

Determination of Location and Design of Trans Palu Bus Stops (Case Study: Corridor 1 and Corridor 3)

Agus Adijaya Pratama*, Taslim Bahar, Novita Pradani

Universitas Tadulako, Indonesia

Email: agusadijaya@gmail.com*

ABSTRACT

Corridors 1 and 3 of the *Trans Palu Bus* system currently lack bus stops as supporting facilities, and many passenger pick-up/drop-off points are still not served by bus stops or shelters. This study aims to examine the existing conditions of bus stop locations, determine the number of bus stops needed, and identify suitable locations and designs for bus stops along Corridors 1 and 3 of the *Trans Palu Bus*. Based on a survey conducted by the researcher, the average walking distance preferred by 600 respondents is 200 meters. The bus stop demand was analyzed using a buffer analysis method to assess land use potential along the corridors. The number of bus stops needed for each segment was then calculated based on a stop-to-stop distance of 400 meters, aligning with the respondents' walking distance preference. The selection of bus stop locations also refers to the categorization of public transport stop types (Directorate of Land Transport, 1996). According to the analysis results, the existing condition of Corridor 1 includes 32 bus stopping points, consisting of 23 bus stop signs, 1 permanent shelter (*Pegadaian Shelter*), and 8 points with no supporting facilities. Corridor 3M has 15 bus stopping points, including 9 bus stop signs and 6 points with no facilities. Corridor 3Y has 21 stopping points, consisting of 9 bus stop signs, 1 permanent shelter (*Gatot Subroto Shelter*), and 11 points with no facilities. Based on the analysis, the number of bus stops needed is 84 for Corridor 1, 30 for Corridor 3M, and 39 for Corridor 3Y.

Keywords: Corridor, Bus Stop, Buffer

INTRODUCTION

Transportation is a system or process that allows the movement of people or goods from one place to another. In transportation, there are two most important elements: moving/movement and the physical relocation of goods and passengers to other places (Archetti & Peirano, 2020; Hussain, 2023; Marlina & Natalia, 2017; Meyer, 2016; Sumarno, 2020; Vuchic, 2017).

Public transportation is a means of transportation that plays a crucial role in the development of a city. In accordance with the Law of the Republic of Indonesia Number 22 of 2009, the government is obliged to ensure the availability of public transportation services for intercity, inter-provincial, and cross-border transportation services (Joewono et al., 2016; Kash & Hidalgo, 2014; Lanori & Supriyanto, 2023; Prioni & Hensher, 2001; Yatskiv & Budilovich, 2017).

Palu City is currently served by mass transportation, namely *Trans Palu Buses*. *Trans Palu Buses* will start operating on October 1, 2024, and will serve 4 corridors within

the Palu City area. In supporting the services of operating transportation facilities, the *Trans Palu Bus* needs supporting facilities. As stated in the Law of the Republic of Indonesia Number 22 of 2009 concerning Road Traffic and Transportation, one of the supporting facilities for the implementation of traffic and road transportation is the bus stop.

Bus stops are facilities designed to facilitate the boarding and dropping off of passengers from public transportation at each stopping point. Corridor 1 has 30 bus stop points, connecting several main areas in Palu City, starting from the city center to Pantoloan Port. The 3M Corridor has 14 bus stop points, serving the route connecting the city center and MSA Airport via Monginsidi Road. Corridor 3Y has 21 bus stop points, connecting the city center and MSA Airport via Moh. Yamin Road. However, based on the observation results, along the route of each corridor, there are no bus stops as supporting facilities, and there are still many passenger pick-up/drop-off points that have not been facilitated by bus stops or shelters. This situation causes passengers to be reluctant to use the *Trans Palu Bus* because they have to wait at the stop under hot weather conditions and walk a long distance to reach the designated location.

Based on the background described above, the research problems can be formulated as follows: (1) What are the existing conditions of the *Trans Palu Bus* stops in Corridors 1 and 3? (2) What is the number of *Trans Palu Bus* stops needed in Corridors 1 and 3? and (3) What are the location and design of effective *Trans Palu Bus* stops in Corridors 1 and 3?

The purpose of this study is to determine the existing conditions of the *Trans Palu Bus* stop in Corridors 1 and 3, identify the number of ideal stops needed, and formulate the location and design of an effective *Trans Palu Bus* stop in the Palu City area. This research has academic benefits, namely for students to apply the knowledge gained during lectures, especially in the field of transportation, in order to develop the ability to analyze and interpret problems faced during the research process. It also provides a contribution of thought to Tadulako University in determining the location and design of the *Trans Palu Bus* stop in Corridors 1 and 3. Practically, this research is expected to provide additional insight and sensitivity for researchers in designing an effective transportation system and serve as an important input for the government and relevant regional apparatus work units in formulating policies for constructing *Trans Palu Bus* stops that align with community needs and existing conditions in the field.

Research by Rizka Damayanti (2023), entitled "Directions for Determining the Potential Location of *Trans Mamminasata Bus* Friend Stops in Rappocini District, Makassar City," used the Destination Origin Matrix (MAT) analysis method and buffer techniques to identify potential bus stop locations based on user travel patterns. Reza Noor Juniar Firdaus (2022) in his research entitled "Planning the Needs of City Transportation Stops in Salatiga City" used a quantitative descriptive approach by

analyzing the condition of existing bus stops, bus stop needs based on segments and distances, and determining the location and dimensions of proposed bus stop facilities.

Furthermore, research by I Putu Arya Aditya (2024), entitled "Determination of the Location of Bus Stop Points for Corridor 4 *Trans Semarang* Based on Potential Demand and Passenger Effectiveness Using QGIS," used demand characteristic analysis, calculation of bus stop needs based on distance, and determination of bus stop points in areas with high demand. Ida Ayu Made Sawitri Dewi (2023) in her research entitled "Evaluation of the Needs of Urban Transportation Bus Stops in South Minahasa Regency" applied a dynamic data analysis method based on passenger movements (going and returning), and took into account the distance between stops as the basis for evaluating bus stop needs.

Meanwhile, Ketut Susilo (2023) in his research entitled "Analysis of Public Transportation Bus Stop Needs on Rural Transportation Routes in Bantaeng Regency (Case Study of A1 and K1 Routes)" used dynamic data analysis from the travel patterns of passengers to and from the city, then continued with the determination of class intervals, frequency distribution analysis, and the calculation of the number of passengers to determine the need for bus stops.

RESEARCH METHOD

The type of research used in this study is descriptive analysis with a quantitative approach. Descriptive analysis aims to systematically, factually, and accurately describe the facts, nature, and relationships between the phenomena being studied (Nazir, 2005). The quantitative approach is used as a problem-solving procedure under study, focusing on numerical measurements, statistical analysis, and objective interpretation of data. This research was carried out in the Palu City area, specifically in Corridor 1 and Corridor 3 of the *Trans Palu Bus*, with the implementation on weekdays to reflect the actual operational conditions.

The population in this study is not limited to humans but includes all objects that have certain characteristics and are relevant to the purpose of the study. In this context, the population is determined based on the calculation of the Vehicle Operating Cost (BOK) for each bus on each corridor. The population is calculated by dividing the value of BOK per bus by the general passenger fare of Rp5,000. This step is used as an approach to estimate the ideal number of passengers to create operational efficiency.

The data sources used in this study are divided into two categories: secondary data and primary data. Secondary data were obtained from various relevant government agencies, such as the Public Works Office for road network maps, BAPPEDA for land use maps, and the Palu City Transportation Agency for route and public transportation data. Meanwhile, primary data were obtained directly through field surveys and observations of real conditions in Corridor 1 and Corridor 3. The primary data collected

included an inventory of stopping places, passenger boarding and disembarkation data, travel times, and direct interviews with related parties.

The data collection technique is carried out through two main approaches: secondary and primary data collection. Secondary data collection is carried out by accessing official documents from related agencies that support the analysis needs, such as road network maps from the Public Works Office, land use from BAPPEDA, and official routes from the Transportation Office. The primary data collection is conducted through direct observation in the field, such as a survey of stopping points, which aims to determine the number, location, and dimensions of existing bus stops. This survey was conducted with the necessary equipment, such as stationery, survey forms, clipboards, cameras, and meters or walking measures, as an important part of the comprehensive mapping and evaluation of the *Trans Palu Bus* service.

RESULT AND DISCUSSION

Existing Conditions of Trans Palu Bus Stops

From the results of the inventory survey that has been carried out, the existing condition of the study area has 2 (two) bus stops, namely the Pegadaian Bus Stop and the Gatot Subroto Bus Stop. The Pegadaian Bus Stop is located in Corridor 1 and the Gatot Subroto Bus Stop is located in the 3M Corridor. The following are the results of the inventory:



Figure 1. Documentation of Pegadaian Stops

Pegadian Bus Stop is one of the bus stop facilities located in Corridor 1B and located on Jl. Samratulangi. The facilities at the Pegadaian Bus Stop are signs, seats and trash cans with all facilities functioning. However, this bus stop does not have a bus stop

identity, route information board, lighting lights, public telephones, fences and bulletin boards.



Figure 2. Dokumentasi Halte Gatot Subroto

Gatot Subroto Bus Stop is one of the bus stop facilities located in Corridor 3 and is located on Jl. Gatot Subroto. The facilities available at the Gatot Subroto Bus Stop are the identity of the bus stop, signage and seating with the condition that all facilities are functional. However, this bus stop does not have a route information board, lighting lights, public telephone, garbage can, fence and bulletin board.

Analysis of Location and Stop Design

Determination of Bus Stop Location

The determination of the location of the bus stop is to determine the location of the right bus stop construction in accordance with the layout of the bus stop and/or bus stop to the traffic space (Decree of the Director General of HubDat, 1996). Each stop has a coordinate point. After the location of the bus stop has been known, then determine the type of group of passenger vehicle stops as shown in **Figure 2**, which is it necessary to make a bus bay, bus stop or *bus stop* sign only. In this study, all stops were only made bus stops without a bus bay due to the small number of passengers. The following is an example of placing a bus stop in a traffic space:

Segment Jl. Sudirman

Number of units stops : 1 unit

Land Use: Shops and Services

Road type: 4/1 T

Lane width: 7 meters (group 3)

Sidewalk width: 2 meters

Stop position: Front sidewalk (Pedestrian flow position is at the front of the stop)
The location of the new bus stop is on Jl. Sudirman (in front of Bank BNI Sudirman) amounting to 1 unit.

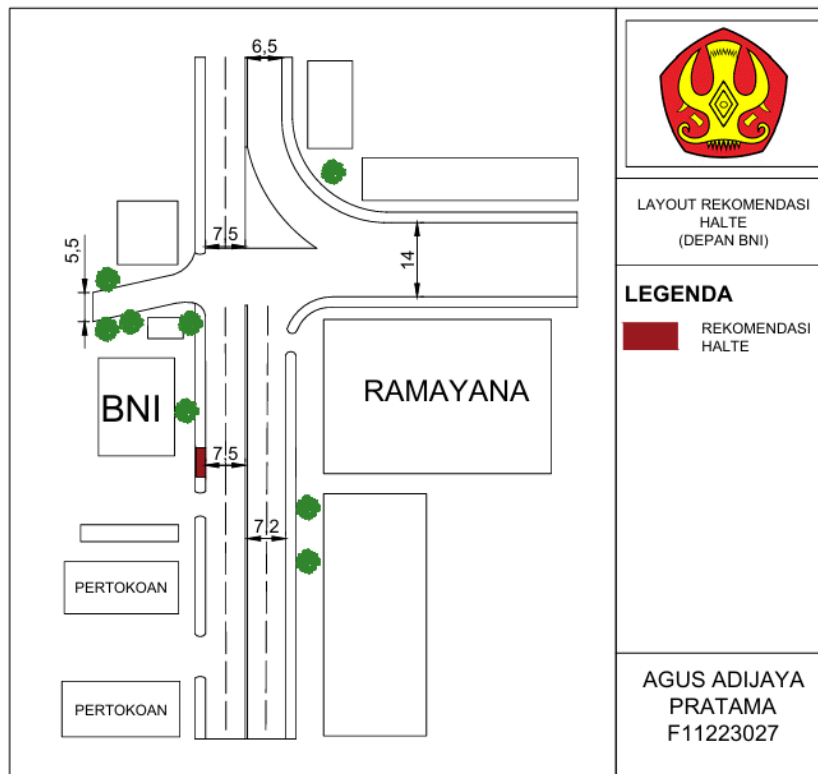


Figure 3. Map of the Proposed Location of the Bus Stop on Jl. Sudirman I (in front of BNI Bank)

Table 1. Recommended Locations of 3M Corridor Bus Stops

No.	Segment	Number of Bus Stops Needed	Left Side (Coordinates)	Right Side (Coordinates)
1	Jalan Abdurahman Saleh	6	In front of Oleh-Oleh Mbok Sri (X: 119°54'3.92"E, Y: 0°55'9.03"S)	In front of Oleh-Oleh Mbok Sri (X: 119°54'5.26"E, Y: 0°55'8.45"S)
			In front of Balai Wilayah Sungai III (X: 119°53'52.78"E, Y: 0°55'9.28"S)	In front of Hotel Sutan Raja (X: 119°53'53.59"E, Y: 0°55'8.68"S)
			In front of Puskesmas Birobuli (X: 119°53'42.50"E, Y: 0°55'8.75"S)	In front of Toyota Hasjrat Mutiara Dealer (X: 119°53'41.07"E, Y: 0°55'7.73"S)
2	Jalan Basuki Rahmat	8	In front of Sate Kambing Bang Tolib (X: 119°53'25.32"E, Y: 0°55'7.68"S)	In front of Warkop Harapan (X: 119°53'26.79"E, Y: 0°55'8.03"S)

No.	Segment	Number of Bus Stops Needed	Left Side (Coordinates)	Right Side (Coordinates)
3	Jalan Emmy Saelan	6	In front of BW (X: 119°53'13.93"E, Y: 0°55'8.49"S)	In front of Batako Seller (X: 119°53'12.35"E, Y: 0°55'8.03"S)
			In front of Samsung Shop (X: 119°53'0.81"E, Y: 0°55'8.72"S)	In front of BS Collection (X: 119°52'59.47"E, Y: 0°55'8.17"S)
			In front of Indomaret Basuki Rahmat (X: 119°52'47.88"E, Y: 0°55'8.38"S)	In front of Grand Hero (X: 119°52'46.34"E, Y: 0°55'7.93"S)
			In front of Yonif 711 (X: 119°52'35.23"E, Y: 0°55'3.12"S)	In front of Koperasi Yonif 711 (X: 119°52'35.82"E, Y: 0°55'4.54"S)
			In front of TK Yonif 711 (X: 119°52'34.48"E, Y: 0°54'52.40"S)	In front of Indomaret (X: 119°52'35.07"E, Y: 0°54'53.85"S)
4	Jalan Wolter Monginsidi	6	In front of Aesculapius (X: 119°52'33.66"E, Y: 0°54'39.82"S)	In front of Sinar Rezeki (X: 119°52'34.23"E, Y: 0°54'40.22"S)
			In front of Apotek Jenica Farma (X: 119°52'31.64"E, Y: 0°54'27.54"S)	In front of Plano Print (X: 119°52'31.99"E, Y: 0°54'26.51"S)
			In front of Hotel Aston (X: 119°52'29.42"E, Y: 0°54'17.32"S)	In front of DAM Café (X: 119°52'28.80"E, Y: 0°54'16.79"S)
			In front of SMPN 2 Palu (X: 119°52'24.40"E, Y: 0°54'1.02"S)	In front of PMU (X: 119°52'25.50"E, Y: 0°54'2.26"S)
			In front of ATM BRI (X: 119°52'32.12"E, Y: 0°54'27.54"S)	
6	Jalan Sudirman I	1	In front of BNI Palu Branch Office (X: 119°52'8.33"E, Y: 0°53'47.27"S)	
7	Jalan Moh Hatta	1	In front of Taman Gor (X: 119°52'19.91"E, Y: 0°53'46.92"S)	
8	Jalan Gatot Subroto	1	In front of Gatsu (X: 119°52'24.47"E, Y: 0°53'55.50"S)	

Based on the layout of the bus stop to the traffic space and the grouping of public passenger vehicle stops based on the level of use, land availability, and environmental conditions, it is proposed to provide a stop in the 3M Trans Palu Bus Corridor with an example of a description of the location of the stop:

Segment Jl. Emmy Saelan (in front of Yonif 711)

Number of unit stops : 2 units

Land Use : Services and Settlements

Road type : 4/1 TT

Width per lane : 7 meters (group 3)

Sidewalk width : 2 meters

Stop position : Front sidewalk (Pedestrian flow position is at the front of the stop)

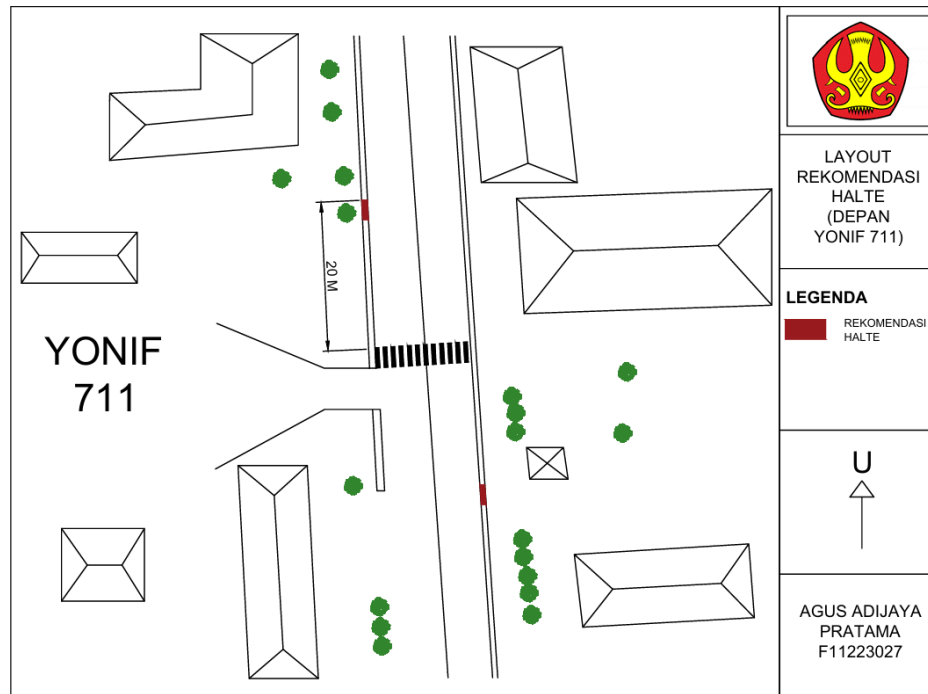


Figure 4. Map of the Proposed Location of the Bus Stop on Jl. Emmy Saelan (in front of Yonif 711)

We can see that the existing condition of the bus stop location to be built is located in front of Yonif 711. The service on the road has two stopover services, so the bus stop built will be opposite. At this location, there are also people crossing facilities.

Table 2. Recommended 3Y Corridor Stops

No.	Segment	Number of Bus Stops Needed	Left Side (Coordinates)	Right Side (Coordinates)
1	Jalan Moh Hatta	1	In front of Taman Gor (X: 119°52'19.91"E, Y: 0°53'46.92"S)	
2	Jalan Suprpto I	1	In front of 3 Jaya (X: 119°52'26.82"E, Y: 0°53'40.67"S)	
3	Jalan Suprpto II		In front of Chicken Bim (X: 119°52'29.43"E, Y: 0°53'25.30"S)	In front of Chicken Bim (X: 119°52'29.72"E, Y: 0°53'25.39"S)
		6	In front of City Inspectorate Office (X: 119°52'31.57"E, Y: 0°53'12.19"S)	In front of City Inspectorate Office (X: 119°52'31.63"E, Y: 0°53'13.72"S)

No.	Segment	Number of Bus Stops Needed	Left Side (Coordinates)	Right Side (Coordinates)
4	Jalan Tombolotutu	6	In front of SD Inpres Bumi Sagu (X: 119°52'33.31"E, Y: 0°53'3.69"S)	In front of SDN 15 Palu (X: 119°52'33.27"E, Y: 0°53'2.18"S)
			In front of Alfamidi Tombolotutu (X: 119°52'43.50"E, Y: 0°53'0.08"S)	In front of Mas Joko Surabaya (X: 119°52'42.70"E, Y: 0°52'59.60"S)
			In front of Omizu (X: 119°52'53.72"E, Y: 0°53'7.06"S)	In front of Milan Laundry (X: 119°53'4.65"E, Y: 0°53'14.10"S)
			In front of Alfamidi Tombolotutu (X: 119°53'4.98"E, Y: 0°53'14.41"S)	In front of Kifli Motorcycle Wash (X: 119°53'3.54"E, Y: 0°53'13.57"S)
5	Jalan Sisingamangaraja	6	In front of J&T Sigma Office (X: 119°53'8.92"E, Y: 0°53'23.95"S)	In front of Honda Dealer (X: 119°53'8.33"E, Y: 0°53'22.76"S)
			In front of Hotel Lawahba (X: 119°53'10.67"E, Y: 0°53'34.51"S)	In front of Sisingamangaraja Gas Station (X: 119°53'11.34"E, Y: 0°53'35.21"S)
			In front of Mie Gacoan (X: 119°53'13.36"E, Y: 0°53'47.97"S)	In front of KFC (X: 119°53'14.34"E, Y: 0°53'49.07"S)
6	Jalan Prof. Moh Yamin	12	In front of Taman Vatulemo (X: 119°53'17.06"E, Y: 0°54'0.86"S)	In front of Taman Vatulemo (X: 119°53'16.00"E, Y: 0°53'59.74"S)
			In front of Immanuel Field (X: 119°53'22.55"E, Y: 0°54'26.16"S)	In front of Provincial BAPPEDA Office (X: 119°53'21.62"E, Y: 0°54'25.04"S)
			In front of Court Office (X: 119°53'25.46"E, Y: 0°54'40.31"S)	In front of Living Plaza (X: 119°53'24.53"E, Y: 0°54'39.12"S)
			In front of Transmitter Tower (X: 119°53'32.10"E, Y: 0°55'3.66"S)	In front of BPK RI Office (X: 119°53'30.94"E, Y: 0°55'2.72"S)
7	Jalan Abdurahman Saleh	6	In front of Oleh-Oleh Mbok Sri (X: 119°54'3.92"E, Y: 0°55'9.03"S)	In front of Oleh-Oleh Mbok Sri (X: 119°54'5.26"E, Y: 0°55'8.45"S)
			In front of Hotel Sutan Raja (X: 119°53'53.59"E, Y: 0°55'8.68"S)	In front of Balai Wilayah Sungai III (X: 119°53'52.78"E, Y: 0°55'9.28"S)
			In front of Toyota Hasjrat Mutiara Dealer (X: 119°53'41.07"E, Y: 0°55'7.73"S)	In front of Puskesmas Birobuli (X: 119°53'42.50"E, Y: 0°55'8.75"S)
8	Jalan Pemuda	1	In front of Detasemen Gegana (X:	

No.	Segment	Number of Bus Stops Needed	Left Side (Coordinates)	Right Side (Coordinates)
			119°52'20.88"E, Y: 0°53'37.69"S)	

Based on the layout of the bus stop to the traffic space and the grouping of public passenger vehicle stops based on the level of use, land availability, and environmental conditions, it is proposed to provide a stop in the 3Y Bus Corridor of the Trans Palu Bus Corridor as an example of an overview of the location of the bus stop:

Segment Jl. Moh. Hatta

Number of units stops : 1 unit

Land Use : Shops and Services

Road type : 4/1 TT

Width per lane : 7 meters (group 3)

Sidewalk width : 2 meters

Stop position : Front Sidewalk (Pedestrian current position is located at the front of the bus stop)

The location of the new bus stop is at Moh. Hatta (in front of Taman Gor) totals 1 unit.

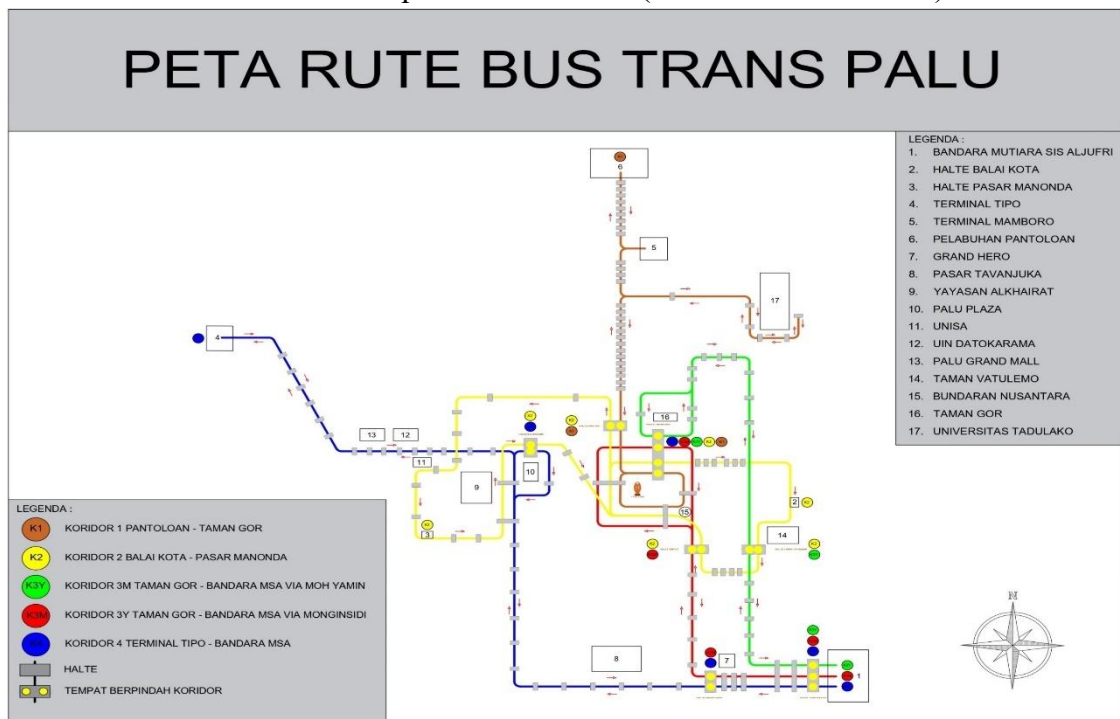


Figure 5. Recommended Design of Trans Palu Bus Map

Bus Stop Design Recommendations



Figure 6. Bus Stop Design Recommendations (Front View)



Figure 7. Bus Stop Design Recommendations (Side View)

CONCLUSION

The research concluded that the current bus stopping facilities in the *Trans Palu Bus* system show varying conditions across the corridors: Corridor 1 has 32 points, including 23 bus stop signs, 1 permanent stop (Pegadaian Stop), and 8 points without facilities; Corridor 3M has 15 points, with 9 bus stop signs and 6 points lacking facilities; and Corridor 3Y has 21 points, consisting of 9 bus stop signs, 1 permanent stop (Gatot Subroto Stop), and 11 points without facilities. The analysis of facility needs indicates that the ideal number of stops required are 84 for Corridor 1, 30 for Corridor 3M, and 39 for Corridor 3Y. Effective bus stop locations should be chosen based on areas with high

human activity, such as activity centers and settlements, while adhering to safety standards, including a minimum distance of 50 meters from intersections and 100 meters from hospitals and places of worship. Future research could explore the impact of these proposed bus stops on passenger behavior, operational efficiency, and the integration of additional transportation modes to enhance the overall urban mobility system in Palu City.

REFERENCES

- Aditya, I. P. A. (2024). *Penentuan titik lokasi halte Koridor 4 Trans Semarang berdasarkan potensi permintaan dan efektivitas penumpang menggunakan QGIS* [Skripsi, Universitas Diponegoro].
- Archetti, C., & Peirano, L. (2020). Air intermodal freight transportation: The freight forwarder service problem. *Omega (United Kingdom)*, 94, 102009. <https://doi.org/10.1016/j.omega.2019.02.009>
- Damayanti, R. (2023). *Arah penentuan lokasi potensial halte Bus Teman Trans Mamminasata di Kecamatan Rappocini Kota Makassar* [Skripsi, Universitas Hasanuddin].
- Dewi, I. A. M. S. (2023). *Evaluasi kebutuhan halte angkutan perkotaan di Kabupaten Minahasa Selatan* [Skripsi, Universitas Sam Ratulangi].
- Firdaus, R. N. J. (2022). *Perencanaan kebutuhan halte angkutan kota di Kota Salatiga* [Skripsi, Universitas Negeri Semarang].
- Hussain, M. N. (2023). Evaluating the impact of air transportation, railway transportation, and trade openness on inbound and outbound tourism in BRI countries. *Journal of Air Transport Management*, 106, 102307. <https://doi.org/10.1016/j.jairtraman.2022.102307>
- Joewono, T. B., Tarigan, A. K. M., & Susilo, Y. O. (2016). Road-based public transportation in urban areas of Indonesia: What policies do users expect to improve the service quality? *Transport Policy*, 49, 114–124.
- Kash, G., & Hidalgo, D. (2014). The promise and challenges of integrating public transportation in Bogotá, Colombia. *Public Transport*, 6, 107–135.
- Lanori, T., & Supriyanto, B. H. (2023). Problems of the impact of modernization of Indonesia's public transportation equipment system. *International Journal of Social Science*, 2(5), 2163–2176.
- Marlina, E., & Natalia, D. A. R. (2017). Land transportation and tourism development. *International Journal of Economic Perspectives*, 11(2), 125–134.
- Meyer, M. D. (2016). *Transportation planning handbook* (4th ed.). John Wiley & Sons.
- Prioni, P., & Hensher, D. (2001). Measuring service quality in scheduled bus services. *Journal of Public Transportation*, 3(2), 51–74. <https://doi.org/10.5038/2375-0901.3.2.4>
- Sumarno, A. (2020). *Transportation infrastructure planning*. Technology Publisher.

- Susilo, K. (2023). *Analisis kebutuhan halte angkutan umum pada jalur angkutan pedesaan di Kabupaten Bantaeng (Studi kasus Jalur A1 dan K1)* [Skripsi, Universitas Negeri Makassar].
- Vuchic, V. (2017). *Transportation for livable cities*. Routledge.
- Yatskiv, I., & Budilovich, E. (2017). A comprehensive analysis of the planned multimodal public transportation hub. *Transportation Research Procedia*, 24, 50–57.



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