

## Evaluation of Trans Metro Deli Bus Performance in Corridor 2 in an Effort to Improve the Quality of Public Services

Putri Permata Silalahi, Gina Cynthia Raphita Hasibuan, Ridwan Anas

Master of Civil Engineering Study Program, Department of Civil Engineering, University of North Sumatera, Medan, INDONESIA

E-mail: putripermata@students.usu.ac.id, gina.hasibuan@usu.ac.id, ridwananas@usu.ac.id

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### ABSTRACT

TransMetro Deli Urban Transport is a bus-based transportation system in Medan City that started operating on 22 November 2020, with a Bus Rapid Transit (BRT) transportation system. TransMetro Deli buses provide 5 corridors around the area in Medan City. For Route K2M Terminal Amplas - Bank Indonesia - Terminal Amplas has a fleet of 10 main units and 2 backup units and passes 36 stops. This research begins with collecting data in the field directly and then analyzed including load factor, Headway, stopping time, and travel time on Weekdays and Weekends on the K2M route. Based on the analysis results obtained for Load Factor in Weekdays for Morning, Afternoon, and Evening are 14%, 8%, and 20%, while for Weekend are 12%, 15%, and 20%. For Headway in Weekdays in the Morning, Afternoon, and Evening are 10 minutes 16 seconds, 10 minutes 27 seconds, and 11 minutes 31 seconds, while in Weekend are 9 minutes 47 seconds, 9 minutes 40 seconds, and 10 minutes 2 seconds. For Downtime on Weekdays in the Morning, Afternoon, and Evening are 9 seconds, 9 seconds, and 10 seconds, while for Weekend are 7 seconds, 7 seconds, and 8 seconds. For Travel Time in Weekdays in the Morning, Afternoon, and Evening are 1 hour 13 minutes, 1 hour 16 minutes, and 1 hour 18 minutes, while in Weekend are 1 hour 3 minutes, 1 hour 14 minutes, and 1 hour 13 minutes.

**Keywords:** load factor; headway; travel time; intermediate time; Transmetro Deli.

### INTRODUCTION

Medan City is located in North Sumatra province with an area of 265.1 km<sup>2</sup> and is also the capital of North Sumatra Province. Medan City has a total population of 2,494,512 people [1]. The volume of vehicles in Medan city every year tends to increase and grows around 11.5% [1]. The number of vehicles in Medan City causes congestion and is less efficient in terms of time. Public transportation in Medan City currently does not have a significant impact in reducing the level of congestion in Medan City.

The Trans Metro Deli bus is a means of transportation provided by the *Buy The-Service* (BTS) based government, which means a bus in the form of purchasing services from public transport companies for the implementation of public passenger transportation in urban areas to the public. The transportation system is a system that plays a role in moving people and objects from one place to another with a specific purpose. In addition to the role in the process of moving people or goods, transportation also has a function within the scope of other needs, such as economic, social and political needs [2] Trans Metro Deli Bus is presented in Medan City with the hope of supporting the improvement of services to the community, especially Medan City.

The majority of people in Medan City tend to choose to use private vehicles compared to public transportation, this could be influenced by the quality of public transportation that is less effective and efficient. The establishment of Trans Metro Deli Bus is expected to be able to become a public transportation based on Economical, Easy, Safe, and Comfortable. The Trans Metro Deli bus is also the result of the development of public transportation in road-based urban areas that are reliable and Trans Metro Deli buses are currently operated by PT Medan Bus Transport which has five corridors in operation, namely Corridor I (K1M) with the route Pinang Baris Terminal - Merdeka Field), Corridor II (K2M) with the route Amplas Terminal - Merdeka Field, Corridor III (K3M) with the route Belawan - Merdeka Field, Corridor IV (K4M) with the route Medan Tuntungan - Merdeka

Field, and Corridor V (K5M) with the route Tembung - Merdeka Field).

This research aims to evaluate the performance of Trans Metro Deli Bus services in improving performance and service quality so that the presence of Trans Metro Deli Bus can be a solution for the community, especially Medan City, to prefer public transportation over private transportation.

In this study using a quantitative descriptive analysis model where this research was conducted based on direct events on the condition of the Trans Metro Deli Bus, especially Corridor 2 (K2M) which will be described regarding Load Factor, Headway, Speed, Frequency, Travel Time and Stop Time. The value of these quantities will be given an assessment related to indicators and criteria based on the assessment sources that will be used as a reference in this study.

City bus service is closely linked to the availability and quality of bus stop facilities. Bus stops serve as passenger boarding and alighting points, serving as the primary link between users and the bus service [3]-[5]. Good bus stop facilities not only support passenger comfort and safety but also enhance the overall image of public transportation services. Well-planned bus stops can encourage people to choose city buses over private vehicles, thus supporting sustainable mobility. Good bus stop facilities are characterized by strategic locations, easy access for pedestrians, and integration with other transportation modes [6]-[8]. Bus stops should be located in areas with high travel demand, such as shopping centers, educational areas, offices, and densely populated residential areas. Appropriate placement will reduce passenger walking distances and increase travel time efficiency [9]-[11].

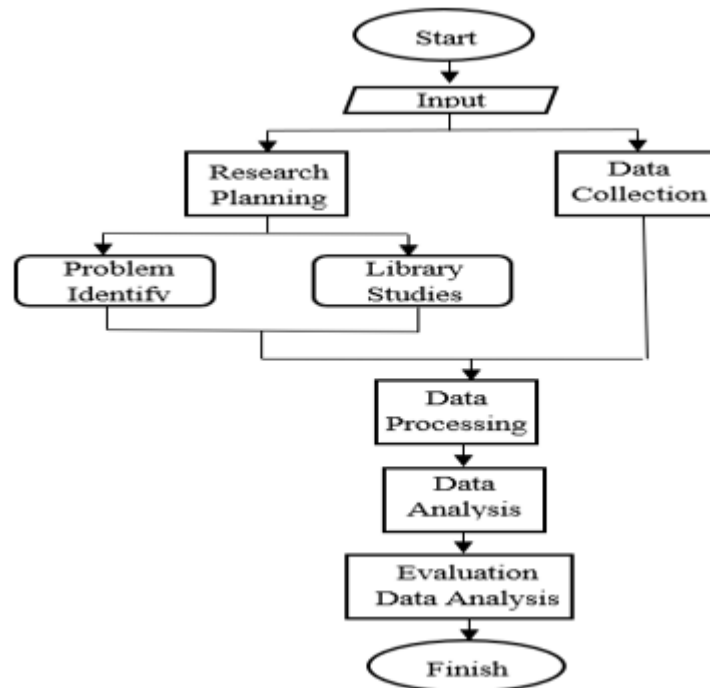
In terms of comfort, bus stops should be equipped with protective roofs from heat and rain, seating, adequate lighting, and good air circulation. Security aspects are also important, such as the presence of crossing signs, waiting areas away from traffic lanes, and CCTV or surveillance to deter crime. Clear information about bus schedules, routes, and fares is crucial for passengers when planning their trips. Modern bus stops are even equipped with real-time information systems that provide certainty about bus arrival times [12]-[14]. Bus stops must be accessible to people with disabilities, for example by providing ramps, guiding blocks, and wheelchair spaces. Bus stops must also be kept clean to ensure passenger comfort. With adequate bus stop facilities, city bus services will be more efficient, safe, and attractive to the public, thereby increasing the number of public transportation users [15]-[16].

Public transportation service can be measured using the load factor indicator, which is the ratio between the number of passengers carried and the available seating capacity. The load factor indicates the level of efficiency of vehicle utilization in serving passengers. If the load factor approaches 100%, it means the vehicle's capacity is fully utilized and service is considered optimal. However, if it frequently reaches 100% or more, this condition indicates vehicle overloading, which reduces comfort, safety, and service quality. Conversely, a load factor that is too low indicates a lack of efficiency due to many empty seats. Therefore, public transportation operators need to maintain the load factor within the ideal range, neither too high nor too low, to achieve a balance between passenger comfort and operational efficiency [17].

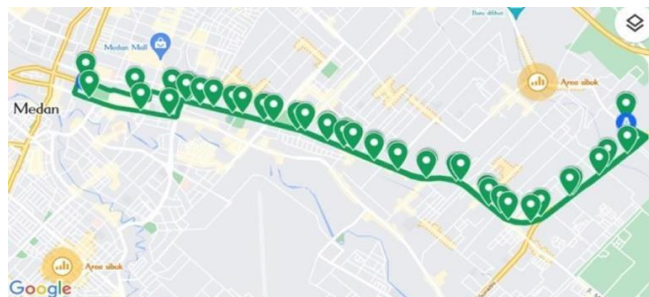
## **RESEARCH METHODS**

### **Materials**

This research was conducted in Medan City by selecting the Trans Metro Deli Bus Transportation facility or Teman Bus. The type of research used is descriptive quantitative where this research is carried out by analyzing data objectively starting from data collection, data analysis, to the presentation of results. In this study, the method used during the data collection process used observation data collection techniques. The following is a flow chart used in research as a guide in research steps.



**Figure 1:** Research flow diagram



**Figure 2.** Route Map of Corridor 2 of the Trans Metro Deli Bus (Source: Teman Bus Website, 2024)

## Methods

This research was conducted in corridor 2, as for the location of the stops passed by the Trans Metro Deli Bus in Corridor 2, namely the research location used by researchers is the KM 2 Transmetro Deli route, namely Terminal Amplas - Merdeka Field. The stopping points that will be passed are Terminal Amplas Stop - Amplas 1 - Smk Parulian 3 - ALS - Tritura - Marendal - Forestry - Wuling Dealer - Simpang Limun 2 - Budi Darma 2 - Clean Water Stop 2 - Pelangi Stop - Teladan 2 - HM Joni 2 - Juanda - Taman Sri Deli - Paradiso Swimming Pool - PDAM Tirtanadi 2 - Gedung Juang 45 - Kesawan - Bank Indonesia - Central Merdeka Square - Fish Tax - Bank Mestika - PDAM Tirtanadi - Bunda Specialist Clinic - Yuki Simpang Raya - Simpang Juanda - Simpang HM Joni 1 - Teladan 1 Stadium - UISU - Clean Water Stop 1 - Budi Darma 1 - Simpang Limun 1 - SD 100 - SM Raja University - Harjosari 1 - Indogrosir - Ar Rivai Mosque - RS Mitra Medika - Terminal Amplas.

The data collection method used in this research is direct observation or survey, where the researcher conducts a direct survey to the specified location, namely Corridor 2 Amplas - Merdeka Field and then collects data such as the number of passengers, travel time, stopping time, intermediate time, and operational duration. After the data is collected, this study then evaluates performance based on an assessment of the amount of Load Factor, Headway, Stop Time, and Travel Time. The data

collected during the survey is differentiated based on table 1 below.

**Table 1.** Time and Day of Data Collection

No.	Type Day	Name Day	Data Collection Time		
			Morning (Office Hours)	Daytime	Afternoon (Office Hours)
1	Day Work	Monday	07.00 - Finish	12.00 - Finish	16.00 - Finish
2		Tuesday	07.00 - Finish	12.00 - Finish	16.00 - Finish
3		Wednesday	07.00 - Finish	12.00 - Finish	16.00 - Finish
4		Thursday	07.00 - Finish	12.00 - Finish	16.00 - Finish
5		Friday	07.00 - Finish	12.00 - Finish	16.00 - Finish
6	Day Holiday	Saturday	07.00 - Finish	12.00 - Finish	16.00 - Finish
7		Sunday	07.00 - Finish	12.00 - Finish	16.00 - Finish

#### Data Analysis

The data analysis carried out in this study uses several indicators based on the quantities evaluated, while the indicators used as a reference are:

**Table 2.** Indicators of Magnitude Assessment

Indicator	Terms			
	Load Factor	Headway	Downtime	Travel Time
World Bank	< 70%: Less	> 10 minutes: Less	-	> 1 hour: Less
	70%: Standard	5-10 minutes: Standard	-	1-2 hours: Standard
	>70%: Good	1-4 minutes: Good	-	<1 hour: Good
Bogota Trans Milenio	peak load 80%, non-peak load 70%	High Headway: 3 minutes or less	-	-
		Medium Headway: 3 - 6 minutes	-	-
		Low Headway: greater than 6 minutes	-	-
Directorate General of Land Transportation Regulation 2002	70%	H ideal 5 - 10 minutes	10% travel time between stops	Average: 1.0 - 1.5 hours
		H peak 2 - 5 minutes		Maximum: 2 - 3 hours
PM No. 98 Year 2013	-	H peak at most 15 minutes	60 seconds maximum	-
	-	H non-peak for at most 30 minutes		-
	-	H peak max 7 minutes	Maximum peak time 45 seconds	-
PM No. 10 Year 2012	-	H non-peak maximum 15 minutes	Maximum non-peak time 60 seconds	-

## RESULTS AND DISCUSSION

The research was conducted for two weeks by dividing between weekdays and holidays and then differentiating based on three times, namely morning, afternoon, and evening. The following is the value of the research results obtained:

Table 3. Value of Each Quantity

Magnitude	Working Day			Holidays		
	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon
Load Factor	14%	8%	20%	12%	15%	20%
Headway	00:10:30	00:10:30	00:11:28	00:09:38	00:09:52	00:10:02
Downtime	00:00:09	00:00:08	00:00:10	00:00:07	00:00:07	00:00:08
Travel Time	01:13:11	01:16:13	01:18:29	01:03:26	01:14:52	01:13:12

After obtaining the results of the study, each amount is given an assessment evaluation based on certain indicators, where each indicator has certain criteria in the assessment process. The following is an evaluation of the assessment of the amount of Load Factor, Headway, Stop Time, and Travel Time:

Table 4. Load Factor Assessment Based on Indicators

Indicator	Working Day			Holidays		
	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon
World Bank	Less	Less	Less	Less	Less	Less
Bogota Trans Milenio	Not yet compliant	Not yet compliant	Not yet compliant	Not yet compliant	Not yet compliant	Not yet compliant
Directorate General of Land Transportation Regulation 2002	Not yet compliant	Not yet compliant	Not yet compliant	Not yet compliant	Not yet compliant	Not yet compliant

Table 5. Headway Assessment Based on Indicators

Indicator	Working Day			Holidays		
	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon
World Bank	Less	Less	Less	Standard	Standard	Less
Bogota Trans Milenio	Low Headway	Low Headway	Low Headway	Low Headway	Low Headway	Low Headway
Directorate General of Land Transportation Regulation 2002	Not yet compliant	Not yet compliant	Not yet compliant	Meet	Not yet compliant	Not yet compliant
PM No. 98 Year 2013	Meet	Meet	Meet	Meet	Meet	Meet
PM No. 10 Year 2012	Not yet compliant	Meet	Not yet compliant	Not yet compliant	Meet	Not yet compliant

Table 6. Downtime Assessment Based on Indicators

Indicator	Working Day			Holidays		
	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon

<b>Downtime</b>	PM No. 98 Year 2013	Meet	Meet	Meet	Meet	Meet	Meet
	Directorate General of Land Transportation Regulation 2002	Meet	Meet	Meet	Meet	Meet	Meet
	PM No. 10 Year 2012	Meet	Meet	Meet	Meet	Meet	Meet

**Table 7.** Travel Time Assessment by Indicator

	<b>Indicator</b>	<b>Working Day</b>			<b>Holidays</b>		
		<b>Morning</b>	<b>Daytime</b>	<b>Afternoon</b>	<b>Morning</b>	<b>Daytime</b>	<b>Afternoon</b>
<b>Travel Time</b>	Directorate General of Land Transportation Regulation 2002	Meet	Meet	Meet	Meet	Meet	Meet
	World Bank	Standard	Standard	Standard	Standard	Standard	Standard

## CONCLUSION

For Weekdays, in the Morning the values of Load Factor, Headway, Downtime, and Travel Time are 14%, 10 minutes 30 seconds, 9 seconds, and 1 hour 13 minutes 11 seconds. In the afternoon the values of Load Factor, Headway, Stop Time, and Travel Time are 8%, 10 minutes 30 seconds, 8 seconds, and 1 hour 16 minutes 13 seconds. And in the afternoon the values of Load Factor, Headway, Stop Time, and Travel Time are 20%, 11 minutes 28 seconds, 10 seconds, and 1 hour 18 minutes 29 seconds. As for Holidays, the values obtained in the Morning for the values of Load Factor, Headway, Stop Time, and Travel Time are 12%, 9 minutes 38 seconds, 7 seconds, and 1 hour 3 minutes 26 seconds. At noon the values of Load Factor, Headway, Stop Time, and Travel Time are 15%, 9 minutes 52 seconds, 7 seconds, and 1 hour 14 minutes 52 seconds. And in the afternoon the values of Load Factor, Headway, Stop Time, and Travel Time are 20%, 10 minutes 2 seconds, 8 seconds, and 1 hour 13 minutes 12 seconds.

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