

Analysis of Suroboyo Bus Tariffs Based on Ability to Pay (ATP) and Willingness to Pay (WTP)

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Abstract: Public transportation plays an important role in supporting urban mobility and promoting sustainable economic development. One of the main challenges in public transport provision is ensuring that services remain affordable for the public while operating efficiently and sustainably. Based on the background and existing challenges, an analysis of tariffs based on ability to pay (ATP) and willingness to pay (WTP) is a relevant and strategic topic to investigate. From the calculations, the average tariff based on the WTP method is Rp. 8,000 per passenger, while based on the ATP method it is Rp. 15,000 per trip/km. These results show that the current tariff of Suroboyo Bus, as per the Surabaya Mayor Regulation, is still more affordable than both the public's ability and willingness to pay for using the bus. Additionally, this study recommends that the Surabaya City Government consider adjusting the Suroboyo Bus tariffs to improve services and expand routes according to public demand.

Keywords: ATP WTP, Public Transport Subsidy.

INTRODUCTION

Surabaya is the capital of East Java Province, the second-largest city after Jakarta. Surabaya covers an area of about 335.28 km² with a population of 3,000,076 people (Wikipedia, 2023). The development of transportation in Surabaya has been very rapid due to advances in technology and the increasing standard of living of the people. One of the most commonly used transportation services is public transport. As a metropolitan city, one of the issues faced is traffic congestion. Many efforts have been made to address the transportation problems in Surabaya, such as adding city roads and intercity transportation like commuter trains connecting Surabaya with surrounding cities like Sidoarjo, Mojokerto, and Gresik. However, these efforts have not been able to solve the traffic congestion, which is particularly noticeable during peak hours. The increasing demand for travel is marked by the growing number of private vehicles in Surabaya. Since 2004, the average annual increase in the number of motorcycles has been 6.63%, and in 2018, there were 1,335,192 motorcycles. The high demand for travel is not proportional to the increase in road length in Surabaya. There is a need for efficient use of road space by revitalizing public transportation (buy the service) in Surabaya. One effort to address transportation issues in Surabaya is by improving public transport services so that the existence of public transport remains valuable to the community. To improve the quality of public transport services, a study is needed, which includes the costs and investments required, so that the Surabaya City Government can set the appropriate tariffs and subsidies for public transport to enhance service quality.

The traffic congestion in Surabaya is becoming more complex as the number of private vehicles, particularly motorcycles and cars, operating daily increases. Despite efforts by the government to improve infrastructure through road additions and alternative transportation such as commuter trains in the Gerbangkertosusila agglomeration area (Gresik, Bangkalan, Mojokerto, Surabaya, Sidoarjo, Lamongan), traffic congestion still frequently occurs, especially during rush hours. This indicates that infrastructure alone is not sufficient to solve urban transportation problems without good transportation management (Bappenas, 2018; ITDP, 2020).

Therefore, the focus has shifted to the revitalization of public transportation as a solution to reduce the number of private vehicles on the road. One of the strategic approaches applied in Surabaya is subsidizing public transportation services, particularly the Suroboyo Bus. The "buy the service" program implemented by the local government aims to improve the quality of public transportation

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and attract more users to switch from private vehicles to public transportation (JICA, 2019). This quality improvement will ensure that public transportation remains relevant and becomes the primary choice for people's daily mobility.

To improve the existence and competitiveness of public transportation, the Surabaya government needs to consider several aspects, including operational costs, infrastructure investment, and fair tariff determination. In this context, tariff subsidy analysis becomes crucial so that the government can balance the public's need for affordable tariffs with the operational efficiency of public transportation (Primasworo et al., 2022). A cost and investment study is also necessary to ensure that subsidy allocations are optimal and can improve service quality without burdening the regional budget excessively.

The buy the service policy is an initiative where the government cooperates with transportation operators to provide high-quality services with tariff subsidies, allowing people to enjoy affordable and comfortable transportation services. Through this policy, the government not only covers part of the operational costs but also ensures that operators can maintain high service standards. Such subsidy programs aim to increase passenger numbers, reduce carbon emissions, and alleviate traffic congestion (World Bank, 2021).

In recent years, Surabaya City has continued to develop its public transportation services to become the primary choice for people's daily mobility. The Suroboyo Bus was introduced as an innovative solution to address urban transportation issues, such as congestion and high carbon emissions. In addition to offering affordable services, the Suroboyo Bus also promotes environmental awareness by allowing passengers to pay their fare with plastic waste. This initiative demonstrates the commitment of Surabaya's local government to creating a sustainable transportation system (ITDP, 2020; Primasworo et al., 2022).

However, as the demand for quality and consistent service increases, an in-depth evaluation of tariff subsidies and operational costs of the Suroboyo Bus is necessary. Low tariffs without adequate subsidies can burden the operators and lower service quality, leading to bus delays, suboptimal fleet maintenance, and passenger dissatisfaction. On the other hand, well-managed subsidies can create a balance between operational costs and service affordability, encouraging more people to use public transportation (JICA, 2019).

Generally, people prefer public transport services that are fast, safe, affordable, and comfortable. Public transport services help people travel from one place to another according to their desired mode of transport. Public transport users include students, workers, and people simply traveling around Surabaya. One of the reliable public transport services in Surabaya is the Suroboyo Bus.

Suroboyo Bus began operating in April 2018 and is expected to reduce vehicle volume in Surabaya due to the continued increase in private vehicles. Currently, the ratio of private vehicles to mass transportation is 75% to 25%. If this ratio reaches 90%, traffic in Surabaya will come to a halt.

Other goals include reducing the number of accidents and plastic waste. The bus is also designed to be accessible to people with disabilities, the elderly, and pregnant women, with facilities and safety features that prioritize the comfort of Suroboyo Bus passengers.

The Suroboyo Bus is 2.4 meters wide and 12 meters long, with features that differentiate it from other public transport services. It has a capacity of 67 passengers and features gender-segregated seating to minimize sexual harassment, handle bars for support, 12 CCTV cameras, door sensors, emergency buttons in case of fire or accident, and an app to track bus schedules and locations for more effective and efficient use. The app, GoBis, is available for download on Android. Payment for riding the Suroboyo Bus can be made with 5 medium-sized plastic bottles, 3 large bottles, or 10 small mineral water bottles. The aim is to reduce plastic waste in Surabaya. Additionally, non-cash payment methods

like QRIS (through Gopay, Shopeepay, OVO, Dana, LinkAja, Dompotku, etc.) are available, with the general tariff set at Rp. 5,000 and the student tariff at Rp. 2,500. For those without QRIS, electronic toll cards like Flazz, Brizzi, E-Money, and Tap Cash are also accepted.

The operational costs of the Suroboyo Bus are relatively high, but with the subsidy provided by the Surabaya City Government, the tariff burden on passengers is reduced. Therefore, this study will analyze the tariff subsidy of the Suroboyo Bus in relation to its operational costs and the applicable tariffs.

Given the background and challenges, analyzing the ability and willingness of Suroboyo Bus users to pay based on ATP and WTP is a relevant and strategic topic for research. With the right analysis, the Surabaya City Government can improve public transport service quality, reduce congestion, and encourage people to switch to public transportation. Additionally, the use of technology in operational management will have a positive impact on service sustainability.

MATERIALS AND METHODS

In the preparation stage, the researcher will prepare various necessary matters, including correspondence such as data request letters and permission letters for field surveys if required. These letters will be submitted to relevant institutions to support the smooth execution of this study. This preparation process is crucial to ensure that all survey and data collection activities can be conducted according to applicable regulations and that the necessary permissions for field research are obtained.

In the literature review stage, the researcher will study various references related to the study topic. These references will be used as a foundation for moving on to the next stage, which is data collection and analysis. The literature review helps the researcher understand concepts related to tariff analysis, subsidies, and public transportation management, as well as providing deeper insights into technical aspects and policies that may influence the research outcomes.

The data collection stage consists of two types of data: primary and secondary data. Primary data collection is carried out through passenger surveys and operator surveys. The operator survey aims to gather information about vehicle operating costs, involving interviews with drivers regarding several parameters, such as daily mileage, crew income, fuel consumption, and bus washing costs. Secondary data is obtained from relevant government departments in Surabaya, as well as other sources regarding travel routes, operational hours, and vehicle operating costs, both direct and indirect.

RESULTS AND DISCUSSION

1. Analysis of Suroboyo Bus Fare Based on the WTP Method

Each service user who receives a survey form will choose the fare amount based on their willingness, adding assumptions such as if a fare is imposed, Suroboyo Bus will add more fleets so that the departure time at each stop becomes 15 minutes, increases speed, and implements a cashless payment system.

After conducting the survey, the fare based on the passengers'/community's willingness to pay was obtained. The data was then processed to calculate the average fare based on the number of respondents who selected it.

Below is a graph showing the percentage of passengers' willingness to pay for the fare on the Suroboyo Bus.

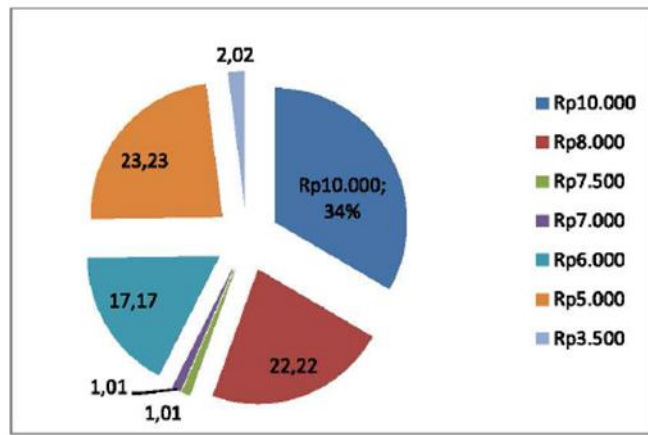


Figure 1. Percentage Diagram of Fare Selection Based on Willingness to Pay

Source: Processed by the Researcher, 2024

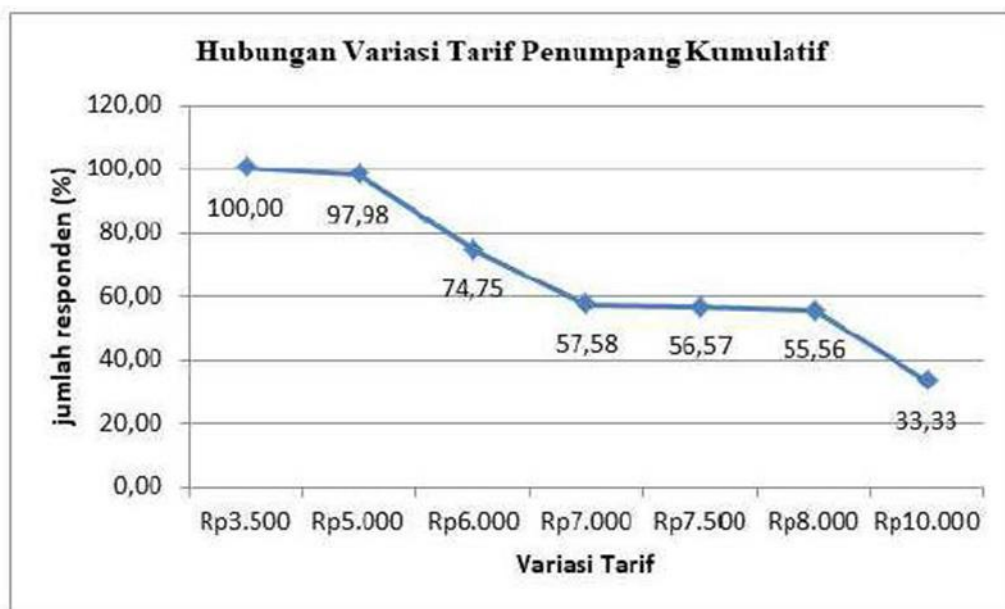


Figure 2. Cumulative Percentage Graph of Fare Selection Variations

Source: Processed by the Researcher, 2024

Based on the graph above, it shows that if a fare of Rp. 3,500 is applied, the number of passengers is 100%. If a fare of Rp. 5,000 is applied, the percentage of passengers decreases to 97%. If a fare of Rp. 6,000 is applied, the percentage decreases to 74%. If a fare of Rp. 7,000 is applied, the percentage decreases to 57%. If a fare of Rp. 7,500 is applied, the percentage decreases to 56%. If a fare of Rp. 8,000 is applied, the percentage decreases to 55%, and if a fare of Rp. 10,000 is applied, the percentage decreases to 33%. This suggests that the higher the fare, the greater the reduction in the number of passengers on the Suroboyo Bus.

Next, the WTP calculation based on the number of respondents can be seen in the following table.

Table 1. WTP Calculation Based on the Number of Respondents

No.	Fare Options	Number of Respondents	Percentage (%)	Respondents x Fare
a	b	c	d	e = b x d
1	Rp 10.000	33	33,33	330000
2	Rp 8.000	22	22,22	176000
3	Rp 7.500	1	1,01	7500

No.	Fare Options	Number of Respondents	Percentage (%)	Respondents x Fare
a	b	c	d	e = b x d
4	Rp 7.000	1	1,01	7000
5	Rp 6.000	17	17,17	102000
6	Rp 5.000	23	23,23	115000
7	Rp 3.500	2	2,02	7000
Total		99	100,00	744500

Source: Processed by the Researcher, 2024

Based on the WTP calculation table above, the average WTP fare value is as follows.

$$WTP = \frac{\sum (\text{Selected Fare} \times \text{Number of Respondents})}{\text{Total Number of Respondents}}$$

$$WTP = 744,500 / 99$$

$$WTP = \text{Rp. } 7,520$$

Thus, the average fare based on the WTP method is Rp. 7,520 per passenger.

2. Analysis of Suroboyo Bus Fare Based on the ATP Method

To assess the ability of Suroboyo Bus users to pay, a survey using the Ability to Pay (ATP) approach was conducted. The indicators surveyed in ATP included respondents' monthly income, transportation-related expenses per month, and the ratio of monthly transportation expenses. Based on the questionnaire results from 99 respondents, data on income and expenses showed considerable variation.

Table 2. Recapitulation of ATP Values from Respondents

Res p.	Income	Total Expenditure	Trip Length (km)	Frequency of Trips	Total Trip Length (km)	Transport Cost (%)	ATP Value	
							Cost/Km	Trip/Km
1	Rp2.700.000	Rp400.000	10	40	400	15%	Rp1.000	Rp10.000
2	Rp5.000.000	Rp400.000	20	25	500	8%	Rp800	Rp16.000
3	Rp9.200.000	Rp640.000	15	38	570	7%	Rp1.123	Rp16.842
4	Rp6.700.000	Rp225.000	29	35	1015	3%	Rp222	Rp6.429
5	Rp4.200.000	Rp450.000	21	26	546	11%	Rp824	Rp17.308
6	Rp4.800.000	Rp205.000	13	48	624	4%	Rp329	Rp4.271
7	Rp5.400.000	Rp575.000	22	36	792	11%	Rp726	Rp15.972
8	Rp7.300.000	Rp595.000	42	45	1890	8%	Rp315	Rp13.222
9	Rp4.800.000	Rp400.000	19	40	760	8%	Rp526	Rp10.000
10	Rp3.900.000	Rp270.000	12	36	432	7%	Rp625	Rp7.500
11	Rp2.200.000	Rp70.000	2	16	32	3%	Rp2.188	Rp4.375
12	Rp6.000.000	Rp300.000	22	36	792	5%	Rp379	Rp8.333
13	Rp9.800.000	Rp1.030.000	42	40	1680	11%	Rp613	Rp25.750
14	Rp5.200.000	Rp445.000	42	28	1176	9%	Rp378	Rp15.893
15	Rp12.700.000	Rp850.000	39	42	1638	7%	Rp519	Rp20.238
16	Rp8.500.000	Rp600.000	37	16	592	7%	Rp1.014	Rp37.500
17	Rp4.200.000	Rp380.000	35	8	280	9%	Rp1.357	Rp47.500
18	Rp6.500.000	Rp800.000	40	36	1440	12%	Rp556	Rp22.222
19	Rp3.500.000	Rp455.000	14	40	560	13%	Rp813	Rp11.375
20	Rp3.500.000	Rp410.000	23	56	1288	12%	Rp318	Rp7.321
21	Rp6.600.000	Rp580.000	29	40	1160	9%	Rp500	Rp14.500

Res p.	Income	Total Expenditure	Trip Length (km)	Frequency of Trips	Total Trip Length (km)	Transport Cost (%)	ATP Value	
							Cost/Km	Trip/Km
22	Rp7.500.000	Rp420.000	41	30	1230	6%	Rp341	Rp14.000
23	Rp7.200.000	Rp650.000	40	38	1520	9%	Rp428	Rp17.105
24	Rp8.900.000	Rp700.000	42	32	1344	8%	Rp521	Rp21.875
25	Rp4.100.000	Rp700.000	35	36	1260	17%	Rp556	Rp19.444
26	Rp3.500.000	Rp220.000	8	48	384	6%	Rp573	Rp4.583
27	Rp5.500.000	Rp350.000	36	24	864	6%	Rp405	Rp14.583
28	Rp300.000	Rp225.000	10	28	280	75%	Rp804	Rp8.036
29	Rp8.200.000	Rp520.000	36	40	1440	6%	Rp361	Rp13.000
30	Rp12.500.000	Rp1.000.000	12	50	600	8%	Rp1.667	Rp20.000
31	Rp1.200.000	Rp80.000	42	8	336	7%	Rp238	Rp10.000
32	Rp7.000.000	Rp235.000	7	24	168	3%	Rp1.399	Rp9.792
33	Rp6.800.000	Rp460.000	25	8	200	7%	Rp2.300	Rp57.500
34	Rp10.800.000	Rp1.020.000	35	60	2100	9%	Rp486	Rp17.000
35	Rp4.000.000	Rp80.000	5	16	80	2%	Rp1.000	Rp5.000
36	Rp6.600.000	Rp520.000	40	38	1520	8%	Rp342	Rp13.684
37	Rp38.000.000	Rp240.000	18	48	864	1%	Rp278	Rp5.000
38	Rp5.200.000	Rp300.000	16	40	640	6%	Rp469	Rp7.500
39	Rp7.500.000	Rp350.000	14	40	560	5%	Rp625	Rp8.750
40	Rp6.000.000	Rp350.000	12	28	336	6%	Rp1.042	Rp12.500
41	Rp11.800.000	Rp880.000	33	56	1848	7%	Rp476	Rp15.714
42	Rp5.000.000	Rp350.000	8	40	320	7%	Rp1.094	Rp8.750
43	Rp8.000.000	Rp265.000	8	30	240	3%	Rp1.104	Rp8.833
44	Rp2.500.000	Rp170.000	5	24	120	7%	Rp1.417	Rp7.083
45	Rp5.600.000	Rp420.000	7	32	224	8%	Rp1.875	Rp13.125
46	Rp4.500.000	Rp290.000	36	18	648	6%	Rp448	Rp16.111
47	Rp4.900.000	Rp180.000	11	12	132	4%	Rp1.364	Rp15.000
48	Rp7.800.000	Rp830.000	40	52	2080	11%	Rp399	Rp15.962
49	Rp7.600.000	Rp500.000	25	38	950	7%	Rp526	Rp13.158
50	Rp3.900.000	Rp350.000	6	48	288	9%	Rp1.215	Rp7.292
51	Rp3.700.000	Rp350.000	23	24	552	9%	Rp634	Rp14.583
52	Rp6.000.000	Rp325.000	33,6	30	1008	5%	Rp322	Rp10.833
53	Rp3.500.000	Rp325.000	23	24	552	9%	Rp589	Rp13.542
54	Rp3.700.000	Rp775.000	25	42	1050	21%	Rp738	Rp18.452
55	Rp3.000.000	Rp425.000	26	24	624	14%	Rp681	Rp17.708
56	Rp2.000.000	Rp250.000	26	16	416	13%	Rp601	Rp15.625
57	Rp4.500.000	Rp290.000	23	26	598	6%	Rp485	Rp11.154
58	Rp11.000.000	Rp900.000	25	60	1500	8%	Rp600	Rp15.000
59	Rp4.000.000	Rp500.000	25	30	750	13%	Rp667	Rp16.667
60	Rp3.800.000	Rp800.000	28	44	1232	21%	Rp649	Rp18.182
61	Rp1.800.000	Rp450.000	33	30	990	25%	Rp455	Rp15.000
62	Rp3.500.000	Rp400.000	15	30	450	11%	Rp889	Rp13.333
63	Rp2.000.000	Rp150.000	41	10	410	8%	Rp366	Rp15.000
64	Rp3.500.000	Rp750.000	6	46	276	21%	Rp2.717	Rp16.304
65	Rp4.000.000	Rp650.000	25	42	1050	16%	Rp619	Rp15.476

Res p.	Income	Total Expenditure	Trip Length (km)	Frequency of Trips	Total Trip Length (km)	Transport Cost (%)	ATP Value	
							Cost/Km	Trip/Km
66	Rp6.500.000	Rp750.000	25	42	1050	12%	Rp714	Rp17.857
67	Rp5.000.000	Rp600.000	13	36	468	12%	Rp1.282	Rp16.667
68	Rp3.400.000	Rp700.000	32	44	1408	21%	Rp497	Rp15.909
69	Rp3.400.000	Rp400.000	25	28	700	12%	Rp571	Rp14.286
70	Rp6.500.000	Rp700.000	25	30	750	11%	Rp933	Rp23.333
71	Rp5.000.000	Rp450.000	27	30	810	9%	Rp556	Rp15.000
72	Rp3.000.000	Rp400.000	30	20	600	13%	Rp667	Rp20.000
73	Rp2.700.000	Rp750.000	32	46	1472	28%	Rp510	Rp16.304
74	Rp3.500.000	Rp325.000	33	20	660	9%	Rp492	Rp16.250
75	Rp3.700.000	Rp350.000	22	20	440	9%	Rp795	Rp17.500
76	Rp3.500.000	Rp675.000	27	40	1080	19%	Rp625	Rp16.875
77	Rp4.000.000	Rp675.000	27	42	1134	17%	Rp595	Rp16.071
78	Rp3.000.000	Rp425.000	24	28	672	14%	Rp632	Rp15.179
79	Rp3.800.000	Rp500.000	30	30	900	13%	Rp556	Rp16.667
80	Rp4.500.000	Rp550.000	20	36	720	12%	Rp764	Rp15.278
81	Rp5.600.000	Rp575.000	25	42	1050	10%	Rp548	Rp13.690
82	Rp3.400.000	Rp425.000	30	24	720	13%	Rp590	Rp17.708
83	Rp4.000.000	Rp650.000	25	36	900	16%	Rp722	Rp18.056
84	Rp5.000.000	Rp650.000	35	46	1610	13%	Rp404	Rp14.130
85	Rp4.100.000	Rp290.000	31	20	620	7%	Rp468	Rp14.500
86	Rp2.500.000	Rp375.000	25	26	650	15%	Rp577	Rp14.423
87	Rp3.500.000	Rp600.000	31	38	1178	17%	Rp509	Rp15.789
88	Rp4.700.000	Rp450.000	40	28	1120	10%	Rp402	Rp16.071
89	Rp3.800.000	Rp750.000	30	48	1440	20%	Rp521	Rp15.625
90	Rp3.000.000	Rp400.000	26	30	780	13%	Rp513	Rp13.333
91	Rp3.400.000	Rp425.000	14	34	476	13%	Rp893	Rp12.500
92	Rp2.500.000	Rp700.000	25	40	1000	28%	Rp700	Rp17.500
93	Rp2.500.000	Rp225.000	20	30	600	9%	Rp375	Rp7.500
94	Rp2.700.000	Rp300.000	23	20	460	11%	Rp652	Rp15.000
95	Rp4.750.000	Rp400.000	25	34	850	8%	Rp471	Rp11.765
96	Rp2.000.000	Rp325.000	25	22	550	16%	Rp591	Rp14.773
97	Rp5.000.000	Rp350.000	25	22	550	7%	Rp636	Rp15.909
98	Rp4.500.000	Rp375.000	23	36	828	8%	Rp453	Rp10.417
99	Rp2.400.000	Rp300.000	25	24	600	13%	Rp500	Rp12.500
Average	Rp5.312.626	Rp473.636	25	33	819	11%	Rp713	Rp14.992

Source: Processed by Researcher 2024

The analysis results show that the average expenditure incurred by respondents for each trip is Rp. 14,992/trip, or rounded to Rp. 15,000.

Based on the Ability to Pay (ATP) and Willingness to Pay (WTP) values, as well as the load factor observed in the field, the following image can be displayed:

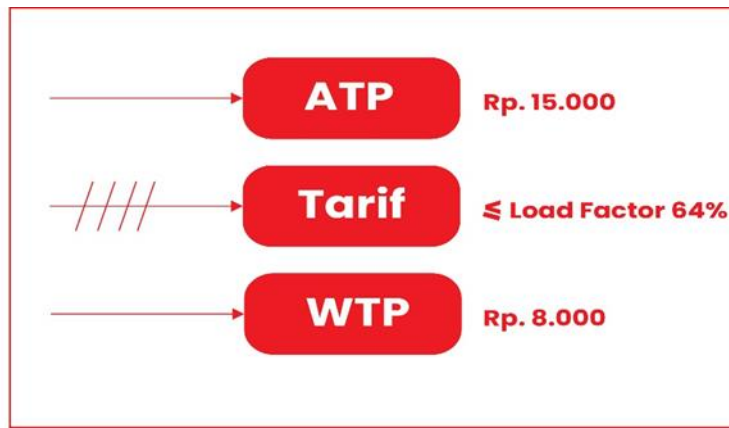


Figure 3. Passenger Load Factor Based on ATP and WTP

Source: Processed by Researcher 2024

Based on the image above, the data for tariff calculations with the load factor approach can be displayed in the following table, showing the tariff sensitivity of Suroboyo Bus:

Table 3. Sensitivity of Suroboyo Bus Tariffs

No.	Tariff	Load Factor
1	Rp. 15000,-	64%
2	Rp. 10.000,-	96%
3	Rp. 5.000,-	192%

Source: Processed by Researcher 2024

Based on the table above, it can be concluded that if the tariff is implemented according to the Surabaya Mayor Regulation, the load factor will increase to 192%.

3. The Applicable Fare for Suroboyo Bus Based on the Surabaya Mayor Regulation

Based on the Surabaya Mayor Regulation Number 22 of 2023 concerning Tariffs and Contributions for Waste in the Use of Public Service Agency Transportation Services at the Surabaya City Transportation Office, the general fare is IDR 5,000 for regular passengers, IDR 2,500 for students, while seniors aged 60 years and above and children under 5 years old are given a special fare of IDR 0 or free.

CONCLUSION

Based on the data analysis and discussion in Chapter 4, several conclusions can be drawn, namely: The tariff value based on the WTP method is IDR 8,000 per passenger, while based on the ATP method it is IDR 15,000 per trip/km. Maximizing the potential of trip generation and attraction for the development of urban transportation in Surabaya to attract interest in the allocation of Corporate Social Responsibility (CSR) funds in the transportation sector in Surabaya. To minimize tariff leakage paid by passengers, it is more effective and secure to use a tapping ticket machine installed inside the bus. When boarding the bus, passengers will directly tap the machine placed near the passenger entrance, which is expected to increase revenue.

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