

## **Performance of Rural Public Transport on the Gadang-Karangkates Route in Malang District**

Dwi Ratnaningsih<sup>1</sup>, Wahiddin Wahiddin<sup>2</sup>, Lailatun Nashiroh<sup>3</sup>

*\*Department of Civil Engineering, State Polytechnic of Malang, Indonesia*

**Abstract:** Public transport is the most frequently used mode of transportation, both as a means of transporting passengers and goods. The Gadang - Karangkates public transport route is one of the public transport routes in Malang Regency. The route is a connecting route to the market, school, which every day there is density at certain points which causes less efficient travel time to the destination. Rural transport is currently slowly starting to be abandoned, due to the inefficient time taken for each trip and the long waiting time for passengers.

This performance analysis requires two data, namely primary data and secondary data. Primary data includes the number of angkot operating per day and the number of passengers per day. Secondary data includes data on the number of public transport and the route map of the Malang Regency passenger public transport route Gadang - Karangkates. Indicators for performance include load factor, speed, frequency, headway.

Based on the results of the evaluation of the performance of public transport on the Gadang - Karangkates route, the average value of the load factor (Load Factor) is 51%, the average time between (Headway) is 33 minutes, speed 25 km / hour.

**Keywords:** Public transport, Gadang-Karangkates route, transport performance

**Publication Date: 10 March 2024**

### **I. INTRODUCTION**

Public transport is the most frequently used mode of transport, both as a means of transporting passengers and goods. With the rapid economic growth in Malang Regency and the increasing number of population additions in Malang Regency, public transport facilities are transportation facilities that need to be developed and improved service performance. (Nurhadi: 2019)

Public transport is one of the transport media used by the community together by paying tariffs. The need for transport or public transport is the main human need in making movements. The rapid increase in population in an area will greatly affect the movement and economic activities of the community, thus the need for providers of transport facilities and infrastructure will increase. Theoretically, the provision of public transport should ideally fulfil two different interests, namely service users (Demand) and operators (supply). On the one hand, service users are at their best, and on the other hand operators make significant profits. (Junior: 2016)

The purpose of transportation is to realise the implementation of safe, secure, fast, smooth, orderly and comfortable and efficient transportation at a cost that is affordable by the purchasing power of the community, supporting equitable growth and stability, as a driver, driver and supporter of national development and strengthening relations between nations. (Warpani: 1990)

Public transport is now slowly being abandoned, due to the inefficient time taken for each trip and the long waiting time for passengers. In addition, the cheapening of vehicle loan instalments is also one of the reasons for the loss of public interest in using public transport modes. The Gadang - Karangkates route is a connecting route to the market, school, which every day there is density at certain points which causes less efficient travel time to the destination.

Public transport companies are now concerned about the decline in customer interest in using public transport, especially on the Gadang-Karangkates route. As services are still inadequate and are often considered slow in reaching destinations, people are reluctant to use public transport. Often, the lack of passengers causes drivers to lose money. It is important to know the performance of public transport and the ideal fleet size for this

route according to demand to avoid oversupply which would adversely affect the performance of operators and reduce the quality of service provided to customers

Transportation is the activity of moving people and goods from one place (origin) to another destination using vehicles. In this case, there are 2 types of transportation, namely micro transportation and macro transportation. (Setiawan: 2019)

According to Munawar (2005) in Nurhadi (2019), the transportation system is a system that has a unity, namely the form of interrelation between one variable and another in a structured order, and transportation, namely the activity of moving passengers and goods from one place to another.

### Capacity of vehicle

Capacity of Vehicle is the capacity of passengers on each public transport vehicle, the following vehicle capacity according to the Department of Land Transportation in 2002:

Table 2.1. Capacity of Vehicle

Type of Transport	Passenger Capacity			Kapasitas Penumpang (orang/hari/kendaraan)	Passenger Capacity
	Sitting	Standing	Total		
Passenger car	8	-	8	250 - 300	
Small Bus	14	-	14	300 - 400	
Medium Bus	20	10	30	500 - 600	
Single Large Bus	49	30	79	1000 - 1200	
Double Large Bus	85	35	120	1500 - 1800	

Source: Directorate General of Land Transportation, 2002

### Public Transport

According to the decision of the Minister of Transportation Number: KM.35 Year 2003 concerning the Implementation of Transportation of People on Roads with Public Vehicles, Article 1 Transportation is the movement of people and/or goods from one place to another by using a vehicle. While public vehicles are any motorised vehicle provided for use by the public for a fee either directly or indirectly.

According to Warpani (1990) in Setiawan, A. D. (2019), Public Transport is passenger transport carried out by a rental or payment system. Included in the understanding of public transport passengers are city transport (buses, minibuses, etc.), trains, water transport and air transport. The purpose of public transport is to provide good and decent services for the community.

### Rural Transportation

According to the decision of the Minister of Transportation Number: KM.35 of 2003 concerning the Implementation of People Transport on Roads with Public Vehicles, Article 1, rural transportation is transportation from one place to another in one district area that is not included in the city route in the Regency capital area by using public buses or public passenger cars that are bound in the route.

According to the decision of the Minister of Transportation Number: KM.35 Year 2003 on the Implementation of People Transport on Roads with Public Vehicles, Section 21 point 2, rural transportation services are organised with the following characteristics:

- a. Have a fixed schedule and / or unscheduled;
- b. Fixed schedule is applied if the demand for transport is high at the time;
- c. Transport services are slow, stopping at each terminal, with relatively long waiting times;
- d. Terminals that are origin and destination terminals are at least type C terminals;
- e. Served by small buses or public passenger cars.

According to the decision of the Minister of Transportation Number: KM.35 of 2003 concerning the Implementation of Transport of People on Roads with Public Vehicles, Article 21 paragraph 3, vehicles used for rural transport must be equipped with:

- a. The company name and serial number of the vehicle listed on the left, right, and rear sides of the vehicle;
- b. Route boards that contain the origin and destination as well as the track travelled with a white base with black writing placed on the front and rear of the vehicle;
- c. The type of route served is clearly written in block letters, attached to the left and right side of the vehicle body with the words "**RURAL TRANSPORTION**";
- d. The driver's identity placed on the dashboard;
- e. Luggage facilities as required;
- f. List of applicable tariffs.

### Tracks

The route network is a collection of routes that form a single unit of the people transport service network. Trayek is a track of Public Motorised Vehicles for the service of transporting people by Passenger cars or Bus Cars that have fixed origins and destinations, fixed trajectories, and fixed types of vehicles and scheduled or unscheduled. (Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 15 of 2015).

Based on government regulation No. 41 Article 7 of 1993, the route network consists of:

- a. Inter-city inter-provincial routes (AKAP), namely routes that pass through more than one provincial area of level I.
- b. Inter-city routes within the province (AKDP), namely routes that pass between level II regions within one provincial level I region.
- c. City routes, namely routes that are entirely within one municipality of level II or routes within the special capital city of Jakarta.
- d. Rural routes, namely routes that are entirely within one district area of level II region
- e. Cross-border routes, namely routes that cross state borders.

### Performance Analysis of Passenger Public Transport

Passenger public transport performance is the result of the work of public transport in running to serve all community activities to travel or move. The performance of public transport is much influenced by the behaviour of the drivers in running the fleet both in managing speed, travel time and in passenger service. In addition, passenger performance is also influenced by the characteristics of the road or route travelled by the transport. The meaning of performance means describing the condition of the performance capability of a system to serve the needs of others. The higher the level of performance, the better the service (Pratomo: 2013).

Evaluation of the operating performance of transport, especially passenger cars, can be done through several analyses using indicators set by the Department of Transportation as follows:

Table 2.2. Public Transport Service Criteria

No	Parameter	Standard
Number	Parameter	Standard
1	Time between	1 - 12 minutes
2	Headway	
	a. Average	5 - 10 minutes
	b. Maximum	10 - 20 minutes
3	Load Factor	70%
4	Journey distance	0 km/car/day
5	Operating capacity	80 - 90 %
6	Journey time	
	a. Average	1 - 1,5 hours
	b. Maximum	2 - 3 hours

7	Journey speed	
	a. Congested areas and max. traffic	10 - 12 km/hours
	f. Bus-only lane areas	15 - 18 km/hours
	g. Less congested areas	25 km/hours

Source: Regulation of the Minister of Transportation of the Republic of Indonesia no. 10 of 2012

### Load Factor

In the Technical Guidelines for the Implementation of Public Passenger Transport in Urban Areas in Fixed and Regular Routes (Directorate General of Land Transportation, 2002) defined the load factor as the ratio between sold capacity and available capacity for one trip expressed in percent (%).

Load Factor is the division between existing demand and available supply. The load factor can be a clue to know whether the number of fleets is still lacking, sufficient, or exceeds the needs of a public transport trajectory and can be used as an indicator in representing the efficiency of a route. The Load Factor of public transport on each route ranges from 30% to 100%. (Nurhadi, F. S. : 2019)

The Government Regulation No. 41 (1993), regulates the addition of vehicles for routes that are already open using a load factor above 70% except for pioneer routes. For regular routes within the city, the load factor in question is to use a dynamic approach, namely by taking into account the Load Factor on all road sections so that there is no excess supply. According to Abu Bakar (1995), that the dynamic condition is 70%.

$$Lf = \frac{JP}{C} \times 100\%$$

Where:

LF = Load Factor (%)

JP = The number of passengers carried along one one-way track

C = The vehicle of capacity

### Travelling Speed

According to the Directorate General of Highways (1990), in the guidebook Survai and Calculation of Traffic Travel Time defines that speed is the rate of movement of certain traffic or vehicles often expressed in kilometres per hour. Travel speed is the average speed of a vehicle between two specific points on the road, which can be determined from the travel distance divided by the total travel time including delays.

Speed is the amount of distance travelled by a vehicle divided by the travel time. In Indonesia, it is usually expressed in kilometres per hour (km/h). The faster the speed that a system can provide, the shorter the time it takes to reach the destination. (Zul, A.: 2017)

Public transport speed describes the time required by service users to reach the destination up and down. It also includes the time waiting for passengers who ride up and down. In general, the performance will be better if the speed of travel is high. (Raharjo, I. B.: 2015).

The formula used is as follows:

$$V = S/T$$

Where:

V : Speed (km/h)

S : Distance (km)

T : Time (hour)

### Headway

The arrival or departure of the first vehicle or the departure of subsequent vehicles measured at one point  
The formula used is as follows:

$$Ht : 60/Q$$

Where:

Ht: Headway in minutes

Q : Number of vehicles in 1 hour

Or

$H: (60 \times c \times lf) / P$

Where:

H : Headway time in minutes

C : Vehicle capacity

P : Passengers

The basis for calculating vehicle travel time on one type of route is determined by vehicle capacity, stopping time at the terminal, and intermediate time:

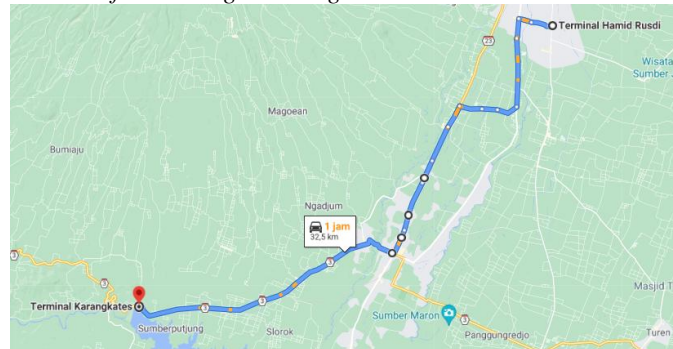
- Time deviation of 5% of the journey.
- Vehicle stopping time at the origin or destination ( $T_{TA}$  or  $T_{TB}$ ) is set at 10% of the travel time between A and B. (Directorate General of Land Transportation 2002)

## II. METHODOLOGY

### Research Location

This study was conducted in the district of Malang and observed the performance of the Gadang-Karangkates public transport route that is still operating in the region

*Map of Public Transport Network for Gadang - Karangates Route*



To determine the performance of public transport services needed a way to evaluate the performance of public transport in operation itself. the best way to evaluate the performance of public transport is to analyse several indicators that support. Some of these indicators can be obtained through two types of surveys, namely static surveys and dynamic surveys.

### Static Survey

Is a survey conducted from outside the vehicle by observing/counting/recording information from each public passenger vehicle passing on the road in each direction of traffic, as well as at the entrance and exit of the terminal.

### Dynamic Surveys

Dynamic surveys are surveys carried out in vehicles with the method of recording the number of passengers boarding and disembarking vehicles travelling on a route, where Surveyors recorded the number of passengers boarding and alighting during each segment.

### Expansion factor

Sample data must be expanded to become population data. To expand the data of "Interview of passengers in public transport" to 100%, it can be done by transferring the interview data with the expansion formula. The expansion factor is obtained by the formula:

Expansion factor:  $A/B$

Where:

A: total number of passengers carried by a public vehicle in one route (population).

B: the number of sample passengers successfully interviewed from the same route

### III. DISCUSSION

The district of Malang has 47 routes and one of them is the Gadang - Karangates route which serves passengers from Gadang to Karangates and vice versa. The fleet operates from 05.00 WIB until 16.00 WIB. The length of the route in the direction of Gadang - Karangates is 31.1 km. The route passes from Jl. Raya Gadang - Jl. Satsui Tubun - Jl. Supriadi - Jl. Kebonsari - Jl. Raya Kb. Agung - Jl. Raya Genengan - Jl. Raya Pakisaji - Jl. Raya Karangpandan - Jl. Raya Pepen - Jl. Raya Mojosari - Jl. Panglima Sudirman - Jl. Raya Ngadilangkung - Jl. Sido Utomo - Jl. Ahmad Yani - Jl. Kawi - Jl. Nasional III - Jl. Raya Talang Agung - Jl. Raya Jatikerto - Jl. Raya Slorok - Jl. Raya Ngebruk - Jl. Raya Sambigede - Jl. General Sudirman - Jl. General Ahmad Yani - Jl. General Basuki Rahmad.

#### Load Factor

Load Factor is the division between existing demand and available supply. The load factor can be a guide to determine whether the number of vehicles is insufficient, sufficient, or exceeds the needs of a public transport route and can be used as an indicator in representing the efficiency of a route. The Load Factor of public transport on each route ranges from 30% to 100%. (Nurhadi: 2019)  
average results of Load Factor calculations on the Gandang - Karangates route

Table 4.3 Load Factor for Gadang - Karangates Route

Number	Date	Average of Load factor
1	Thursday, 8 April 2021	48%
2	Sunday, 11 April 2021	47%
3	Tuesday, 13 April 2021	49%
4	Wednesday, 5 Mei 2021	60%
Average		51%

Source: Data Processing

Based on the results of the analysis of the average Load Factor of 51% where according to the standards issued by the Regulation of the Minister of Transportation of the Republic of Indonesia No. 10 of 2012 the Load Factor is 70%, it can be concluded that the Load Factor in the survey calculation results is below the standard that has been set due to the number of passengers who are decreasing every day.

#### Journey Speed

Table 4.4. Speed of Public Transport Route Gadang - Karangates

Number	Date	Average of journey speed
1	Thursday, 8 April 2021	24.72
2	Sunday, 11 April 2021	24.9
3	Tuesday, 13 April 2021	25.1
4	Wednesday, 5 Mei 2021	25.0
Average		24.93

Source: Data Processing

The results of the speed analysis obtained the average speed of travel is 24.93 km / h or equal to 25 km / h. In accordance with the Regulation of the Minister of Transportation of the Republic of Indonesia No. 10 of

2012 concerning Minimum Service Standards for Road-Based Mass Transport, the results of the calculation are included in the criteria for travel speed in less congested areas.

### Headway

Table 4.5 Headway of Public Transport Route Gadang - Karangates

Number	Date	Average of Headway (menit)
1	Thursday, 8 April 2021	33.33
2	Sunday, 11 April 2021	36.7
3	Tuesday, 13 April 2021	33.3
4	Wednesday, 5 Mei 2021	30.0
Rata - rata		Average

Source: Data Processing

The results of the Headway calculation obtained the average Headway is 33 minutes. In accordance with the Regulation of the Minister of Transportation of the Republic of Indonesia No. 10 of 2012 which is 5 - 10 minutes for average Headway and 10 - 20 minutes for Maximum Headway, it can be concluded that Headway for the Gadang - Karangates route does not meet the standard criteria.

### Frequency of Vehicles

Table 4.6 Frequency of public transport on the Gadang - Karangates route

Number	Date	Average of Frequency (Rites)
1	Thursday, 8 April 2021	1.63
2	Sunday, 11 April 2021	1.7
3	Tuesday, 13 April 2021	1.7
4	Wednesday, 5 Mei 2021	1.7
Average		2

Source: Data Processing

The frequency of vehicles obtained during the research study was an average of 2 travelling rites.

## IV. CONCLUSIONS

The conclusions of the study are as follows:

1. Public transport performance in Malang Regency, especially the Gadang - Karangates route Load Factor 51%, Speed 25 km / h, Headway 33 minutes and Average frequency of 2 rites / day
2. Solutions to improve public transport performance for the Gadang - Karangates route are:
  - a. Reduce the number of vehicles operating.
  - b. Improve public transport services such as: distinguishing between special public transport for traders and special public transport for passengers.
  - c. Reduce the length of time spent idling.
  - d. Organise departure times.

## REFERENCES

- [1]. Anonymous, "Indonesian Road Capacity Manual", Directorate General of Highways, Jakarta, 1997.
- [2]. Anonymous, PM 96 Year 2015 on "Guidelines for the Implementation of Traffic Management and Engineering Activities",
- [3]. Directorate of City Road Development, "Guidelines for the Survey and Calculation of Traffic Travel Time", Jakarta, 1990.
- [4]. Ratnaningsih, "Analysis of Need road Facilities in Jalan Soekarno Hatta Malang City", IOP Conf. Series Material Science and Engineering, 2020.
- [5]. Bakhtiar, A., Evaluation of Malang City Public Transport Performance, 2018
- [6]. Buchika, D.M, Study of Public Transport Route Planning in Pontianak City, 2018
- [7]. BPS Malang Regency. (2016). Geography. Geography. Central Statistics Agency of Malang Regency, 2016
- [8]. C.Jotin Khisty, B Kent, Fundamentals of Transportation Engineering, Volume I, Lall, Page 5).
- [9]. Directorate General of Highways. Guidelines for the Survey and Calculation of Travelling Time, Traffic. Jakarta, 1990
- [10]. <http://ngalam.id/read/3262/angkutan-pedesaan-angkudes-di-kabupaten-malang/> viewed 30 June 2021
- [11]. Junior, N. P. S. Analysis of Public Passenger Transport Needs in Manado City (Case Study: Paal Dua - Polytechnic), 2016
- [12]. Year 2002, tariff setting mechanism and calculation formula of the basic cost of transport by economy class inter-city public bus, 2002
- [13]. Decree of the Minister of Transportation Number: KM.35 Year 2003, Organising the Transport of People on the Road with Public Vehicles, 2003
- [14]. Murti, L. N. F. , Performance Evaluation of Passenger Public Transport LYN Route Department Rajekwesi Terminal - Dander Ponorogo Regency., 2019
- [15]. Nurhadi, F.S. , Analysis of Public Transport Performance in Malang Regency (Case Study of Public Transport Route Donomulyo - Gadang), 2019
- [16]. Malang Regent Regulation No.27 of 2013 on the Determination of Rural Transport Tariffs.
- [17]. Government Regulation No. 41 (1993).
- [18]. Number 41 of 1993 concerning Road Transport. Jakarta.
- [19]. Regulation of the Minister of Transportation of the Republic of Indonesia No. 10 Year 2012. About Minimum Service Standards for Road-Based Mass Transport.
- [20]. Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 15 of 2019. Regarding the Implementation of Transport of Persons by Public Motorised Vehicles on Tracks.
- [21]. Pratomo, A. B. Analysis of Trans Jogja Bus Performance (Case Study of Route 4A and 4B). Sebelas Maret University, 2013
- [22]. Raharjo, I. B., Performance and Tariff Evaluation Study of Public Transport (Pasuruhan Route in 2015. A.1 and B.2) City. 2015
- [23]. Setiawan, A. D. , Evaluation of the Performance and Number of Public Transport Fleets in Malang Regency (Case Study of the Lawang - Arjosari Transport Route). 2019
- [24]. Decree of the Director General of Land Transportation Number: SK.687/AJ.206/DRJD/2002, public transport route network planning.
- [25]. Law of the Republic of Indonesia No. 22 of 2009, traffic and road transport.
- [26]. Zul, A., Analysis of Motor Vehicle Travel Time with the Moving Vehicle Method (Case Study of Pekanbaru - Bangkinang Road), 2017