IJSSR
International Journal of Social Service and Research

Vol. 4, No. 11, November 2024
e-ISSN: 2807-8691 | *p*-ISSN: 2807-839X

THE INFLUENCE OF THE BANDUNG DISTRICT TOURIST AREA TRANSPORTATION SYSTEM

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Keywords
Vehicle Speed, Degree of Saturation, Road Slope, BOK, BOT

ABSTRACT

One of the problems with the transportation system to tourist locations in the Bandung Regency area is congestion which causes an increase in average daily traffic (LHR) due to the use of private vehicles. If the vehicle's LHR increases, the vehicle speed will be low and the cost of transporting the vehicle to tourist locations will become expensive. This research aims to calculate the BOK for the Bandung Regency tourist area, calculate the BOT for the Bandung Regency tourist area and analyze the influence of the transportation system in the Bandung Regency tourist area. The research method uses quantitative and qualitative research (mix method). From the results of BOK calculations and analysis using the Pacific Consultant International (PCI) method, the total BOK value for working days and holidays for Curug Cinulang is IDR 56,582.00. Tebing Keraton Rp. 79,841.00, and Ranca Upas Rp. 103,366.00. From the results of BOT calculations and analysis using the Pacific Consultant International (PCI) method, the total BOT value for weekdays and holidays for Curug Cinulang is IDR 59,714.00. Tebing Keraton Rp. 50,959.00 and Ranca Upas Rp. 108,137.00. Based on the results of the analysis, It can be seen from the indicators that the obstacles faced in daily activities, especially in traveling, are having to deal with traffic jams which cause low vehicle speeds, wasting a lot of time and fuel on the road, thus disrupting travel activity plans.

INTRODUCTION

Bandung Regency is a tourism area that has its own advantages in natural tourism, which can attract local visitors or foreign visitors (Hurriyati, 2015; Khoir & Dirgantara, 2020; Parhan et al., 2021; Pratiwi et al., 2022; Sianipar & Sitorus, 2022). The tourist locations that are the focal point of this study are Curug Cinulang, Tebing Keraton, and Ranca Upas. The problem that occurred at the 3 (three) tourist locations was congestion, because the transportation system was not optimal. Meanwhile, it is very important as a regulator and supporter of a series of tourism activities in Bandung Regency and in fact until now there have not been many changes to the transportation system as a whole. The development of the transportation system in the Bandung Regency area requires sustainable development with planning that has a good or not harmful impact on the community and the environment and can meet mobility needs consistently. The condition of the road is still damaged and there is a need for repairs with adequate quality, of course, according to the contours of the land in Bandung Regency which are hilly or mountainous.

The average daily traffic (LHR) that increases every day, especially on school and national holidays with geometric conditions and existing road capacity, causes vehicle speeds to be low and causes vehicle flow to be hampered. The government's lack of firmness towards developers or business entities so that they do not operate on holidays (weekends) or divert the route of heavy vehicles that pass through tourist area roads so that it will reduce the volume of vehicles passing through (Beck et al., 2019; Karim et al., 2014; Moreno et al., 2013; Yajima & Takami, 2019; Yang et al., 2022). One of the

existing modes of public transportation is public transportation (angkot), in fact public transportation consumers have decreased because people prefer to use private vehicles such as motorcycles which are still people's favorite transportation because they are more effective and efficient in mobility to tourist sites. The government should immediately find a solution or strategy so that people can use public transportation comfortably and safely to support tourism activities which are expected to reduce the number of private vehicle use and reduce the number of congestion in the Bandung Regency area.

Transportation plays a very important role in helping the economic growth of a region, even a country (Rasyid, 2020). The economic growth of the community needs the availability of mobility for the movement of people and goods (Barbosa et al., 2021; Mendolia et al., 2021; Mounce et al., 2020; Poltimäe et al., 2022; Zhao & Yu, 2020). If it is not analyzed, economic growth may exceed the capacity of existing transportation facilities and infrastructure. If this happens, then transportation becomes a barrier to economic growth with congestion that cannot accommodate the length of the road, then there is inefficiency with a lot of time wasted on the road, not to mention the extraordinarily large waste of fuel from the results of the increasingly severe congestion. Therefore, if there is a problem in the transportation system, the impact will have a wide impact on the smooth flow of traffic which can then harm and hinder the community's economy and efforts to grow people's welfare will also be hampered. For example, in the economic and business sectors, not a few entrepreneurs and the general public complain about congested vehicle mobility routes, thus increasing operational expenses. The problem is even more complicated when the mode of transportation chosen by the community is a private vehicle. This phenomenon can be a policy to suppress the use of private vehicles and prosper better public transportation facilities and infrastructure (Kadarisman et al., 2015).

There are many things that must be considered in relation to transportation system policies and tourism, such as public transportation modes, road conditions, LHR, and road capacity. Seeing the importance and strategic role of the transportation system in the progress of tourism and the economy of a region, it is hoped that the research on the influence of the transportation system in the tourist area of Bandung Regency can help in improving the quality of public services or infrastructure for the progress of tourism in the Bandung Regency area.

The objectives of this study are: 1) Calculating the operational costs of vehicles in tourist areas in Bandung Regency. 2) Calculating the operational costs of transportation in tourist areas in Bandung Regency. 3) Analyze the influence of the transportation system in the Bandung Regency area. The research contribution of this study lies in providing a detailed analysis of transportation costs and the transportation system in tourist areas of Bandung Regency. Specifically, the study offers three key contributions: 1) It provides a quantifiable assessment of vehicle operational costs in tourist areas, which is valuable for transportation planning and policy-making. 2) It offers an evaluation of overall transportation operational costs in these regions, contributing to a better understanding of cost-efficiency in tourism-related transport. 3) It analyzes the influence of the transportation system on the tourism industry, offering insights that can inform improvements to transportation infrastructure and services to enhance the visitor experience and support sustainable tourism development in Bandung Regency.

METHODS

The method used in this study is using quantitative and qualitative research (mix methods). The survey method uses a quantitative method where the author distributes questionnaires to tourist visitors and analyzes using quantitative and qualitative methods, namely by using questionnaire data, calculating the volume of vehicle traffic on one of the road sections to tourist sites and also reviewing the existing condition of the road to tourist sites. The number of research samples or respondents from tourist visitors in 3 (three) tourist locations, namely Curug Cinulang, Tebing Keraton and Ranca Upas, amounted to 261 people, consisting of 16 respondents from Curug Cinulang, 119 respondents from Cliff Keraton and 126 respondents from Ranca Upas with statements on the questionnaire divided into 20 assessment indicators. The data sources used in this study are primary and secondary data.

In this study, the instrument used was a closed questionnaire, respondents only chose one alternative answer that was considered in accordance with their own opinions. The independent variable (X) is the development of tourist visitors, the growth of MSMEs, the improvement of road sections, transportation mode services and the bound variable (Y) is fuel oil consumption. The data analysis methods in this study are the data instrument test method, data presentation method and data analysis technique.

RESULTS

Curug Cinulang Tourism Road Network System

Cinulang Waterfall is a tourist attraction located in Cicalengka District, known as a waterfall tourist attraction with a height of 50-60 m and one of the waterfall attractions with a million charms. The road network and road status to the Cinulang Waterfall tourism can be seen in Figure 1 and Table 1 below.

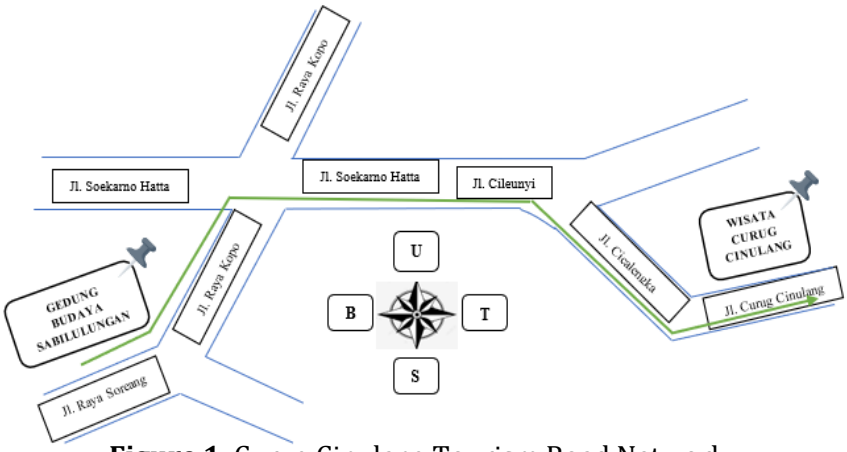

Figure 1. Curug Cinulang Tourism Road Network
Source : Analysis Results, 2024

Table 1. Status of the Road to the Cinulang Waterfall Tourist Location

No	Street Name	Street Classification	Road Length (m)	Secondary Data Source	Total
1	Jl. Raya Soreang	Primary Collector Road	4500	DISPUTR, DISHUB Bandung Regency	1
2	Jl. Raya Kopo	Primary Collector Road	8500	DISPUTR, DISHUB Bandung Regency	1
3	Jl. Soekarno Hatta (Jl. Nasional III)	Road Arteries Example	14000	DSDABM Bandung City	1
4	Jl. Raya Cibiru (Jl. Nasional III)	Road Arteries Example	1000	DSDABM Bandung City	1
5	Jl. Raya Cinunuk (Jl. Nasional III)	Road Arteries Example	2000	DSDABM Bandung City	1
6	Jl. Raya Cileunyi (Jl. Nasional III)	Road Arteries Example	11000	DISPUTR, DISHUB Bandung Regency	1
7	Jl. Raya Cicalengka (Jl. Nasional III)	Road Arteries Example	3000	DISPUTR, DISHUB Bandung Regency	1
8	Jl. Curug Cinulang	Primary Neighborhood Road	7000	DISPUTR, DISHUB Bandung Regency	1

Source : Analysis Results, 2024

Tebing Keraton Tourism Road Network System

Tebing Keraton is a tourist attraction located in Cimenyan District, Taman Hutan Raya (TAHURA) area. Visitors can see an incredible view, not the city lights but the vast expanse of forest. The road network and road status to the Tebing Keraton tourism are seen in Figure 2 and Table 2 below.

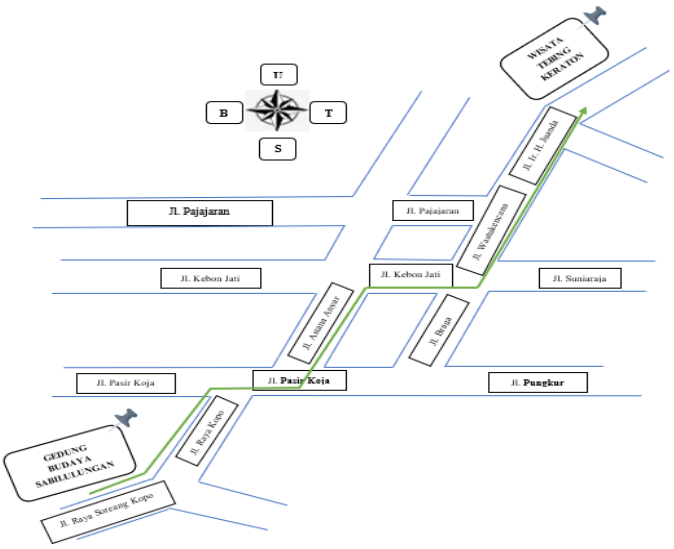

Figure 2. Tebing Keraton Tourism Road Network
Source : Analysis Results, 2024

Table 2. Status of the Road to the Tebing Keraton Tourist Location

No	Street Name	Street Classification	Road Length (m)	Secondary Data Source	Total
1	Jl. Raya Soreang	Primary Collector Road	4500	DISPUTR, DISHUB Bandung Regency	1
2	Jl. Raya Kopo	Primary Collector Road	10500	DISPUTR, DISHUB Bandung Regency	1
3	Jl. Pasir Koja	Secondary Arterial Roads	170	DSDABM Bandung City	1
4	Jl. Astana Anyar	Primary Collector Road	680	DSDABM Bandung City	1
5	Jl. Gardujati	Primary Collector Road	450	DSDABM Bandung City	1
6	Jl. Kebon Jati	Primary Collector Road	450	DSDABM Bandung City	1
7	Jl. Suniaraja	Primary Collector Road	250	DSDABM Bandung City	1
8	Jl. Otto Iskandar Dinata	Primary Collector Road	2000	DSDABM Bandung City	1
9	Jl. Stasiun Timur	Secondary Collector's Path	800	DSDABM Bandung City	1
10	Jl. Perintis Kemerdekaan	Primary Collector Road	200	DSDABM Bandung City	1
11	Jl. Wastukencana	Secondary Collector's Path	750	DSDABM Bandung City	1
12	Jl. R.E. Martadinata	Secondary Collector's Path	250	DSDABM Bandung City	1
13	Jl. Ir. H. Juanda	Secondary Collector's Path	5200	DSDABM Bandung City	1
14	Jl. Dago Pakar	Secondary Collector's Path	5800	DSDABM Bandung City	1

Source : Analysis Results, 2024

Ranca Upas Tourism Road Network System

Ranca Upas is a tourist attraction located in Rancabali District, known as a campground tourist attraction covering an area of 215 hectares, positioned at 1700 meters above sea level. The road network and road status to Ranca Upas tourism are seen in Figure 3 and Table 3 below.

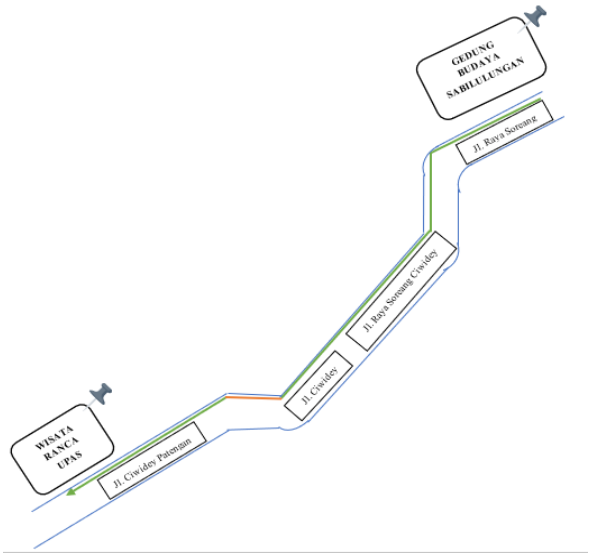

Figure 3. Ranca Upas Tourism Road Network
Source : Analysis Results, 2024

Table 3. Status of the Road to the Ranca Upas Tourist Location

No	Street Name	Street Classification	Road Length (m)	Secondary Data Source	Total
1	Jl. Raya Soreang	Primary Collector Road	1500	DISPUTR, DISHUB Bandung Regency	1
2	Jl. Raya Soreang - Ciwidey	Primary Collector Road	9500	DISPUTR, DISHUB Bandung Regency	1
3	Jl. Raya Soreang - Rancabali	Primary Collector Road	6100	DISPUTR, DISHUB Bandung Regency	1
4	Jl. Raya Ciwidey - Patengan	Secondary Arterial Roads	7900	DISPUTR, DISHUB Bandung Regency	1

Source : Analysis Results, 2024

Analysis of Volume/Number of Vehicles in Tourist Areas

This data is to find out the traffic volume that affects the road to the tourist area of Bandung Regency. The analysis was carried out using junior high school (passenger car unit) and the conversion factor used was LV (Light Vehicle) = 1.00; HV (Heavy Vehicle) = 1.30 and MC (Motorcycle) = 0.25

Road Capacity Analysis

The calculation of capacity adjustment factors due to side obstacles in this study is based on the selected road sections from each road to the tourist site of Bandung Regency. This can be seen in the following Table 4.

Table 4. Road Capacity Per Direction of Traffic to Tourist Sites

No	Tour	Road Sections	Base Capacity/ Direction (Co)	Road Width Factor (FCw)	Directional Separation Factor (FSp)	Side Drag Factor (FCsf)	Road Capacity (junior high school/hour)
1	Tebing Keraton	Intersection of Dago - Jl. Ir. H. Juanda (4/2D)	1850	1	1	0,97	3589
2	Curug Cinulang	Intersection of Jl. Soekarno Hatta – Moch. Toha (6/2D)	1900	0,91	1	1,01	5757
3	Ranca Upas	Intersection of Rancabali - Jl. Raya Ciwidey Patengan (2/2UD)	2900	0,91	1	0,99	2507

Source : Analysis Results, 2024

The capacity of the Tebing Keraton tourist road uses the section of the Dago Intersection - Jl. Ir. H. Juanda with a 4/2D road type, which is 3589 smp/h. The capacity of the Cinulang Waterfall tourist road uses the section of Jl. Soekarno Hatta – Moch Intersection. Toha with a 6/2D road type is 5757 junior high school/hour. The capacity of the Ranca Upas tourist road uses the Rancabali Intersection - Jl. Raya Ciwidey Patengan road with a road type of 2/2 UD, which is 2507 smp/hour.

Calculation of Degree of Saturation (DS)

The degree of saturation analysis can be calculated through a formula, namely DS = Q / C, then the calculation results can be seen in the following Table 5.

Table 5. Degree of Traffic Saturation on Tourist Roads

No	Tour	Road Sections	Day/Date	Total Vehicle Flow smp/h (Q)	Road Capacity (C)	Degree of Saturation
1	Tebing Keraton	Intersection of Dago - Jl. Ir. H. Juanda	Tuesday, 12/09/2023	2445	3589	0,68
			Sunday, 17/09/2023	2866	3589	0,80
2	Curug Cinulang	Intersection of Jl. Soekarno Hatta – Moch. Toha	Wednesday, 20/09/2023	3762	5757	0,65
			Sunday, 24/09/2023	4311	5757	0,75
3	Ranca Upas	Intersection of Rancabali - Jl. Raya Ciwidey Patengan	Thursday, 20/09/2023	1604	2507	0,64
			Sunday, 24/09/2023	2169	2507	0,87

Source : Analysis Results, 2024

Travel Speed Analysis

Based on the results of a field survey with the volume of traffic along the roads of the Bandung Regency tourist area, the speed of vehicles passing through a road section depends on the length of a track with travel time. The results of the calculation of travel speed can be seen in the following Table 6.

Table 6. Travel Speed to Tourist Locations

No	Road Sections	Day	Date	Travel Speed (km/h)			Average
				Morning	Noon	Evening	
1	Intersection of Dago - Jl. Ir. H. Juanda	Tuesday	12/09/2023	41,88	51,41	45,39	46,23
		Sunday	17/09/2023	38,66	42,00	47,21	42,63
2	Intersection of Jl. Soekarno Hatta – Moch. Toha	Wednesday	20/09/2023	44,84	54,10	47,11	48,68
		Sunday	24/09/2023	39,79	49,04	40,92	43,25
3	Intersection of Rancabali - Jl. Raya Ciwidey Patengan	Thursday	28/09/2023	41,15	40,37	43,88	41,80
		Sunday	01/10/2023	32,77	35,91	36,43	35,04

Source : Analysis Results, 2024

Vehicle Operating Cost Analysis

The calculation of the vehicle operational cost component (BOK) of the Bandung Regency tourist area using the PCI (Pacific Consultant Indonesia) method is still in units per 1000 km and the equation used for the calculation of BOK on weekdays is the equation of group I (car), group IIB (truck) and motorcycle. The results of the calculation of vehicle operational costs can be seen in the following Table 7.

Table 7. Operational Costs of Vehicles to Tourist Locations

No	Day/Date	Tour	Road Length (km)	Vehicle Type	BOOK (rp/1000 km)	BOK (Rp/Km)	Total BOK (Rp/Kend)
1	Tuesday, 12/09/2023	Tebing Keraton	3	LV	Rp 3.812.364	IDR 3,812	Rp 11.437
				HP	Rp 7.899.050	IDR 7,899	Rp 23.697
				MC	Rp 1.160.482	IDR 1,160	Rp 3.481
	Sunday, 17/09/2023			LV	Rp 4.073.630	IDR 4,074	Rp 12.221
				HP	Rp 8.420.759	IDR 8,421	Rp 25.262
				MC	Rp 1.247.713	IDR 1,248	Rp 3.743
2	Wednesday, 20/09/2023	Curug Cinulang	2,2	LV	Rp 3.704.480	IDR 3,704	IDR 8,150
				HP	Rp 7.498.551	IDR 7,499	IDR 16,497
				MC	Rp 1.127.050	IDR 1,127	Rp 2.480
	Sunday, 24/09/2023			LV	Rp 3.969.902	IDR 3,970	Rp 8.734
				HP	Rp 8.209.377	IDR 8,209	IDR 18,061
				MC	Rp 1.209.166	IDR 1,209	Rp 2.660
3	Thursday, 28/09/2023	Ranca Upas	3,6	LV	Rp 4.057.670	IDR 4,058	IDR 14,608

		HV	IDR 8,054,552	IDR 8,055	IDR 28,996
		MC	IDR 1,236,211	IDR 1,236	IDR 4,450
Sunday, 01/10/2023		LV	IDR 4,653,254	IDR 4,653	IDR 16,752
		HV	IDR 9,285,582	IDR 9,286	IDR 33,428
		MC	Rp 1.425.509	IDR 1,426	Rp 5.132

Source : Analysis Results, 2024

Transportation Operational Cost Analysis

The calculation of the transportation operational cost component (BOT) of the Bandung Regency tourist area using the PCI (Pacific Consultant Indonesia) method for non-toll roads is still in units per 1000 km so that to get the unit value per km it is necessary to distance the distance from the road traveled, for the speed (running speed) in km/h. The calculation results can be seen in the following Table 8.

Table 8. Transportation Operational Costs to Tourist Locations

Tour	Day	Date	Route	Road Length/ Route (Km)	BOT (Rp/ 1000 Km)	BOT (Rp/Km)	Total BOT (Rp/Day/Vehicle)
Tebing Keraton	Tuesday	12/09/2023	St. Hall - Dago	6,8	3.616.306	3.616	24.591
	Sunday	17/09/2023		6,8	3.877.710	3.878	26.368
Curug Cinulang	Wednesday	20/09/2023	Cicalengka – Cinulang Waterfall	8,2	3.508.154	3.508	28.767
	Sunday	24/09/2023		8,2	3.773.981	3.774	30.947
Ranca Upas	Thursday	28/09/2023	Ciwidey - Patengan	13,0	3.861.735	3.862	50.203
	Sunday	01/10/2023		13,0	4.456.479	4.456	57.934

Source : Analysis Results, 2024

The Relationship of BOK and BOT to Speed

$Y = \alpha + \beta 1X1 + \beta 2X2 + e$

$Y = 133{,}702 + 0{,}002X1 - 0{,}032X2 + e$

With a correlation test value of R square of 0.978.

The Relationship between BOK and BOT to the Degree of Saturation

$Y = \alpha + \beta 1X1 + \beta 2X2 + e$

$Y = -0{,}672 + 0{,}000X1 - 0{,}001X2 + e$

With a correlation test value of R square of 0.926.

The Relationship between BOK and BOT on Road Slope

$Y = \alpha + \beta 1X1 + \beta 2X2 + e$

$Y = 1{,}651 - 0{,}004X1 + 0{,}012X2 + e$

With a correlation test value of R square of 0.920.

The Relationship of BOK and BOT to Average Daily Traffic

$Y = \alpha + \beta 1X1 + \beta 2X2 + e$

$Y = 3466{,}713 + 2{,}978X1 - 10{,}61X2 + e$

With a correlation test value of R square of 0.369.

Based on the results of the calculation and analysis of the existing geometric roads leading to 3 (three) tourist locations carried out, there are many inconsistencies with planning that should be in accordance with applicable regulations, resulting in a lack of security and safety for road users. The road condition is still damaged and has many long ramps so that it requires a lot of energy or fuel in the vehicle and is dangerous for vehicles that lack maintenance. So that the existing factor of road geometry affects the speed of vehicles which has an impact on increasing transportation operational costs and threatening the safety of road users. Unlike several other areas in Bandung Regency and other regions in Indonesia, with the geometric condition of flat roads to facilitate mobility, transportation operational costs can be lower than uphill roads and vehicle traffic flows can run well and comfortably.

CONCLUSION

The operational costs of vehicles in the Bandung Regency tourist area were calculated using the Pacific Consultant International (PCI) method. The Cliff Wisata Keraton vehicles had a total BOK of Rp 38,616/day on weekdays and holidays of Rp 41,226/day. The Cliff Tourism of the Palace on the St. Hall - Dago route had a BOK of Rp 24,591/Kend on weekdays and Rp 26,368/Kend on holidays. The Cinulang Waterfall Tour route Cicalengka – Cinulang Waterfall had a BOK of IDR 28,767/Kend on weekdays and IDR 30,947/Kend on holidays. The Wisata Ranca Upas route had a BOK of IDR 50,203/Kend on weekdays and IDR 57,934/Kend on holidays. The current transportation system in the area is far from expectations, with daily activities being hindered by congestion, low vehicle speeds, and heavy vehicles operating during holidays. Future research could focus on sustainable transportation solutions, infrastructure improvements, and smart traffic management technologies to enhance transportation systems in Bandung Regency.

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