

The Phenomena of On-Street Parking at Kadipaten Traditional Market, West Java

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Abstract

Congestion in Indonesia is a complex problem to overcome, caused by the large number of vehicles that are not matched by optimal road capacity and management. This often happens in community activity centers that are forced to park on the street with many vehicles that are not matched by optimal road capacity and management. This often happens in community activity centers that are forced to park on the street. This study aims to analyze the impact of on-street parking. The data was taken at the duchy's traditional market in West Java, Indonesia. The research method used is qualitative, carried out directly or through field surveys, referring to ICHM 1997. The results and conclusions show that on-street parking affects on-road performance in the Traditional Market Kadipaten.

Keywords: On-street parking, Road Performance, Traditional Markets

1. Introduction

Road congestion in crowded places such as urban areas is caused by drivers having difficulty finding parking spaces, with severe environmental and economic consequences (Bock, Di Martino, & Origlia, 2019). On-street parking management in urban areas has long been a problem, with a direct impact on accessibility access to public spaces and the livability of the built environment; fighting an existing problem is not a common problem approach (Piccioni, Valtorta, & Musso, 2019). This condition occurs in almost all countries worldwide because many drivers still park their vehicles on the road. This is not entirely the driver's fault, but it could be due to the need for adequate special parking spaces so the driver is forced to park on the road. However, there are still many naughty drivers who deliberately park on the road because the particular parking area is a bit far away, which impacts traffic jams in that area. This phenomenon is referred to as On-Street Parking or parking on the side of the road.

Congestion is one of the problems in developing countries like Indonesia. As a result of massive urbanization, the volume of traffic in urban areas is growing, making urban life very congested and polluted, causing many negative impacts on human life, such as higher energy consumption, global warming, and airborne diseases (Abdeen, Nemer, & Sheltami, 2021). Congestion in Indonesia is a problem that is difficult to overcome. Congestion is a situation or condition of stagnation or even cessation of traffic caused by the large number of vehicles exceeding the capacity of the road. Traffic jams are often experienced in big cities in Indonesia, such as Jakarta, Surabaya, Malang, Bandung, Sidoarjo, and others (Nur, Wulan, & Fadil, 2020). Congestion is caused by road areas that cannot accommodate the number of vehicles, indiscriminate parking, traffic chaos, lack of public transportation, flooding, availability or damage to roads, and traffic accidents.

Majalengka is one of the regencies in Indonesia, precisely in the province of West Java. Majalengka is one of the areas prone to congestion, including an arterial road near the Duchy traditional market area.

The existence of on-street parking for two and four-wheeled vehicles at several points in the Duchy market makes it difficult for other vehicles to move forward and causes congestion in the area. The impact of on-street parking cannot be ignored. This has an impact in several ways, such as traffic accidents, congestion, increased pollution, or increased duration of time because drivers have to wait for parking (Khaliq, van der Waerden, Janssens, & Wets, 2019).

On-street parking is parking along the road body with or without widening the road for parking barriers. To benefit from the internet and Information Communication Technology (ICT), many municipalities have started the concept of "Smart Cities" with the deployment of advanced ICTs aimed at providing their citizens with a better life experience (Wong, et al., 2018). Everyone is prohibited from using the road benefit space, which results in the disruption of road functions. Interfere with the function of the road, for example, to park the vehicle for purposes other than emergencies. It is true that some parking facilities make use of the space available on the road, but only on roads designated by the local government based on parking control zoning.

From the problems above, it can be concluded that parking on the road is only intended for emergencies. The goal of sustainable transportation in smart cities is to ensure the efficient movement of traffic while minimizing the negative impact on the environment and public health (Kurek & Macioszek, 2021). The research was conducted in the arterial road area in front of the duchy traditional market where there is the on-street parking phenomenon. This study aims to analyze the impact of on-street parking on on-road performance. The results of this study can be used as joint learning and also provide solutions to the problem of the on-street parking phenomenon in the Duchy traditional market area.

2. Literature Review

2.1 On-Street Parking

On-street or street parking is a common form of parking because it is efficient in land use and convenient for motorists. After all, they can park their vehicles close to their destination of the driver. On-street parking has several benefits depending on certain situations and circumstances. There are many questions about whether parking on the street is permitted because, from the public's perspective, on-street parking has more benefits than disadvantages. Before allowing or limiting parking on the street, one must first study the different consequences of that (Biswas, Chandra, & Ghosh, 2017).

In most cities in the world, parking is considered to be a big problem due to various reasons, such as an increase in population size, number and size of vehicles, limited parking spaces, traffic congestion on roads, location of parking lots, etc. (Saharan, Kumar, & Bawa, 2020). In many urban areas, illegal parking is a common problem. Illegal parking is one of the factors that endanger motorists in traffic. Illegal parking on public roads in big cities is caused by various factors, including limited public roadside parking due to provisions for public parking, parking attendants who take advantage of illegal parking locations, lack of coordination between related agencies, and unreasonable parking fees. By established regulations. The condition of parking services that are not good causes disturbances in the form of congestion that occurs due to traffic irregularities. Parking occupancy and time duration are the two leading indicators to determine parking efficiency (Shao, et al., 2018).

One solution to reduce illegal parking is to control the problem by issuing roadside parking restrictions. Outreach to the public about the dangers of illegal parking can also be a solution by approaching the community and educating them. Another solution is to reduce the use of private vehicles by switching to public transportation to reduce parking needs. Although designated parking lots have increased in most metropolitan areas, parking lots still frequently fail to accommodate vehicles during rush hour (Marsden, 2018).

2.2 Road Performance

Road performance is strongly influenced by traffic flow on a particular road section (Septiansyah, M., & N., 2018). In Majalengka, to be precise, at the Kadipaten Traditional Market, there has been an on-street parking phenomenon that has resulted in traffic jams. Some of the problems that occur are public

transportation that stops and parks on the road. These problems result in road performance that could be more optimal, causing traffic jams. Braiding capacity plays a vital role in traffic roundabout planning, especially in mixed traffic, with the traffic composition being dominated by motorcycles (Sugiarto, Faisal, & Reyhan, 2019).

Means of Transportation need a place to stop. If not appropriately served, it can disrupt traffic flow and cause congestion (Sulistiyono, Sulistio, & Badriani, 2018). Traffic flow is one of the factors that affect road performance. Vehicle traffic flow is the number of motorized vehicles that pass a point on the road per unit of time expressed in vehicles/hour, junior high school/hour, or LHRT (Annual Average Daily Traffic) (IHCM, 1997). Urban road traffic flow is divided into four types. The first is Light Vehicle (LV), which includes two axle four-wheeled motorized vehicles with axles distance of 2.0-3.0 m (including passenger cars, jitters, minibuses, pickups, and small trucks according to the Bina Marga classification system). The second is heavy vehicles (HV), which include motorized vehicles with an axle distance of more than 3.5 m, usually with more than four wheels (including buses, two-axle trucks, three-axle trucks, and combination trucks according to the Bina Marga classification system). Thirdly, there are Motor Cycle (MC) and two- or three-wheeled motorized vehicles (including motorbikes and three-wheeled vehicles according to the Highways classification system). Finally, there are non-motorized vehicles (UM), wheeled vehicles that use human or animal power (including bicycles, rickshaws, horse carriages, and strollers according to the Bina Marga classification system). The effect of the presence of non-motorized vehicles is included as a separate event in the side drag adjustment factor. Congestion will hurt drivers or road users because of the long travel time (Akbar, Paresa, & Pamuttu, 2021).

The free flow speed is the theoretical average speed (Km/h) of traffic at a density equal to zero, i.e. no vehicles pass. The free flow speed is the speed (km/hour) of the vehicle that is not affected by other vehicles, the speed at which the driver feels comfortable traveling, in geometric conditions, the environment, and existing traffic arrangements, on a road segment where there are no other vehicles (Ranto, Rumayar, & Timboeleng, 2020). The capacity of a road section in a road system is the maximum number of vehicles that have sufficient possibilities to pass on that road (in one or both directions) in a given period and under public road and traffic conditions. (Septiansyah, M., & N., 2018). The degree of saturation is the ratio of current (pcs/hour) to capacity (pcs/hour). It is a critical factor in assessing and determining a road segment's performance level. (IHCM, 1997). The degree of saturation value indicates whether the road segment will have capacity problems (Ranto, Rumayar, & Timboeleng, 2020).

2.3 Traditional Market

More than half of the global population currently lives in urban areas. The World Health Organization estimates that the population in urban areas will continue to grow by 1.5% per year until 2030 (WHO, 2010) (Cleophas, Cottrill, Ehmke, & Tierney, 2019). The possible consequences of congestion, pollution, and vehicle noise but also a more extensive customer base and business opportunities for economies of scale. Moving cargo between and within cities while keeping residents safe and having a high quality of life is a significant challenge for urban planners and logistics providers.

Logistics and transport enable economic development but are traditionally less efficient in cities, and urban areas are characterized by the interaction of people with different interests nearby (Rose, J., Bell, Autry, & Cherry, 2017). Nevertheless, significant cities continue to develop the transportation sector. The obstacles are low load factors, long journeys, long waiting times, limited waiting points, and many deliveries to the customers themselves. (Cepolina & Farina, 2015).

Accelerating industrialization worldwide leads to higher rates of economic growth, incomes, and living standards of the population, as well as continued growth in private car ownership (Parmar, Das, & Dave, 2020). Transportation in the duchy traditional market is divided into two. The first is public transportation which takes passengers from the waiting point to the market. We can use public transportation again to return home or order a motorcycle taxi at the base as another alternative. The use of these two forms of transportation can be an effort to reduce road congestion and can also reduce the use of parking requests for private vehicles. However, in reality, many market visitors still use private vehicles

because it is simpler and easier to travel, and they can even reduce financial expenses because they do not have to pay for public transportation and motorcycle taxis. Due to the increase in private vehicles and the lack of sufficient parking space, parking has become a significant problem in urban transportation (Das & Ahmed, 2018).

3. Methodology

This study uses primary data, secondary data, and other supporting data. Primary data were obtained from surveys and measurements in the field. Field data and actual conditions were obtained from the survey conducted in the study area. The research location was chosen in an attractive, on-street parking area. The research area is in the Kadipaten Traditional Market, Majalengka, as shown in figure 1. Meanwhile, secondary data collection was carried out in collaboration with related agencies. The data is in the form of On-street parking location maps, Road Situation Maps, On-Street Parking Floor Plans, and Street Geometry.

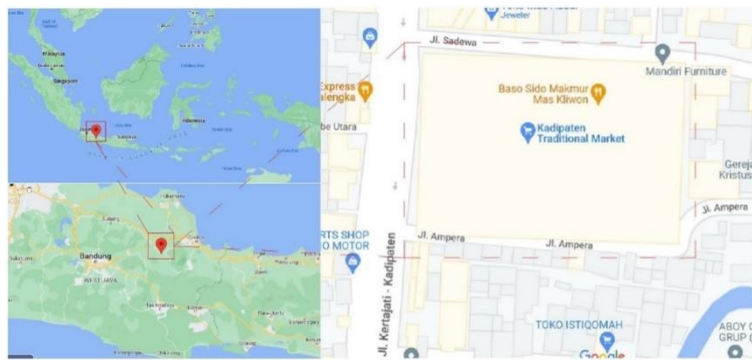


Figure 1. Intersection Locations

Data collection was carried out on Sunday, starting at 06.00 to 18.00 WIB. The choice of schedule is because Sunday is the peak crowd of visitors.

4. Result and Discussion

The Kadipaten Traditional Market, Majalengka, West Java, is a shopping center area and community activity center. As a result, several two-wheeled and four-wheeled vehicles are parked on the road, and other vehicles are crossing the road. The situation of on-street parking in the study area can be seen in figure 2.



Figure 2. On-Street Parking Phenomenon in Kadipaten traditional market

Furthermore, the number of users on-street parking in traditional markets tends to peak in the morning. The highest parking accumulation condition is because the main activity in the traditional market

is trading transactions for daily necessities such as vegetables and staple foods. The survey results and calculations show that the peak parking accumulation was found at 9 o'clock, as seen in figure 3.

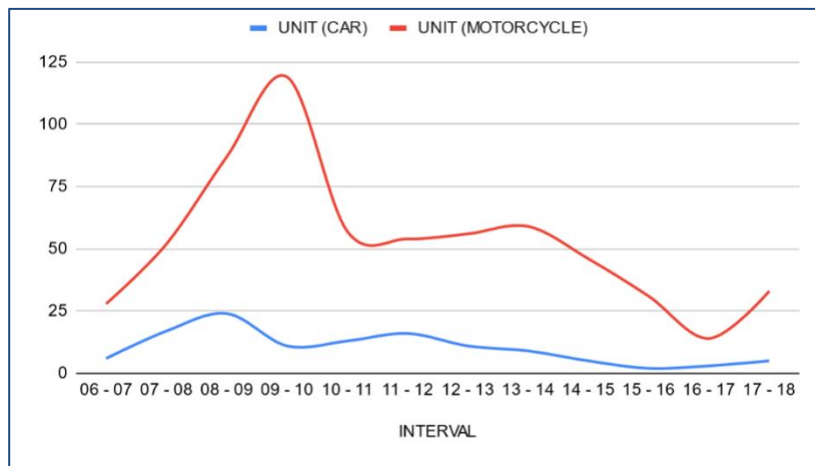


Figure 3. Graph of Motorcycle & Car Parking Accumulation

The comparison of the parking accumulation graph above shows the accumulation of motorbike and car parking at the Duchy traditional market on Sunday, November 20, 2022. The highest peak hours for motorbikes occur at 09.00-10.00, while the highest peak hours for cars occur at 08.00-09.00. It can be seen that there are 119 parking lots at the Kadipaten Traditional Market, Majalengka, West Java, for motorcycles and 24 for cars. Whereas parking volume figure 4 below shows the results of on-street parking volume in the traditional market area.

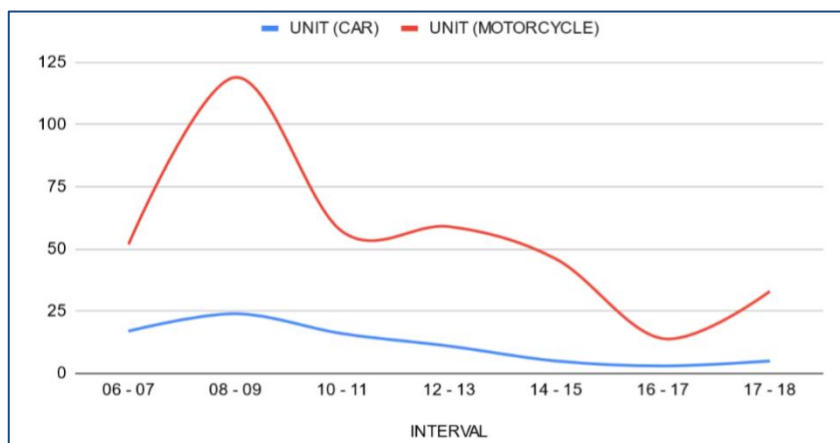


Figure 4. Graph of Motorcycle & Car Parking Volumes

The comparison of the parking volume graph above shows the volume of motorcycle and car parking at the Duchy traditional market on Sunday, November 20, 2022. The highest peak hours for motorbikes occur at 09.00-10.00, while the highest peak hours for cars occur at 08.00-09.00. Therefore, it can be seen that the total parking at the Kadipaten Traditional Market, Majalengka, West Java is 119 for motorbikes and 24 for cars. Furthermore, the parking index can see in figure 5.

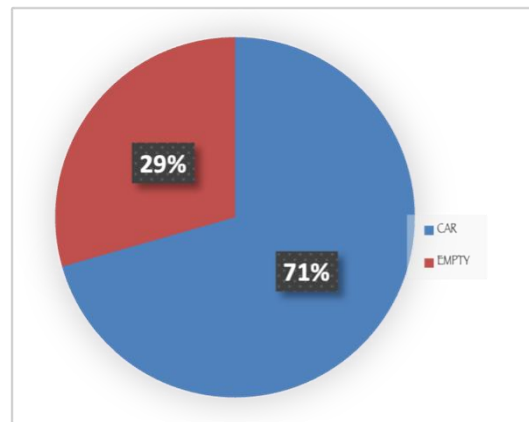


Figure 5. Car Parking Index

The summary of the most significant overall averages taken on Sundays for cars and motorcycles is as follows Car parking is about 71% < 100%. However, Motorcycle parking is around 114% > 100%. From the results of this analysis, it was concluded. The results of the average parking index showed that four-wheeled vehicles were less than 100%, while two-wheeled vehicles were more than 100%. Therefore, the parking capacity in the Duchy's traditional market was insufficient to meet parking needs. Based on the parking index section above 100%, this is suspected because the observation was carried out on Sunday, when Sunday is the peak day of the crowd at the Duchy traditional market. Furthermore, parking Duration can be seen in figure 6. This figure shows the duration of on-street parking in the market area.

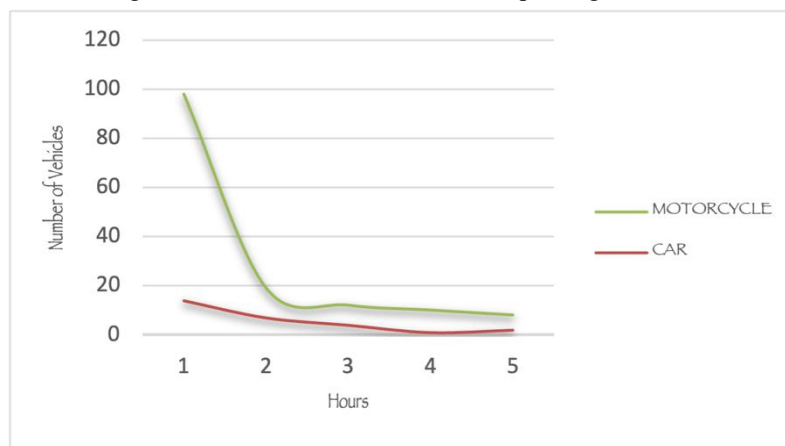


Figure 6. Parking Duration Graph

The conclusion from the parking duration graph taken on Sunday is that more motorists park their vehicles in under 1 hour. In contrast, only a small proportion of motorists parked their vehicles for more than an hour. Furthermore, about turn over parking car is 0,71 and motorcycle is 1,04. Earned turnover Rate: According to the calculations, the use of parking spaces, the turnover rate of parking space usage, and the maximum motorcycle turnover rate obtained on Sundays are 1.04 vehicles per day per space and 0.71 vehicles per day per room, respectively.

5. Conclusion

Based on the results of the data analysis that has been carried out in this study, the conclusion is that the highest accumulation for motorcycles was 119 units. In comparison, the highest accumulation for cars was 24 units. For the highest parking volume, it was 119 for motorbikes and 24 for cars. The average duration of vehicle parking is 1 hour for motorbikes and 1 hour for cars. Therefore, the parking space capacity is still sufficient for cars, while for motorcycles, it is still insufficient. The parking index obtained

from data collection on Sunday, November 20, 2022, is 71% <100% for cars and 114% > 100% for motorbikes. This shows that more than the capacity of the parking space provided for motorbikes is needed. Based on the analysis results, road performance is slightly affected, especially at 09.00-10.00 WIB when parking accumulation reaches a peak, resulting in traffic jams at the Duchy Traditional Market.

Bibliography

- Abdeen, M., Nemer, I., & Sheltami, T. (2021). A Balanced Algorithm for In-City Parking Allocation: A Case Study of Al Madinah City. *Sensors*, 3148.
- Akbar, M., Paresa, J., & Pamuttu, D. L. (2021). Analysis of the Effect of Parking on Road Bodies on Road Service Levels. *In IOP Conference Series: Materials Science and Engineering*, Vol. 1125, No. 1, p. 012014.
- Biswas, S., Chandra, S., & Ghosh, I. (2017). Effects of on-street parking in urban context: A critical review. *Transportation in developing economies*, 1-14.
- Bock, F., Di Martino, S., & Origlia, A. (2019). Smart parking: Using a crowd of taxis to sense on-street parking space availability. *IEEE Transactions on Intelligent Transportation Systems*, 21(2), 496-508.
- Cepolina, E. M., & Farina, A. (2015). A new urban freight distribution scheme and an optimization methodology for reducing its overall cost. *European Transport Research Review*, 7(1), 1-14.
- Cleophas, C., Cottrill, C., Ehmke, J. F., & Tierney, K. (2019). Collaborative urban transportation: Recent advances in theory and practice. *European Journal of Operational Research*, , 801-816.
- Das, D., & Ahmed, M. A. (2018). Level of service for on-street parking. *KSCE Journal of Civil Engineering*, 22(1), 330-340.
- IHCM. (1997). *Indonesian Highway Capacity Manual*. Jakarta: Directorate General of Highway, Indonesia.
- Khaliq, A., van der Waerden, P., Janssens, D., & Wets, G. (2019). A conceptual framework for forecasting car driver's on-street parking decisions. *Transportation Research Procedia*, 37, 131-138.
- Kurek, A., & Macioszek, E. (2021). Impact of Parking Maneuvers on the Capacity of the Inlets of Intersections with Traffic Lights for Road Traffic Conditions in Poland. *Sustainability*, 432.
- Marsden, G. (2018). The Evidence Base for Parking Policies. *A Review White Rose Research Online*.
- Nur, B., Wulan, N. D., & Fadil, M. (2020). Efektivitas Program RTTIC Dan ATCS untuk Mengatasi Kemacetan di Kota Malang (Studi Kasus: DISHUB Kota Malang). *Prosiding Simposium Nasional "Tantangan Penyelenggaraan Pemerintahan di Era Revolusi Industri 4.0"*, 357-373.
- Parmar, J., Das, P., & Dave, S. M. (2020). Study on demand and characteristics of parking system in urban areas: A review. *Journal of Traffic and Transportation Engineering (English Edition)*, 7(1), 111-124.
- Piccioni, C., Valtorta, M., & Musso, A. (2019). Investigating effectiveness of on-street parking pricing schemes in urban areas: An empirical study in Rome. *Transport Policy*, 80, 136-147.
- Ranto, W., Rumayar, A. L., & Timboeleng, J. A. (2020). Analisa Kinerja Ruas Jalan Menggunakan Metode Manual Kapasitas Jalan Indonesia (MKJI) 1997. *Jurnal Sipil Statik*, , 8(1).
- Rifai, A. I., Hadiwardoyo, S. P., Correia, A. G., & Pereira, P. A. (2016). Genetic Algorithm Applied for Optimization of Pavement Maintenance under Overload Traffic: Case Study Indonesia National Highway. *Applied Mechanics and Materials (Vol. 845)*, pp. 36.
- Rifai, A. I., Hadiwardoyo, S. P., Correia, A. G., Pereira, P., & Cortez, P. (2015). The data mining applied for the prediction of highway roughness due to overloaded trucks. *International Journal of Technology*, 6(5), 751-761.
- Rifai, A. I., Surgiarti, A. Y., Isradi, M., & Mufhidin, A. (2022). Analysis of Road Performance and the impact of Development in Pasar Minggu, Jakarta : Case Study of Jalan Lenteng Agung-Tanjung Barat. *ADRI International Journal of Civil Engineering*, 68-74.
- Rifai, A. I., & Hafis, K. (2020, May). Analysis of Road Performance and Vehicle Parking Characteristics in the Halim Perdanakusuma International Airport Area. In *Journal of World Conference (JWC)* (Vol. 3, No. 1, pp. 89-98).
- Rifai, A.I., Wibowo, T., Isradi, M., & Mufhidin, A. (2021) On-Street Parking and Its Impact on Road Performance: Case Commercial Area in Jakarta City. *World Journal of Civil Engineering* Vol. 1 No.

- 1, pp. 10-18
- Rose, J. W., Bell, J. E., Autry, C. W., & Cherry, C. R. (2017). Urban logistics: Establishing key concepts and building a conceptual framework for future research. *Transportation Journal*, *56*(4), 357-394.
- Saharan, S., Kumar, N., & Bawa, S. (2020). An efficient smart parking pricing system for smart city environment: A machine-learning based approach. *Future Generation Computer Systems*, *106*, 622-640.
- Septiansyah, M., M. V., & N., W. D. (2018). Analisa Kinerja Ruas Jalan Medan Merdeka Barat, DKI Jakarta. *Jurnal Kajian Teknik Sipil*, 110-115.
- Shao, W., Zhang, Y., Guo, B., Qin, K., Chan, J., & Salim, F. D. (2018). Parking availability prediction with long short term memory model. . In *International conference on green, pervasive, and cloud computing*, pp. 124-137. Springer, Cham.
- Sugiarto, S., Faisal, R., & Reyhan, M. (2019). Pengaruh sepeda motor terhadap kapasitas bagian jalinan pada perencanaan bundaran di Simpang Tujuh Ulee Kareng. *Teras Jurnal*, *8*(2), , 416-425.
- Sulistiyono, S., Sulistio, H. D., & Badriani, R. E. (2018). On street parking and its impact on road performance. . In *MATEC Web of Conferences*, (Vol. 181, p. 06008). EDP Sciences.
- Wong, M., Wang, T., Ho, H., Kwok, C., Lu, K., & Abbas, S. . (2018). Towards a Smart City: Development and Application of an Improved Integrated Environmental Monitoring System. . *Sustainability*, 623.