Analysis Of Transportation Facility At The Intersection Of Phh Mustofa Street And Ahmad Yani Street In Bandung City

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Abstract. Bandung is a prominent city in Indonesia that encounters substantial challenges related to traffic and transportation, including congestion. Intersections are locations where cars from many directions converge and must halt or alter their course. An effective intersection can enhance traffic flow, mitigate congestion, and maximize the utilization of road space. Traffic infrastructure often present at signalized intersections comprises Yellow Box Junction (YBJ) traffic signs, Ruang Henti Khusus (RHK), pedestrian pathways (sidewalks), zebra crossings, bicycle lanes, traffic signals, traffic signage, road medians, and street illumination. This study focuses on the intersection at the traffic signal on JL. Phh. Mustofa and JL. Ahmad Yani in the city of Bandung. The infrastructure and traffic amenities at this crossroads require assessment to confirm compliance with safety and user comfort criteria. The data gathered for this research origi- nates from field surveys, rendering it primary and current. The study results in- dicate that sidewalk conditions are poor, the paint on zebra crossings and yellow boxes has deteriorated, lighting is insufficient, pedestrian lanes fail to satisfy standards, and vehicle speed analysis reveals low or slow speeds at specific peri- ods. To resolve these difficulties, assessments may be performed, encompassing environmental regulations and enhancements to traffic infrastructure.

Keywords: Bandung, Transportation, Intersection, Traffic Infrastructure, Speed Analysis

1 INTRODUCTION

Indonesian city Bandung struggles with traffic and transportation, especially congestion. Public facilities for road users are essential to transportation. Public facilities are open to everyone, hence transportation infrastructure issues can cause traffic congestion. Triwibisono and Aurachman (2020) found that traffic congestion is most common at intersections during peak hours, such as morning commutes and evening homecomings. Traffic signals and other controls can also cause congestion. To fix this, we must improve the efficiency and performance of our infrastructure and facilities. Traffic includes straight roads and junctions where vehicles from different directions must stop

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or change route. Intersections are vital to traffic regulation and give clear road directions. Intersections can improve traffic flow, reduce congestion, and maximize road space. Suboptimal intersections can slow traffic, increase congestion, and increase traffic accidents. Traffic lights at signalized junctions prevent congestion by regulating traffic on each lane sequentially, according to Harahap et al. (2018). According to Kustanrika (2015), this light uses red to indicate stopping and yellow to indicate warning. At signalized crossings, the Yellow Box Junction (YBC) traffic sign, a square-shaped yellow-lined demarcation, reduces traffic congestion. Wirasutama and Pragningrum (2017) state that yellow boxes at junctions prevent vehicle congestion by requiring vehicles to stay outside the box until the vehicle ahead has crossed it.

Rangkuti (2015) defines the Special Stopping Area (RHK) for motorbikes at signalized junctions as a designated space at the end of a junction. Motorbikes can stop at red lights in the Special Stopping Area (RHK), reducing traffic at intersections caused by motorcyclists and four-wheeled vehicles. Sendow and Jansen (2015) claim that inadequate pedestrian infrastructure, especially walking paths and crossings, reduces pedestrian safety. Minister of Public Works and Housing Circular No. 03-2017-B, Technical Planning of Pedestrian Facilities, governs transportation facility approval. The research framework uses this guideline to ensure alignment with objectives. According to the Ministry of Public Works and Housing (2018), pedestrian infrastructure includes sidewalks, at-grade crossings, and grade-separated crossings like overpasses and underpasses. A zebra crossing is a pedestrian crossing marked by black and white stripes to slow down drivers. Meviana et al. (2023) recommend installing zebra crossings on roads with low traffic, speed, and pedestrian activity. To minimize zebra crossing delays, its location must be visible. To ensure pedestrian comfort and safety, the pathway must have adequate infrastructure and space. Walkways should be safe and adequate for pedestrians. According to Lestari and Pramita (2020), pedestrian injuries are more likely in areas without pedestrian infrastructure and high-speed vehicle traffic.

Bike lanes are separate from motor vehicle lanes, just as pedestrian lanes. The Mayor of Bandung's Decree Number 551/Kep.146-DisHub/2020 requires bicycle lanes to be built on roadways with road markings, traffic signs, and other road amenities in accordance with legal rules. The quality of walker and bicycle infrastructure depends on safety, accessibility, barrier-free separation from motor vehicles, proper lighting, CCTV surveillance, and consistent maintenance. Road infrastructure includes traffic signs, which warn, prohibit, guide, or instruct. Traffic signs are necessary to reduce transportation-related accidents, according to Wardan and Kurniadi (2016). The Indonesian Minister of Transportation regulates all traffic signs under Regulation PM 13 of 2014 to meet environmental standards. The median strip separates lanes to reduce accidents. Dwi et al. (2015) argue that the median of the roadway segregates opposing traffic flows and improves traffic safety and fluidity as infrastructure and a complementary part of the road environment.

Final item: Public Street Lighting. Shamin and A.Kiay Demak (2019) argue that local or regional authorities must provide public street lighting. Monthly community taxes,

included in the electricity bill paid to PT.PLN, fund public street lighting. This roadway's lighting helps motorists see the road and people walk safely.

In Bandung, this study evaluates the traffic signal intersection on JL. Phh Mustofa and JL. Ahmad Yani. Traffic is heavy at the Bandung crossroads, where two major routes meet and the Cicaheum Terminal is located. The Central Bureau of Statistics (2021) classifies Bandung as a big city with 2,527,854 residents. That location has heavy traffic during peak hours. Road users' safety depends on Bandung's JL. Phh Mustofa–JL. Ahmad Yani intersection. Ruas et al. (2015) claim that lateral barriers cause congestion at this point, as a large number of autos surpass the road infrastructure. Traffic congestion increases the risk of car accidents, especially for inattentive drivers. The intersection's infrastructure and traffic amenities must be assessed for road user safety and comfort. According to Suryaningsih and Kurniati (2020), road capacity is the maximum passenger car equivalent (pcu/hour) of vehicle traffic a road segment can support given particular criteria (geometric design, environment, and traffic composition). The study on Jl. Phh Mustofa-Jl. Ahmad Yani includes data on the available facilities, including the geometric state of the roadway, environmental conditions, transportation dynamics, infrastructure status, and vehicular speeds. Rodji and Handoyo (2023) state that the geometric configuration of a road defines its shape or dimensions.

2 METHODOLOGY

This study utilizes data collected via field surveys, rendering the resulting data primary and current. The subsequent flowchart delineates the stages of work, specifically:

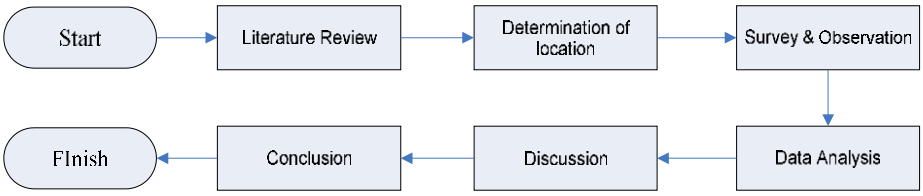

Fig 1 Research Flow Diagram

A survey was conducted in person on April 12, 2023, at the signalized intersection of Jl. Phh Mustofa and Jl. Ahmad Yani in Bandung. The average speed of vehicles at that intersection will be examined during the data processing step using Microsoft Excel. Upon acquiring the results, the subsequent stage is to consolidate the observations, augmented by empirical data presented in tabular and graphical formats.

3 RESULT AND DISCUSSION

The current intersection condition pertains to the status of the intersection during the survey period. This data encompasses geometric characteristics, environmental factors,

vehicle crossing velocities, and traffic signal durations acquired from surveys performed at the intersection location.

Fig 2 Intersection of Phh Mustofa-Ahmad Yani Road

The identification of traffic issues is typically associated with congestion and the comfort of road users. The problems that emerge typically hinge on land use planning and the infrastructure's capacity to facilitate access. The intersection of Jl. Phh Mustofa and Jl. Ahmad Yani faces several challenges, including vehicles halting at arbitrary locations, which obstructs traffic flow; insufficient street lighting that endangers road users; obscured traffic signs; and the inappropriate use of sidewalks for parking. The following conditions apply to the establishments situated on Phh Mustofa Street:

(a)

(b)

Fig 3 (a) Median on the road at Phh Mustofa Street. (b) Zebra crossing on Phh Mustofa street.

(c)

(d)

Fig 4 (c) Traffic Signs on Phh Mustofa Street. (d) Red Light at the Intersection of Phh Mustofa Street and Ahmad Yani Street

The conditions of the facilities on Ahmad Yani Street are as follows:


(e) (f)

Fig 5 (e) Zebra crossing on Ahmad Yani street. (f) Sidewalk on Ahmad Yani Street


(g) (h)

Fig 6 (g) Median on the road at Ahmad Yani Street. (h) Red Light at the Intersection of Ahmad Yani Street and PHH Mustofa Street

3.1 Geometric Condition

The intersection is a single-plane configuration featuring a three-legged design, resembling a Y-shape with a turning road. The quantity of lanes for the roadway determined by the orientation of the road segment:

- The Phh Mustofa Street features a four-lane configuration with a central median.
- Cicaheum Terminal Direction: Four lanes with a median.
- Ahmad Yani Street: Four lanes with a central median.

3.2 Environmental Condition

The intersection is situated in a locale featuring shopping centers, hotels, restaurants, office buildings, and a terminal accommodating both urban and intercity transportation, leading to a substantial volume of vehicular traffic at that intersection. Side barriers at intersections may arise from public transport boarding or alighting people, automobiles accessing the roadside, and pedestrians inadequately using sidewalks and crosswalks.

3.3 Condition of Transportation Facilities

The continued underutilization of transportation facilities has led to road damage and vehicle congestion.

(i)

(j)

Fig 7 (g) Condition of Motorcycle Stop Space. (h) Condition of Yellow Box Junction.

The aforementioned scenario indicates the improper usage of a motor stop area, which is currently occupied by vehicles with four or more wheels, in conjunction with the deteriorating state of the road exhibiting cracks. Furthermore, figure 7 illustrates that the quality of the zebra crossing has deteriorated and become indistinct. The zebra crossing and the quality of the Yellow Box Junction both appear to have deteriorated and become ambiguous.

3.4 Infrastructure Condition

The condition of the infrastructure on the sidewalks is poor; the materials on the sidewalks are damaged, and the sidewalks have been repurposed as parking spaces. This causes pedestrians to choose to walk in areas designated for motor vehicles, which can lead to traffic accidents. In addition, the poorly maintained drainage conditions lead to blocked water flow and increase the potential for flooding.

3.5 Traffic Sign Condition

The condition of the traffic signs at the intersection is largely obscured by vegetation, making them less visible to road users. This poses a danger to road users both at night and during the day.

3.6 Road Lighting Conditions

The condition of the road lighting has dimmed, and there are even lights that are out, resulting in a potential risk of accidents on that stretch of road.

3.7 Speed Analysis

Kumalawati et al. (2021) state that in a traffic flow, each vehicle moves at a different speed, so the traffic flow does not have a single speed characteristic but rather takes the form of a distribution of individual vehicle speeds. The following is an analysis of the average vehicle speed and the duration of traffic lights obtained from a survey conducted between 4:00 PM and 5:50 PM WIB. The vehicle path on the Phh Mustofa-Cicaheum road segment is 113.13 meters long.

Table 1 The Speed Analysis of Vehicle Traffic on the Phh Mustofa-Cicaheum Road Segment

MC Time travel (t_1)	Bus Time Travel (t_2)	LV Time Travel (t_3)	MC Speed (v_1)	Bus Speed (v_2)	LV Speed (v_3)
s	s	s	km/hour	km/hour	km/hour
20	55	37	20	7	11
19	52	50	21	8	8
12	56	35	34	7	12
13	69	47	31	6	9
11	72	39	37	6	10
	Average		29	7	10

Information:
MC = Motorcycle
LV = Light Vehicle

The vehicle lane on the Cicaheum-Ahmad Yani road spans 106.39 meters. On this stretch of road, there are no traffic lights because it is bordered by a park, marking the intersection from Cicaheum towards Ahmad Yani.

Table 2 The Speed Analysis of Vehicle Traffic on Cicaheum – Ahmad Yani Road Segment

MC Time Travel (t_1)	LV Time Travel (t_2)	MC Speed (v_1)	LV Speed (v_2)
s	s	km/hour	km/hour
10	17	38	22
14	10	27	38
9	12	44	33
11	12	35	34
13	13	39	29
Average		37	31

Information:
MC = Motorcycle
LV = Light Vehicle

The vehicle lane on Ahmad Yani-Cicaheum road stretches for 68.42 meters.

Table 3 The Speed Analysis of Vehicle Traffic on Ahmad Yani – Cicaheum Road Segment

MC Time Travel (t_1)	LC Time Travel (t_2)	MC Speed (v_1)	LV Speed (v_2)
s	s	km/hour	km/hour
9	18	33	16
7	12	40	24
8	10	37	30
9	11	32	27

MC Time Travel (t_1)	LC Time Travel (t_2)	C Speed (v_1)	LV Speed (v_2)
9	8	33	36
Average	35	27	

Information:
MC = Motorcycle
LV = Light Vehicle

Based on the analysis of vehicle crossing speeds and the duration of red lights, the intersection falls into the category of urban areas with a maximum speed limit of 50 km/h, thus the vehicle speeds are still below the maximum speed.

3.8 Disscusion

According to the survey results and analysis conducted at the intersection of Jl. Phh Mustofa and Jl. Ahmad Yani, solutions for each identified concern are as follows:

1. The compatibility of transportation infrastructure
   Repainting the dilapidated zebra crossings and Yellow Box Junction with weather-resistant paint would ensure road users' safety and visibility. The local authorities may also install zebra crossing and Yellow Box Junction signs or maintain them. Trimming vegetation or moving traffic signs can fix the issue. Finally, monitoring and control or warning or prohibition signage can reduce vehicles stopping improperly. Another approach is to build shelters or rest areas.
2. Infrastructure Condition
   The motorbike parking area and pathways need repairs or maintenance from the local authority. Additionally, local authorities should limit or prohibit parking on sidewalks turned into parking areas. Community clean-ups, drainage channel closures to deter littering, and local citizen stewardship to prevent road floods can fix refuse-obstructed drainage systems.
3. Lighting conditions
   The problems with street lighting require resolution through consistent maintenance, oversight of acts that harm current fixtures, acquisition of eco-friendly street lights, and implementation of a monitoring system for prompt detection of damage or disruptions.

4 CONCLUSION

The research findings of the evaluative examination of transportation facilities along the Jl. Phh Mustofa-Jl. Ahmad Yani corridor are as follows:

1. The road has inadequate transportation infrastructure, including damaged sidewalks and faded paint on zebra crossings and yellow boxes. We recommend repairing the sidewalk structure and repainting the zebra crossings. Drainage channels need cleaning and maintenance to look good. Transit and pedestrian lighting standards are insufficient for optimal use. Due to plants blocking many lights at night, nighttime visibility is poor, requiring periodic repair.

2. The examination of the average vehicle speed at the intersection categorizes it as an urban area with a speed restriction of 50 km/h, suggesting that the traffic conditions remain constant. Nonetheless, vehicle speed is seen as low at specific periods, including peak commuting hours (7:00 AM and 5:00 PM) and weekends. The duration of the red light is deemed standard, facilitating the safe and efficient passage of cars.

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