Lingkungan dan Infrastruktur (SENTIKUIN)*, 2024, pp. 1–14.

[9] N. Mouter, M. Dean, C. Koopmans, and J. M. Vassallo, "Comparing cost-benefit analysis and multi-criteria analysis," *Advances in Transport Policy and Planning*, vol. 6, pp. 225–254, 2020, doi: 10.1016/bs.atpp.2020.07.009.

[10] T. A. Litman, "Transportation Cost and Benefit Analysis II - Vehicle Costs," 2022.

[11] S. A. H. Ahmad, M. N. Ab Rahman, R. Ramli, and A. A. Muhamed, "The Effects of Increased Distance Travel on the Operating Costs of Freight Truck Vehicles," *Jurnal Kejuruteraan*, vol. 36, no. 2, pp. 777–783, 2024, doi: 10.17576/jkukm-2024-36(2)-34.

[12] G. Barnes and P. Langworthy, "Per Mile costs of operating automobiles and trucks," *Transp Res Rec*, no. 1864, pp. 71–77, 2004, doi: 10.3141/1864-10.

[13] P. J. Claffey, "Running costs of Motor Vehicles as Affected by Road Design and Traffic," 1971.

[14] X. Shen, S. Feng, Z. Li, and B. Hu, "Analysis of bus passenger comfort perception based on passenger load factor and in-vehicle time," *Springerplus*, vol. 5, no. 62, pp. 1–10, 2016, doi: 10.1186/s40064-016-1694-7.

[15] J. Amahoru, G. C. Talanila, and Y. Lelyemin, "Evaluasi Tarif Angkutan Umum Berdasarkan Biaya Operasional Kendaraan (Studi Kasus : Trayek Ambon – Liang)," *Manumata: Jurnal Ilmu Teknik*, vol. 10, no. 2, pp. 106–113, 2024, doi: https://doi.org/10.51135/manumatav10i2p106-113.

[16] M. W. Hapsari, I. Sholichin, and N. Utomo, "Evaluasi Tarif Angkutan Feeder Wirawiri Suroboyo FD01 Berdasarkan Aspek Biaya Operasional Kendaraan (BOK), Willingness To Pay (WTP), Dan Ability To Pay (ATP) Maharanny," *Jurnal Talenta Sipil*, vol. 8, no. 1, pp. 129–139, 2025, doi: 10.33087/talentasipil.v8i1.684.

[17] Y. Yang, D. Li, and X. (Robert) Li, "Public Transport Connectivity and Intercity Tourist Flows," *J Travel Res*, vol. 58, no. 1, pp. 25–41, 2018, doi: 10.1177/0047287517741997.

Vol. 7, No. 1, pp. 41-52
Submit: 09-09-2025 |
Accepted: 24-01-2026 |
Publish: 07-06-2026 |

[18] S. Azemsha and K. Denis, "The Study of Public Transport Occupancy Rate Patterns in Belarusiancities," vol. 11, no. 12, pp. 128–134, 2022.

[19] S. Szabo, S. Makó, A. Tobisová, P. Hanák, and M. Pilát, "Effect of the load factor on the ticket price," *Transport Problems*, vol. 13, no. 3, pp. 41–49, 2018, doi: 10.20858/tp.2018.13.3.4.

[20] A. U. Rohmawan, I. M. Suharta, and L. Agusintas, "Analisis Perhitungan Tarif Angkutan Berbasis Massal Jalan Di Kawasan Perkotaan Dengan Skema Pembelian Layanan (Buy the Service) Kota Bogor," *KOMITMEN: Jurnal Ilmiah Manajemen*, vol. 5, no. 2, pp. 142–149, 2024, doi: 10.15575/jim.v5i2.44460.

[21] T. Azami, K. Nakagawa, and A. Taniguchi, "Effect of low-cost policy measures to promote public transport use: A case study of Oyama City, Japan," *Sustainability (Switzerland)*, vol. 13, no. 11, pp. 1–20, 2021, doi: 10.3390/su13116160.

[22] S. A. Jamaludin, S. Nasir, and I. Ibrahim, "Railway to Leverage on the Tourism Industry to Increase the Number of the Ridership for the Intercity Train Services," *International Journal of Academic Research in Business and Social Sciences*, vol. 12, no. 6, pp. 432–443, 2022, doi: 10.6007/ijarbss/v12-i6/13346.

[23] P. Iamtrakul, S. Chayphong, D. Seo, and T. A. Trinh, "Promoting accessibility for sustainable tourism: a spatial analysis of tourist attractions and public transportation networks in Bangkok," *City, Territory and Architecture*, vol. 12, no. 1, 2025, doi: 10.1186/s40410-025-00266-8.

[24] N. F. F. Lintang, Y. Kadir, and Moh. Y. Tuloli, "ANALISIS PENENTUAN TARIF BERDASARKAN BIAYA OPERASIONAL KENDARAAN, ABILITY TO PAY DAN WILLINGNESS TO PAY TRANS BRT KORIDOR I PROVINSI GORONTALO," *Composite Journal*, vol. 1, no. 2, pp. 41–48, 2021, doi: https://doi.org/10.37905/cj.v1i2.8.

[25] O. Z. Tamin, *Perencanaan dan Pemodelan Transportasi*, Edisi Kedu. Bandung: ITB, 2000.