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The Effect of Increasing PAD in the Parking Sector on the Plan to Shift On-Street Parking to Off-Street Parking

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Abstract
The growth of economic activity in urban areas often leads to new challenges in transportation management, particularly concerning parking arrangements. On Panglima Sudirman Road, Bojonegoro Regency, the prevalence of on-street parking has significantly reduced road service levels, causing traffic inefficiencies. This research aims to analyze changes in road capacity, evaluate the impact on road performance, and assess the effect on increasing Regional Original Revenue (PAD) following the relocation of on-street parking to off-street facilities. A quantitative research approach was employed using descriptive and comparative analysis methods to evaluate road performance before and after the parking relocation. Data were collected to assess traffic flow, road capacity, and changes in local revenue from parking fees. The results revealed that transferring on-street parking to off-street facilities increased road capacity by 290 smp/hour, from 2,639 smp/hour to 2,929 smp/hour, leading to improved road performance. Additionally, the shift resulted in a significant rise in Regional Original Revenue, with an increase of Rp165,436,250.00 or 43%, due to the expanded parking capacity provided by the off-street lot. These findings highlight the positive impact of optimizing parking management on urban traffic flow and regional income. The research suggests that similar parking strategies could be implemented in other urban areas to improve transportation efficiency and boost local government revenue.

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Introduction
Infrastructure improvements, such as road widening or construction of new facilities, result in reduced congestion and fuel consumption (Wang & Zhong, 2023). These efficiencies contribute to improved industrial performance and reduced carbon emissions (Gao et al., 2021). Studies conducted in Zhejiang, China, show that regions with better transportation networks experience faster economic growth compared to those with inadequate infrastructure (Shi et al., 2024).

Successful development in the economic sector often results in the emergence of new centers of activity as well as the development of existing economic centers (Malizia et al., 2021). This phenomenon will trigger an increase in mobility needs, both for people, goods, and vehicles. Along

with increased mobility, effective and efficient transportation infrastructure is crucial to ensure that the economic and social activities of the community remain unimpeded (Rakhmatullah & Dewi, 2024).

The provision of adequate transportation facilities and infrastructure, such as roads, public transportation systems, and parking facilities, is an important step in meeting mobility challenges (Yannis & Chaziris, 2022). Without improving the quality and quantity of infrastructure, the risk of congestion, reduced productivity, and increased greenhouse gas emissions will be higher (Patil, 2021). Therefore, a safe, affordable and efficient transportation system not only plays a role in facilitating people's daily activities, but also directly contributes to inclusive economic growth (Tucho, 2022).

Concrete steps in transportation planning include the implementation of sustainable transportation strategies, such as the integration of public transportation with private modes of transportation and the transfer of on-street parking to off-street (Mepham, 2023). This aims to reduce road congestion and maximize the use of urban space. The implementation of parking structures or off-street parking systems can also increase local revenue through more regulated and controlled parking rates (Najmi et al., 2021a).

Not only does off-street parking facilitate the flow of vehicles, it also has the potential to increase local revenue from the parking sector (Geremew, 2024a). A centralized parking system allows local governments to implement more effective and transparent pricing policies (Aljohani et al., 2021). In addition, the optimization of parking can reduce the use of public space for parking and open it up for other purposes, such as pedestrian paths or green spaces, which also improves the quality of life of urban communities (Li et al., 2021).

The construction of parking lots as off-street facilities not only relieves traffic, but also promotes city efficiency through better transportation management (Najmi et al., 2021b). This policy is in line with the concept of sustainable cities, which emphasizes the importance of optimal use of space and reduction of carbon emissions due to congestion (Fan & Chapman, 2022).

Increased mobility in urban areas, due to economic development and population growth, demands effective transportation solutions to prevent problems such as congestion and environmental degradation (Ceder, 2021). Moving parking from on-street to off-street (such as parking lots) can contribute to reducing traffic pressure on main roads and improving the efficiency of urban space (Geremew, 2024b). It also has the potential to increase local revenue from the parking sector through optimal land utilization and more controlled parking arrangements (Macea et al., 2023).

The transfer of on-street parking to off-street parking has a positive impact on the city, especially in reducing congestion and increasing local revenue (Geremew, 2024b). In addition to facilitating more efficient space allocation, this policy can also reduce travel time and improve road user convenience. Research shows that cities that successfully implement integrated parking management see significant improvements in community mobility and the effectiveness of public transportation networks (Abbas et al., 2023). This measure is becoming increasingly relevant given the increasing pressure on main roads, especially in centers of economic and social activity.

From an economic perspective, moving on-street parking to off-street can contribute to increased local revenue through more planned and effective parking pricing. More efficient use of parking spaces can increase revenue from parking fees, while providing funds for infrastructure

development and other public services (Campisi et al., 2022). Studies show that areas with good parking facilities often attract more businesses, which in turn increases economic activity in the area (Poliak et al., 2023).

The high level of economic activity along Jalan Panglima Sudirman has increased the demand for parking spaces. A research conducted by Bappeda Kabupaten Bojonegoro in 2022 showed that the average daily parking volume on this road reached 1,200 vehicles, with an average parking duration of 2 hours (Badan Perencanaan Pembangunan Daerah Kabupaten Bojonegoro, 2022). Currently, on-street parking reduces road capacity by 30%, which has a significant impact on the performance of the road.

Improved road performance and better parking management can contribute significantly to increasing local revenue from the parking sector. An organized and well-managed parking system will attract more users to utilize the parking facilities, which in turn will increase local revenue. The construction of parking lots is also expected to boost local economic growth by providing better facilities for commercial activities around the development site.

Overall, the shift from on-street to off-street parking on Jalan Panglima Sudirman is a strategic step in improving the quality of road services and traffic management in Bojonegoro Regency. In addition to providing direct benefits to traffic flow, this move also supports local economic growth, increases local revenue, and ensures safety and convenience for all road users.

Based on the above problems, the purpose of this research is to identify the effect of parking displacement on increasing local revenue (PAD) from the parking sector in Bojonegoro Regency.

Materials and Method

This research uses a quantitative approach with descriptive and comparative analysis methods to evaluate road performance before and after the transfer of on-street parking to off-street, as well as analyzing its effect on Local Own Revenue (PAD) from the parking sector. Data sources in this research were obtained from two sources, namely primary and secondary data sources. Primary data was obtained through direct field surveys, observations, and interviews with relevant parties at the research location. Secondary data is obtained through official documents and historical data from relevant government agencies such as the Regional Revenue Office, the Transportation Office, and other related agencies. The data that has been received is then analyzed using Economic Analysis with the calculation of current on-street parking revenue, projected revenue from parking buildings, and comparative analysis of Regional Original Revenue (PAD) before and after parking transfers.

Results and Discussions

Regional Overview

Bojonegoro Regency is one of the regencies in East Java Province, Indonesia. Bojonegoro Regency is located in the northern part of East Java Province and has an important role in the agricultural sector and natural resources. With an area of 2,527.53 km^2, Bojonegoro Regency is divided into 28 sub-districts with Bojonegoro as its capital.

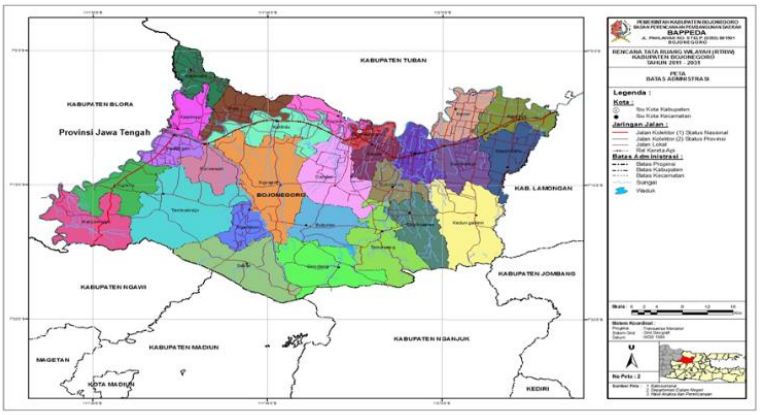

Figure 1. Bojonegoro Map
Source: (Pemkab Bojonegoro, 2024)

Astronomically, Bojonegoro Regency is located between 6.5°-7.3° N (South latitude) and between 111.4°-112.5° E (East longitude). Geographically, it is bordered by Tuban Regency to the north, Lamongan Regency to the west, Nganjuk Regency to the south, and Blora Regency to the east.

Geometric Condition

Road geometric data is data containing the geometric conditions of the studied road segments. This data is primary data obtained from direct road condition surveys:

a. Administration class: City Road
b. Functional Class: Primary Collector Road
c. Road Type: 2/2 UD
d. Total Road Width: 10 m
e. Width per lane: 5 m
f. Types of road pavement: Asphalt
g. Alignment type: Flat
h. Road markings: Available
i. Kereb: There is
j. Shoulder of the road: Available
k. Shoulder width: 1 m
l. Types of road shoulder pavement: Paving

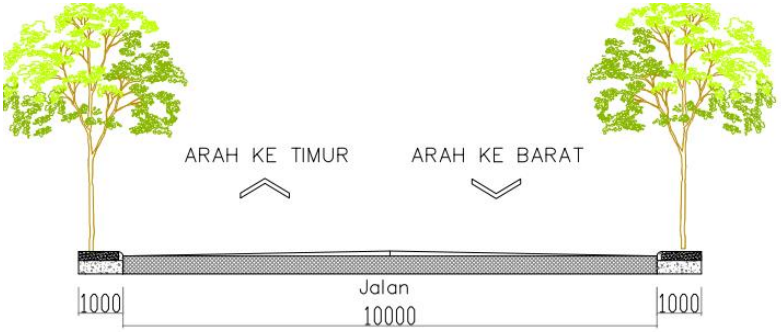

Figure 2. Cross Section
Source: 2024 Survey Results

Figure 3. Documentation of Existing Conditions

Source: 2024 Survey Results

Traffic Volume

To determine the number and type of vehicles traveling on Panglima Sudirman Bojonegoro road, a traffic count survey was conducted. This is to determine the peak hour that occurs on the road section, which will be used as the basis for analyzing the degree of saturation as one of the indicators to determine the level of road performance. With the following survey results.

Table 1. Peak Hour Traffic Volume

Day	Period	Number of Vehicles (vehicles)				Number of Vehicles
		MC	LV	HV	UM	
Sunday	08.00-09.00	1.516	488	165	260	2.429
Monday	06.45-07.45	1.616	532	174	269	2.591
Wednesday	07.00-08.00	1.531	506	165	276	2.478
Saturday	08.00-09.00	1.537	488	165	260	2.450
Total		6,200	2,014	669	1,065	9.948

Source: 2024 Survey Results

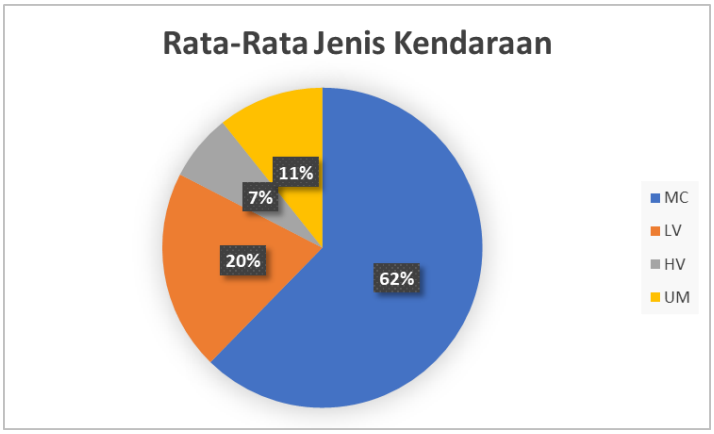

Figure 4. Vehicle Type Chart
Source: 2024 Survey Results

From the graph above, it is known that the types of vehicles passing on Panglima Sudirman Bojonegoro road during peak traffic hours are dominated by MC vehicles by 62%, LV by 20%, UM by 11% and the smallest HV by 7%.

Traffic Speed Condition

By using a *spot speed* vehicle speed data collection survey, namely the speed at a certain point by means of distance divided by time, the speed at the desired point is obtained with the following results.

Table 2. Average Vehicle Speed

No.	Vehicle Type	Average Speed (Km/h)
1	Motorcycle	35.5
2	Car	31.8
3	Truck/Bus	29.5
	Average	32.6

Source: 2024 Survey Results

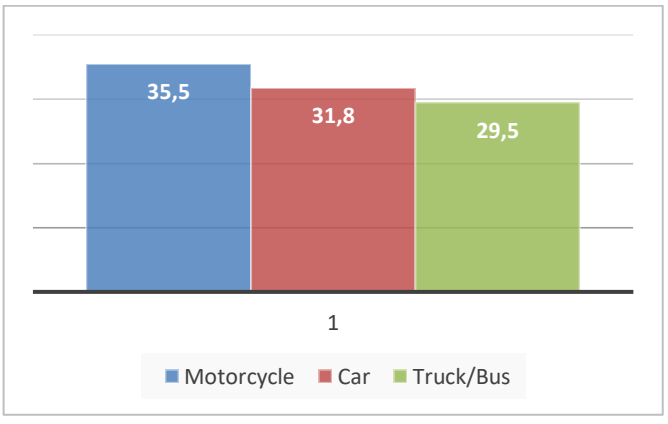

Figure 5. Speed Chart
Source: 2024 Survey Results

From the graph above, it is known that the highest average speed passing on Panglima Sudirman Bojonegoro road at peak traffic hours is dominated by Motorcycle vehicles of 35.5 km/hour,

Cars 31.8 km/hour and Trucks 29.5 km/hour.

Analysis of Annual Revenue from On Street Parking Retribution

According to the calculation data above and Bojonegoro Regency Regional Regulation Number 5 of 2023 concerning Regional Taxes and Levies, the structure and amount of public service retribution rates for public roadside parking services are used to collect parking retribution using the Flat Rate method with a 2 (two) wheel vehicle tariff of Rp.2000, - while a 4 (four) wheel vehicle is Rp. 3000, - then the parking revenue results are as follows:

RP = Average number of vehicles (2-wheelers) x rate
RP = 275 x Rp 2,000
RP = Rp 550,000,-/day
RP = Rp 550,000 x 365
RP = IDR 200,750,000,- / year

Table 3. On Street Parking Contribution Survey Time

No	Jenis Kendaraan	Jumlah Kendaraan Rata-rata (Kend/Hari)	Tarif Parkir	Pendapatan Perhari (Rp)	Pendapatan Setahun (Rp)
1	Roda 2	275	2.000	549.000	200.385.000
2	Roda 4	106	3.000	318.750	116.343.750
Total Pendapatan Asli Daerah Tahunan					316.728.750

Source: 2024 Analysis Results

Based on the parking revenue table above, the total local revenue through parking based on the on street survey time is IDR 316,728,750 per year.

Analysis of Annual Revenue Estimation from Off Street Parking Retribution

Based on the plan to move parking to the offset lane, a simulation alternative is used where there are 65 4-wheel parking plots and 13 rows (563 plots) of 2-wheel parking. The parking tariff is made the same according to Bojonegoro District Regulation No. 5 of 2023 concerning the structure and amount of public service retribution tariffs for public roadside parking services, namely 2 wheels at Rp 2,000 and 4 wheels at Rp 3,000.

Table 4. Parking Retribution for Off Street Parking Simulation

No	Jenis Kendaraan	Jumlah Kendaraan Rata-rata (Kend/Hari)	Tarif Parkir	Pendapatan Perhari (Rp)	Pendapatan Setahun (Rp)
1	Roda 2	563	2.000	1.126.000	410.990.000
2	Roda 4	65	3.000	195.000	71.175.000
Total Pendapatan Asli Daerah Tahunan					482.165.000

Source: 2024 Analysis Results

Based on the figure above, it can be seen that with the off street parking plan, in 1 year there is a total local revenue of Rp 482,165,000. In relation to the two local revenue calculation analyses above, there is a positive difference between the amount of on street parking PAD and off street PAD of Rp 165,436,250. Compared to the existing PAD value, the PAD after the relocation has increased by 34%. This shows that the plan to move on-street parking to off-street has a positive effect on local revenue.

Conclusion

The conclusion of this research shows the results of traffic performance calculations on the Panglima Sudirman Bojonegoro road. The transfer of parking from on-street to off-street parking increased parking revenue by IDR 165,436,250.00 or 43%, due to the availability of more parking space on off-street land. This research contributes to the future by providing an empirical basis for the development of more optimal parking management policies and the provision of more efficient parking lots. In addition, these findings encourage the application of technological solutions in intelligent parking systems to increase local revenue and operational efficiency, as well as facilitate further research related to dynamic pricing models and transportation system integration. Thus, this research is expected to improve the quality of traffic management and public services, while having a positive impact on increasing local revenue. The findings imply that effective parking management strategies, such as transferring from on-street to off-street parking, can lead to both improved traffic flow and increased local government revenue. The implementation of technological innovations in parking systems and integration with other transportation models will enhance service efficiency and sustainability. It is suggested that future studies explore the long-term effects of intelligent parking systems on traffic patterns, local businesses, and community mobility. Additionally, research into the application of dynamic pricing models and the expansion of off-street parking facilities could further optimize parking management and contribute to more sustainable urban development.

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