Volume 4, No. 3 March 2025 – (544-555)
p-ISSN 2980-4868 | e-ISSN 2980-4841
https://ajesh.ph/index.php/gp

The Influence of Landuse on the Performance of Pekalipan Road Cirebon

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ABSTRACT

The land of an area is utilized in such a way as to support human activities. This landuse is influential in generating traffic generation and attraction. However, landuse in an area is often misused, which can cause traffic conflicts and congestion. The congestion that occurs illustrates the condition of the road with a decreased level of road service and is unable to accommodate the number of vehicles passing by. One of the roads that became the research location is Jalan Pekalipan. Jalan Pekalipan is located in an area of trade, shops, and warehouses, and there is misuse of pedestrian land and roads. Activities in the area cause side obstacles that affect the performance of the road. This reserach uses descriptive research methods combined with a quantitative approach. To determine the appropriateness of landuse, refer to Cirebon City Regional Ordinance No. 8 of 2012 on Cirebon City Spatial Planning 2011-2031 and to determine the extent of landuse effects, the calculation is based on the 2023 Indonesia Road Capacity Guidelines (PKJI 2023). Based on observations made for one week, it was found that the greater the activity in an area, the greater the obstacles caused, and the greater the obstacles, the less the road capacity. From the results of the calculation analysis, it is found that the performance of Jalan Pekalipan is at LOS B and C, which means that the road performance is still conducive and stable. To maintain road performance on the Pekalipan Road section, there needs to be assertiveness for land abuse that occurs and there needs to be a disciplined attitude of road users in traffic.

Keywords: Capacity, Cirebon, Landuse, LOS.

INTRODUCTION

Land in an area is utilized to serve various human activities such as landuse for educational areas, trade areas, and others (Asyiawati & Akliyah, 2014). Activities between areas trigger the generation and attraction of traffic flows. Therefore, landuse needs to be regulated according to the regional spatial plan so as not to cause problems for transportation services (Luthfina et al., 2019). However, in existing conditions, there is often land abuse in an area that becomes a side obstacle and affects the movement of traffic flow. So that it can potentially experience traffic congestion (Rachman et al., 2020).

Unplanned and uncontrolled landuse changes contribute significantly to traffic congestion, particularly in urban areas where economic and social activities are concentrated (Waloejo,

2013). The presence of informal activities such as street vendors, illegal parking, and pedestrian encroachments reduces the effective road capacity and disrupts vehicle movement (Otieno, 2019). This situation is further exacerbated in areas with high commercial density, where the volume of traffic increases due to shopping centers, warehouses, and offices operating without adequate transportation planning. Poor spatial planning and weak enforcement of regulations further aggravate congestion, making urban mobility inefficient and causing delays that impact productivity and economic activities (Afolabi et al., 2017).

Research on the topic of the influence of the presence of street vendors or side obstacles on road performance has been done before. Such as research conducted by (Faisal Hadi et al., 2022) with the research title, namely the Influence of Street Vendors on the Performance of the Petumbukan Large Road Section, Galang District (Case Reserach). From the research conducted, it is known that the presence of street vendors on Jalan Petumbukan is a side obstacle that has a major effect on congestion (Faisal Hadi et al., 2022).

Furthermore, research conducted by (Fisu et al., 2019) with the research title, namely Transportation Review in Commercial Areas (Case Reserach of Jalan Cihampelas Bandung City). From the research that has been done, it is known that the existence of side obstacles due to commercial activities in shopping centers, shops, and street vendors has a huge impact on reducing the effective road width and triggering congestion.

The next research by (Rachman et al., 2020) with the research title is Analysis of the Effect of Landuse on Road Performance in Gorontalo City. From the results of his research, it is known that landuse as an education, Synagogue, and goods and services service area has the effect of causing side obstacles that have the potential to cause road congestion.

The research conducted by (Majid et al., 2022) with the research title, namely the Effect of Side Obstacles on Road Section Performance Due to Market Activities and Alternative Solutions. From the results of his research, it is known that the level of side obstacles on the road section is very high, affecting the speed of vehicles slowing down.

And research conducted by (Bertarina et al., 2022) with the research title, namely Analysis of the Effect of Side Obstacles (Case Reserach: Jalan Raya Zainal Abidin Pagar Alam under the Kedaton Flyover in Bandar Lampung City). From the results of his research, it is known that side obstacles greatly affect the speed of traffic flow.

Several phenomena of land abuse for street vendors, on street parking, and others are often found in city centers where the surrounding areas are shopping centers, shops, warehouses, and education. Such as in the trading area in Pekalipan Urban Village, Cirebon City, especially around Jalan Pekalipan. The misuse of the land becomes a side obstacle to the flow of vehicular traffic. In addition to obstacles from land misuse, there are also other side obstacles such as traffic flow cuts, entry/exit of shop vehicles, and pedestrian activities, as well as warehouse loading and unloading activities.

Jalan Pekalipan has recently revived its street food scene. It consists of various street food stalls that use the left lane of the road, operating from late afternoon after the closing hours of shops and warehouses. The strategic location of Jalan Pekalipan is very supportive of this culinary activity. As the night progresses, the culinary scene becomes increasingly crowded and spills over into the right lane of the road. This, of course, impedes traffic flow.

Based on the background outlined above, the purpose of this reserach is to analyze the impact of landuse, especially the presence of side obstacles such as street vendors, on-street parking, and commercial activities, on road performance on Jalan Pekalipan, Cirebon City. The benefit of this reserach is to provide valuable input for urban planners and policy makers in regulating landuse and managing side obstacles to improve traffic conditions. By understanding the extent of the impact caused by street vendors, commercial activities, and other factors, appropriate traffic management strategies can be proposed. In addition, this research is expected to contribute to the development of sustainable urban transportation planning by integrating commercial activities with efficient road use, ensuring a balance between economic activities and smooth traffic flow.

RESEARCH METHOD

This reserach uses descriptive research methods combined with a quantitative approach. To determine the suitability of landuse refers to the Cirebon City Regional Regulation No. 8 of 2012 concerning the Cirebon City Spatial Plan 2011-2031 and to determine the extent of the impact of landuse, the calculation is based on the Indonesian Road Capacity Guidelines 2023 (PKJI, 2023).

The research location is in Pekalipan Sub-district. Pekalipan sub-district has an area of 1.56 Km2 and a population of 29916 thousand people (Cirebon, 2023).The research location is Pekalipan Road, Pekalipan District, Cirebon City, West Java Province. The boundaries of the research location area are as follows:

North : Directly adjacent to Jalan Gudang, Jalan Pekiringan
East : Petratean Street
South : Pulasaren Street
West : Nyimas Gandasari Street.

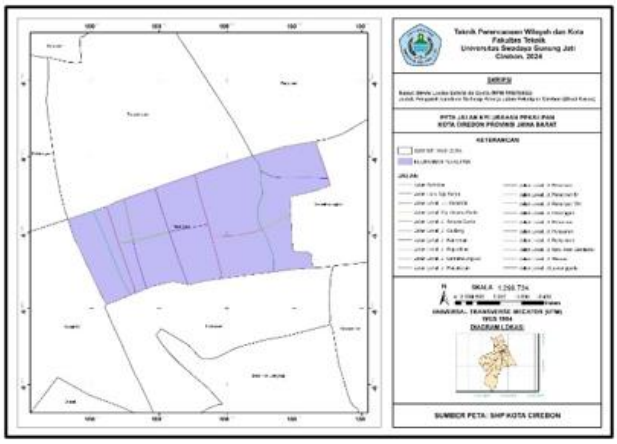

Figure 1. Map of Research Location

Source: Researcher Analysis

RESULT AND DISCUSSION

Pekalipan Road is a neighborhood road with two one-way lanes (2/1). The following is the geometric data of Jalan Pekalipan obtained from direct observation at the research location.

Table 1. Geometric Data of Pekalipan Road

Street Name	Jalan Pekalipan
Length of road (m)	400
Width of road (m)	3,5 x 2
Width of road shoulder (m)	1,0
Start of the road	Intersection 3 (T-intersection)
End of the road	Intersection 3 (T-intersection)
Direction Description	North to South

Source: Observation Results (2023)

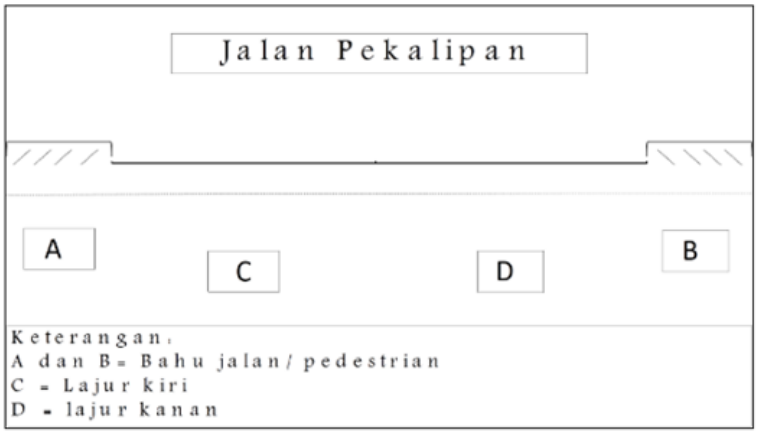

Figure 2. Cross-section of Pekalipan Road

Source: Researcher Analysis

Acquisition of Landuse Data

Jalan Pekalipan is an area dominated by shops, trade and warehousing activities. Along Jalan Pekalipan there are shop buildings that function to support activities in the area. The following is data on landuse on Jalan Pekalipan obtained by counting the number of buildings along Jalan Pekalipan.

Table 2. Landuse on Pekalipan Road Segment

Landuse	Quantity (Unit)
Shophouse	45
Warehouse	13
Restaurant	3
Services	4
Synagogue	1
Banking	2
Street Vendors	5 s.d. 12

Source: Observation Results (2023)

Acquisition of Traffic Data

The data collection time was carried out for seven days at peak hours which were estimated based on daily activities such as going to school/work, shopping, loading/unloading activities, and others. The morning peak hour is estimated at 06:30 to 07:30 am, the afternoon peak hour is estimated at 12:00 to 13:00 pm, and the evening peak hour is estimated to start at 17:30 to 18:30 pm. The traffic data obtained from each hour is then summed up. The following are the results of the data collection:

Table 3. Acquisition of Pekalipan Road Traffic Data

Time	Total Vehicle	Total Side Obstacles
Monday (07/08/23)	7751	1045
Tuesday (08/08/23)	8367	1402
Wednesday (09/08/23)	7967	1286
Thursday (10/08/23)	8027	1256
Friday (11/08/23)	7797	1248
Saturday (12/08/23)	6905	1253
Sunday (13/08/23)	6616	747

Source: Observation Results (2023)

Discussion

Jalan Pekalipan is an area with the highest residential population dominated by shops, trade, and warehousing activities. In terms of transportation facilities, Jalan Pekalipan is a neighborhood road with two one-way lanes (2/1). On the left side of the road, a 3.5 m wide road is used as a parking lot for warehouse vehicles, from small trucks to large trucks (more than 4 wheels). Then, at the bend to Jalan Pekalipan, angkot is often used for ngetem. Several angkots were also observed to be stationed in the middle of the three intersections, obstructing traffic flow towards Jalan Pekalipan. In addition, there is the phenomenon of misuse of pedestrian

space, which should be used for pedestrians, but is used as a stall for street vendors and as a parking lot for motorcycles (Agusman, 2021). The street vendors operate after the shops and warehouses end, from late afternoon to early evening.

The following is a comparison of landuse on Jalan Pekalipan from morning to night.

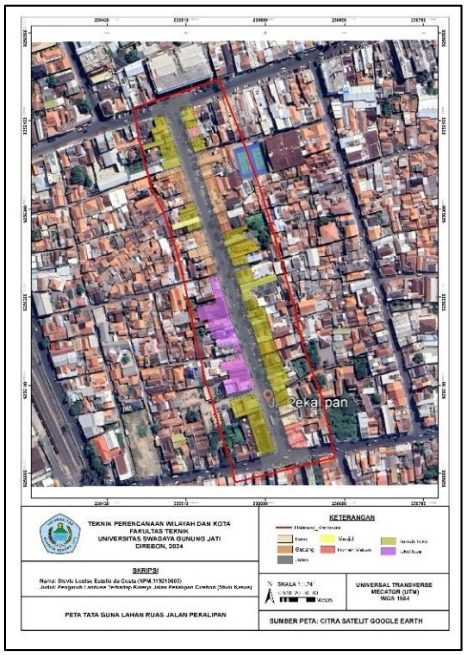

Figure 3. Pekalipan Road Landuse Map (Morning to Afternoon)

Source: Researcher Analysis

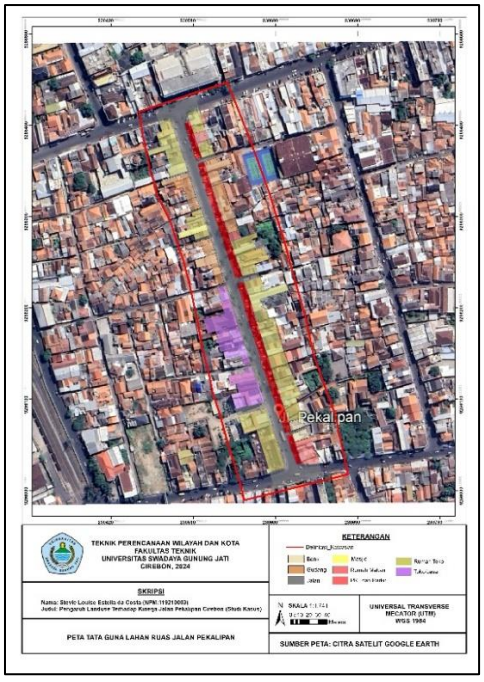

Figure 4. Pekalipan Road Landuse Map (Afternoon to Night)

Source: Researcher Analysis

Based on the landuse map of Jalan Pekalipan, land cover is dominated by shops with an area of ±0.798 Ha. Then followed by services with an area of ±0.284 Ha and warehousing with an area of ±0.181 Ha. The rest of the land is used for other service activities such as restaurants, Synagogue, and banking. For more details can be seen in the following table.

Table 4. Area of Landuse on Pekalipan Road Section

Landuse	Quantity (Unit)	Area (Ha)
Shophouse	45	0,798
Warehouse	13	0,181
Restaurant	3	0,077
Services	4	0,284
Synagogue	1	0,067
Banking	2	0,033
Total	68	1,44

Source: Researcher Analysis

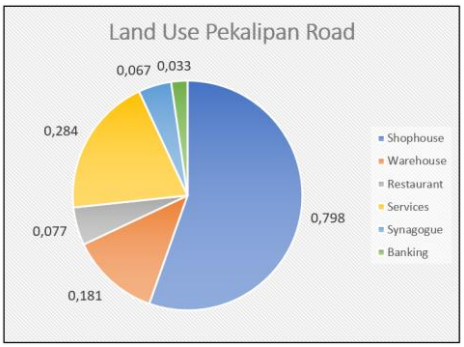

Figure 5. Pie Chart of Landuse of Pekalipan Road Section

Source: Researcher Analysis

The landuse map of Pekalipan Road also shows the difference in landuse between morning before noon and afternoon before night. In the morning before noon, the road is still effectively used as two lanes because there is no street vendor activity and parking is not dense. Whereas starting from noon, afternoon and towards evening, the road section used is only one effective lane. This is because the left lane has begun to be crowded with parking lots during the day and in the afternoon towards evening it begins to be crowded with street vendor stall activities, as well as parking lots for vehicles visiting street vendors at night. Street vendors and parking lots on the left lane of Jalan Pekalipan occupy ±0.51 Ha of land. (Source: Researcher Analysis).

Analysis Results

Landuse Suitability Analysis of Pekalipan Road

Looking at the results of direct observation in the field, the activities on Jalan Pekalipan are in accordance with the regional spatial plan contained in the Cirebon City Regional Regulation No.8 of 2012, which states that: “Pekalipan Urban Village as the center of trade and services at the sub-district scale, is also a development area for micro-industrial activities with daily necessities trading activities in the form of the food and beverage industry”. Under existing

conditions, the area along Jalan Pekalipan does function to support economic activities with trade and service activities. There are several shops along Jalan Pekalipan, a flour warehouse, several offices and restaurants, and street vendors in the evening.

Pekalipan Road Performance Analysis (PKJI 2023)

From the research results and a series of calculations that have been carried out to find the service value of Jalan Pekalipan, a comparison of road services between weekdays and weekend days is obtained. The calculated data is presented in a table.

Table 5. Comparison of Service Value of Pekalipan Road

Time	LHR (Kend/hr)	q_{ex} (smp/hr)	KHS	C (smp/hr)	V_B (km/h)	D_J	LOS
Monday	2583,7	1190,5	269	2856	56,16	0,42	B
Tuesday	2789	1260,2	384,6	2744,4	54,83	0,46	C
Wednesday	2655,7	1202,4	344,8	2835,6	55,59	0,43	B
Thursday	2675,7	1222,9	337	2835,6	55,59	0,43	B
Friday	2599	1277,2	327,1	2835,6	55,59	0,45	C
Saturday	2301,7	1126,5	329,5	2835,6	55,59	0,39	B
Sunday	2205,3	1161,2	180,6	2876,4	56,73	0,40	B

Formula:
LHR = Total vehicles x length of observation
q = Number of vehicles x base EMP value
KHS = Total occurrences x frequency weight value
C = C0 x FCLJ x FCPA x FCHS x FCUK
VB = (VBD + VBL) X FVBHS X FVBUK
Dj = q/c
LOS = determined based on Dj [9]
Description:
LHR = Average daily traffic
Q = Traffic flow
KHS = Class of side obstacles
C = Capacity
VB = Free flow speed MP
Dj = Degree of saturation
LOS = Level Of Service (Level of Road Service)

Source: Researcher Analysis

From the data in the table above, it is known that:

a. side obstacles that occur on Tuesdays are higher than other days so that the impact on the value of road capacity is reduced and results in the level of service of the road being at level C,
b. Traffic activity on Sundays is smaller than on other days. The flow of passing vehicles and side obstacles found is less. This has an impact on increasing road capacity on Sundays so that the resulting road service is better, namely level B.

Performance comparison chart of Pekalipan Road for one week:

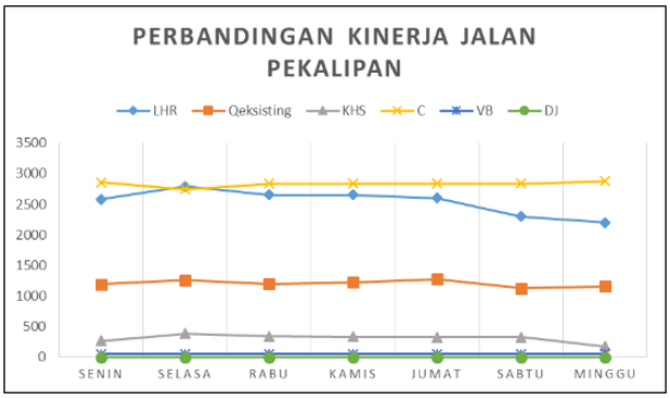

Figure 7. Comparison of Pekalipan Road Performance

Source: Researcher Analysis

Average Speed and Travel Time (VMP and WT)

Travel speed values were obtained using graphical analysis of the relationship between VMP and Dj and VB. Before conducting the graphical analysis, the average values of Dj and VB for 1 week were first determined and found to be: Dj= 0.43 and VB= 55.72 km/h.

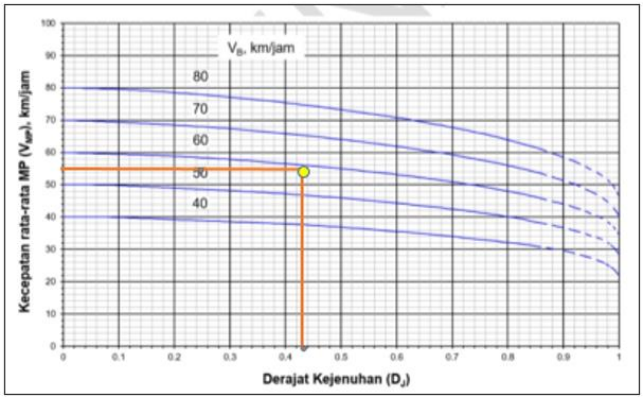

Figure 8. Average VMP Value of Pekalipan Road

Source: Researcher Analysis

From the graph, the average travel time value is approximately 55.7 km/h. Average travel time calculation:

WT = 400 m/55700 m/3600 s

WT = 25,8 s

then the result of the average travel time value is 25,8 second.

Identification of Factors Affecting Pekalipan Road Performance

From the results of the analysis that has been carried out, it can be seen that the activity of Jalan Pekalipan is busier on weekdays than on weekends. This activity is influenced by the existing landuses on Jalan Pekalipan, which are trade and service activities. These activities generate the attraction and generation of travel for people and goods. When compared, commercial activities on Jalan Pekalipan based on observations between weekdays and weekends are as follows.

Table 6. Commercial Activities on Pekalipan Road Segment

Day	Commercial Activities		
	Morning	Afternoon	Night
Monday	-	a. Shops b. Services c. Warehouse loading and unloading d. Banking e. Restaurants	Restaurants, Street Vendors
Tuesday	-	a. Shops b. Services c. Warehouse loading and unloading (Peak) d. Banking e. Restaurants	Restaurants, Street Vendors
Wednesday	-	a. Shops b. Services c. Warehouse loading and unloading d. Banking e. Restaurants	Restaurants, Street Vendors
Thursday	-	a. Shops b. Services c. Warehouse loading and unloading d. Banking e. Restaurants	Restaurants, Street Vendors
Friday	-	a. Shops b. Services c. Warehouse loading and unloading d. Banking e. Restaurants	Restaurants, Street Vendors
Saturday	-	a. Shops b. Services c. Warehouse loading and unloading d. Banking	Restaurants, Street Vendors
Sunday	-	a. Restaurants	Restaurants, Street Vendors

Source: Researcher Analysis

All commercial activities that occur on Jalan Pekalipan cause various kinds of side obstacles such as crossing activities, parking/stopping vehicles, entry-exit vehicles, and slow vehicle traffic flow (KTB). Based on observations, on Tuesdays there are quite dense warehouse loading and unloading activities so that the incidence value of vehicles entering and leaving the warehouse / shop also increases. This activity has an impact on reducing the basic capacity of the road section, and creates obstacles for road users. The cost of travel time increases due to the side obstacles that occur on Pekalipan Road. Sunday is different, with fewer commercial activities compared to other days. The side barriers that occur also decrease compared to other days, resulting in an

increase in the basic capacity of the road section. The cost of travel time incurred by road users is smaller than other days. Trip attraction and generation on Jalan Pekalipan is higher during the morning to afternoon peak hours due to commercial activities of shops, warehouses, etc., and can also be influenced by the interaction process between surrounding areas.

Pekalipan Street shows that the high level of side obstacles, especially on weekdays, has an impact on road capacity and travel time. This is in line with previous research conducted by (Rama, 2015) which found that commercial activity on urban streets with a predominance of shops and services can reduce road capacity by up to 30% compared to road conditions without side obstacles. In addition, research (Fildhania, 2020) confirms that the presence of street vendors and illegal parking can increase vehicle travel time by 25% in congested trade areas. Thus, the pattern of landuse on Jalan Pekalipan has a direct impact on the level of road service, where road space planning and parking management solutions can be effective strategies for increasing capacity and reducing the level of side obstacles.

CONCLUSION

The conclusion of this reserach shows that the Pekalipan Road area is a center of trade and service activities in accordance with Cirebon City Regional Regulation No. 8 of 2012 concerning the Cirebon City Regional Spatial Plan 2011-2031. These commercial activities cause side obstacles, especially from parked vehicles and the entry and exit of vehicles from the surrounding area, which have a direct impact on road capacity. Based on the results of the analysis, the traffic conditions on Jalan Pekalipan are at Level of Service (LOS) B and C, indicating that the road performance is still conducive and stable, although the side obstacles need special attention so as not to further reduce the road capacity in the future. This reserach contributes as a basis for the formulation of policies related to more effective traffic management and landuse on Jalan Pekalipan. Future research is recommended to project the performance of this road over the next 5 to 10 years to determine whether or not comprehensive traffic engineering is necessary. Thus, it is hoped that the results of further research can provide a more comprehensive picture of the strategic steps that need to be taken in dealing with the increasing development of trade and service activities in this region.

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