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# Traffic Management and Engineering Based on Traffic Modeling in the Gilingan Area, Banjarsari, Surakarta City

**Lutfi Mohammad Hakim**
Universitas Muhammadiyah Surakarta, Indonesia
Email: lmohammadhakim@gmail.com

**ABSTRACT**

This study examines the traffic performance in the Gilingan area, Banjarsari District, Surakarta City, which has experienced rapid growth following the construction of the Masjid Raya Syeikh Zayed and the planned Islamic Center. The existing conditions reveal daily congestion, particularly along Ahmad Yani and S. Parman roads, due to road narrowing and limited crossing infrastructure. To address these issues, the study employed field surveys and secondary data analysis, including traffic volume measurements, V/C Ratio calculations based on the Indonesian Road Capacity Guidelines (*Pedoman Kapasitas Jalan Indonesia* - PKJI) 2023, and microsimulation using VISSIM. Three *traffic management and engineering* intervention scenarios were tested: (1) optimizing APILL, installing medians, and constructing sidewalks; (2) enforcing parking regulations and optimizing integrated parking facilities with public transport; and (3) implementing a one-way system through a Giratory System. Results indicate that Scenario 3 provides the most significant improvement, with the V/C Ratio reduced from 0.51 to 0.49, an increase in average road speed, a reduction in intersection delay from 23.59 seconds per vehicle to 13.98 seconds per vehicle, and a substantial decrease in congestion cost. These findings affirm that the one-way system is the optimal solution for enhancing traffic service in the Gilingan area, offering valuable insights for transportation policy-making.

**KEYWORDS** Gilingan Area; Traffic Management; Traffic Engineering; Intervention Scenarios; V/C Ratio, VISSIM Simulation; Congestion; Cost of Congestion.

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## INTRODUCTION

The Gilingan area, located in Banjarsari District, Surakarta City, has undergone rapid development over the past two years. This growth is largely driven by the construction of the Sheikh Zayed Grand Mosque and the planned Islamic Center, both of which have become major landmarks. The mosque alone attracted approximately 3 million visitors in 2023 (Wicaksono, 2024), making it a significant religious and cultural destination. These developments, while beneficial economically and spiritually, have also intensified traffic congestion along major roads such as Ahmad Yani and S. Parman due to limited road width and inadequate crossing infrastructure (Dinas Perhubungan Surakarta, 2024). Although several studies, including Hermawan (2016) and Lubis et al. (2021), have addressed urban traffic management issues in Indonesia, many lack detailed modeling approaches to assess multiple policy intervention scenarios.

Since it began operating in 2022, the Sheikh Zayed Grand Mosque has become a magnet for religious tourism. Reports note that weekly visitors can reach 20,000, with peak numbers during Eid reaching 40,000 in a single day (Wicaksono, 2024). This influx has significantly impacted local traffic patterns and urban mobility. Observational data show daily traffic congestion in the Gilingan area, especially on weekends, with vehicle queues extending for tens of meters. This issue is exacerbated by structural constraints such as the narrow underpass and limited vertical clearance near the railway crossings at Gilingan Viaduct and the Balapan plot (BPS Kota Surakarta, 2024). A recent survey estimated the traffic volume in the area at 985 smp/hour, with a V/C ratio of 0.64, indicating Level of Service (LOS) C (Dinas Pekerjaan Umum dan Penataan Ruang Kota Surakarta, 2024).

The government has recognized the potential of the Gilingan area as a cultural and religious hub. As a continuation of diplomatic relations and religious collaboration, the third President of the United Arab Emirates donated the development of an Islamic Center to be located near the mosque. This center is planned to function as a facility for Islamic education, religious coaching, content development, recitation, da'wah, and Islamic culture dissemination (Kementerian Agama RI, 2024). The presence of both the mosque and Islamic Center is expected to elevate the strategic importance of Gilingan within Surakarta's urban framework, while simultaneously demanding better urban planning and infrastructure management (Setiadi & Wibowo, 2023).

Urban infrastructure in religious tourism destinations must adapt to the increasing flow of visitors. Studies suggest the need for integrated traffic engineering strategies, such as adaptive traffic signal systems, alternative road development, and improved pedestrian infrastructure to support safe and efficient access to religious sites (Sutanto et al., 2020; Yuliani et al., 2021). Moreover, urban planners are encouraged to use microsimulation models and scenario-based policy analysis to anticipate future traffic patterns under different development projections (Mulyani et al., 2022). If not addressed comprehensively, the strain on the Gilingan area's infrastructure may offset the socioeconomic benefits brought by these large-scale religious projects (Rahmawati & Prabowo, 2021; Nugroho et al., 2023).

So, the question that arises is management and engineering and then what needs to be prepared to improve traffic performance in the future. This research will focus on traffic modeling with various alternative traffic management and engineering scenarios so that stakeholders and the public are able to understand the potential positive and negative impacts caused by Traffic Management and Engineering before later being applied in the field

This study fills a critical research gap by employing advanced traffic modeling techniques—specifically VISSIM microsimulation and V/C Ratio analysis based on the Indonesian Road Capacity Guidelines (PKJI) 2023—to test and compare three distinct traffic management and engineering scenarios in Gilingan. While prior research, such as the work of Apriansyah et al. (2018) on intersection gaps and Munawar (2005) on transportation basics, has laid foundational knowledge, our approach uniquely integrates field surveys, secondary data, and dynamic simulation to provide actionable insights. The novelty of this study lies in its systematic evaluation of scenarios, including APILL optimization, parking regulation enforcement, and a one-way Giratory System, to identify the most effective solution for reducing congestion and improving traffic flow.

This study aims to achieve several main objectives to answer the problem formulation that has been identified, namely analyzing traffic performance in the Gilingan area, Banjarsari District, Surakarta City; analyze changes in service levels with several traffic management and engineering scenarios; provide an overview of the amount of congestion costs based on these scenarios; and provide optimal traffic management and engineering solutions to improve regional services. With the achievement of these goals, this research is expected to provide a strategic picture of traffic management and engineering that can be applied to improve the performance of the road network in the Gilingan area, so that the results of this research can be considered in policy making. The findings are expected to contribute not only to local transportation policy but also to broader discussions on urban traffic management in rapidly developing

## RESEARCH METHOD

This research employed a mixed-method approach to analyze traffic performance in Gilingan area, combining field surveys, secondary data analysis, and microsimulation modeling. The selected roads and intersections - including Ahmad Yani Road, S. Parman Road, and Kapten Piere Tendean Road - were chosen based on their high traffic density, geometric constraints, and functional importance as key congestion points near the Sheikh Zayed Grand Mosque. Primary data collection was conducted on Thursdays, representing the 85th percentile of weekly traffic (610,827 vehicles/day), supplemented by secondary data on road geometry and land use from local government sources.

For the VISSIM microsimulation model, careful calibration was performed to ensure accuracy in replicating real-world conditions. The model incorporated precise road layouts from Google Maps and drone imagery, along with observed vehicle composition and driver behavior parameters aligned with Indonesian traffic norms from PKJI 2023. Validation involved comparing simulated V/C ratios against field measurements from 19 road segments, with statistical tests confirming model reliability (P = 0.49 > 0.05 for homogeneity, t-stat = 0.0447 within critical bounds). The model achieved over 90% accuracy in predicting intersection delays and speeds when validated against actual field measurements.

Three distinct intervention scenarios were then simulated: APILL optimization with infrastructure improvements, parking regulation enforcement with public transport integration, and a one-way Giratory System implementation. Each scenario was evaluated using multiple performance metrics including V/C Ratio, average speed, intersection delay, and congestion costs, with results compared against both PKJI 2023 guidelines and the dynamic VISSIM simulations. This comprehensive methodology ensured the study's findings would provide reliable, actionable insights for traffic management in the Gilingan area.

## RESEARCH RESULTS AND DISCUSSION

### Data Acquisition Results

In traffic studies, the selection of days for data collection is one of the important aspects to ensure the representativeness of the data produced. Based on the analysis of the traffic volume of one week in Surakarta City taken from the detector camera of the Central Control Room of the Surakarta City Transportation Office, the data taken on Thursday was chosen because it had the traffic volume closest to the 85th percentile value of the volume distribution in one week.

The daily traffic volume for one week in Surakarta City is as follows:

**Table 1. Volume of Diving Vehicles in One Week**

| DAY | VEHICLE VOLUME (Vehicles/day) | Percentage | PERCENTIL 85% (Vehicle/day) |
|---|---|---|---|
| Monday | 591,458 | 14.33% | 613,173 |
| Tuesday | 585,030 | 14.17% | |
| Wednesday | 605,879 | 14.68% | |
| Thursday | 610,827 | 14.80% | |
| Friday | 634,287 | 15.37% | |
| Saturday | 575,842 | 13.95% | |
| Sunday | 524,303 | 12.70% | |
| Total | 4,127,626 | 100% | |

Source: Secondary data from the *detector camera of the Central Control Room* at the Surakarta City Transportation Office, 2024

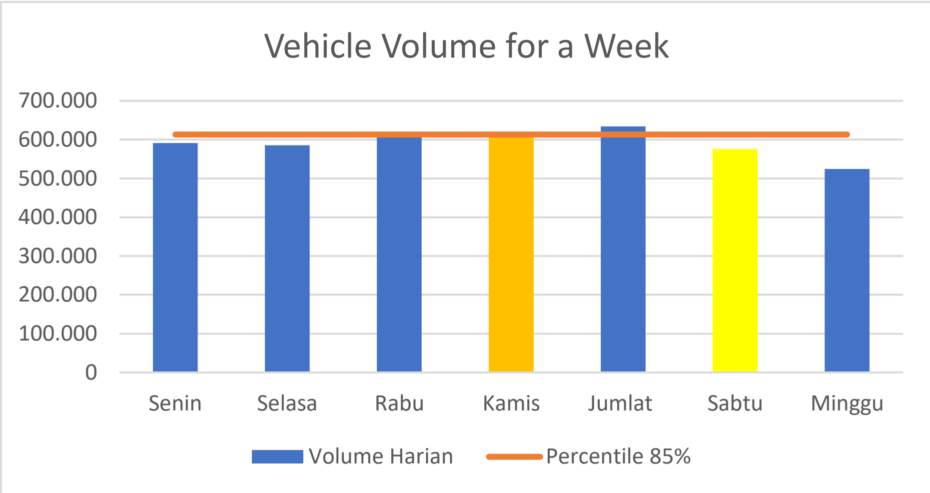


**Figure 1. Vehicle Volume in a Week**
Source: Analysis of primary and secondary data from the Surakarta City Transportation Office, 2024

From the data above, the 85th percentile value of weekly traffic volume is 613,173 vehicles, and the traffic volume on Thursday of 610,827 vehicles is the closest value to the 85th percentile compared to other days. This makes Thursday a representative option for data collection because it is considered capable of reflecting traffic conditions that are close to a fairly high traffic level but not extreme.

In this research and analysis, traffic data in the Gilingan area was collected on Thursday. Although the number of visitors to the Sheikh Zayed Grand Mosque increases by 10 times on holidays, overall the traffic volume is actually less, with a decrease of about 0.85% compared to normal days.

This is due to the dominance of the use of tourism buses by mosque visitors. The use of buses has proven to be more efficient than private vehicles, as they are able to transport more people in a single trip. Thus, even though the number of tourists increases significantly on holidays, traffic density in the Gilingan area is still more controlled compared to weekdays.

Based on these findings, the selection of Thursday as the day of data collection still provides a representative picture of traffic conditions in the Gilingan area. In addition, the results of this analysis also show the importance of optimizing mass transportation, such as tourism buses and integrated public transportation, to reduce the traffic burden in tourist and urban areas.

**Existing Traffic Performance**

1. Traffic Volume
   Performance analysis was carried out based on the results of *the tarffic count* survey and inventory data on the geometric condition of the road section. The parameters of the V/C ratio in relation to the performance of the road network are shown in the table below. These values will be used as a V/C Ratio parameter that determines the performance of the surveyed road network.
2. Section Capacity
   The capacity of each road section is obtained by calculating data based on the 2023 Indonesian Highway Capacity Guidelines (PKJI). The capacity of the connecting road that has a median, the capacity is calculated for each direction. Meanwhile for connecting roads without mediation, capacity is calculated for both directions. The calculation of the capacity of the road section can be calculated using the formula according to the 2023 PKJI. [
   To find out the existing traffic performance and find out the traffic performance in the Gilingan area after traffic management and engineering efforts are carried out, it is necessary to conduct primary and secondary surveys. Primary surveys are carried out in the field in the form of road and intersection inventory surveys, traffic surveys, intersection control surveys and vehicle free speed surveys. As data to support the study, secondary survey data in the form of road infrastructure, land use, transportation systems and regulatory documents obtained from related agencies such as the Transportation Office, Public Works and Spatial Planning Office and so on are needed. The data from the secondary and primary surveys were then analyzed according to the stages of the research objectives.
3. Traffic Simulation Model
   To evaluate the performance of existing traffic and find out the traffic performance in the Gilingan area, a reliable tool in the form of microsimulation program software is needed. The analysis of the performance of the road network and intersections at the study site was carried out with several conditions (scenarios) which included existing conditions and conditions after traffic management and engineering efforts were carried out. Existing traffic conditions in the network of roads and signalized intersections are replicated in the form of simulation models through the calibration and validation process so that the resulting simulation model is valid.
   As the basis for creating a road network in the simulation model, a background image depicting the existing road network in the study area is needed. The simulation model of the road network in the Gilingan area in existing conditions uses background images on google maps and drone photos. The creation of the road network is followed by entering input data including the type, speed, composition and movement of the vehicle, reduced speed area, priority rule, public transportation routes and traffic light signals.
4. Validation of Simulation Data Results

**Table 2. VCR recapitulation**

| No | Street Name | Direction | V/C Ratio Observasi | V/C Model |
|---|---|---|---|---|
| 1 | Jl. A Yani 1 | West | 0.41 | 0.41 |
| | | East | 0.43 | 0.42 |
| 2 | Jl. A Yani 2 | West | 0.42 | 0.42 |
| | | Timur | 0.41 | 0.41 |
| 3 | Jl. A Yani 3 | West | 0.62 | 0.61 |
| | | Timur | | |

| No | Street Name | Direction | V/C Ratio Observasi | V/C Model |
|---|---|---|---|---|
| 4 | Jl. A Yani 4 | West<br>Timur | 0.43 | 0.43 |
| 5 | Jl. A Yani 5 | North<br>South | 0.42 | 0.42 |
| 6 | Jl. Kapten Piere Tendean | North<br>South | 0.73 | 0.72 |
| 7 | Jl. Tagore | North | 0.41 | 0.41 |
| 8 | Jl. S. Parman 1 | North<br>South | 0.79 | 0.79 |
| 9 | Jl. S. Parman 2 | North<br>South | 0.77 | 0.77 |
| 10 | Jl. S. Parman 3 | North | 0.69 | 0.69 |
| 11 | Jl. Monginsidi 1 | West<br>Timur | 0.63 | 0.63 |
| 12 | Jl. Monginsidi 2 | West<br>Timur | 0.44 | 0.44 |
| 13 | Jl. Monginsidi 3 | West<br>Timur | 0.43 | 0.42 |
| 14 | JL. Call. Sugiano | West<br>Timur | 0.33 | 0.33 |
| 15 | Jl. Letjen Sutoyo 1 | North<br>South | 0.45 | 0.46 |
| 16 | Jl. Letjen Sutoyo 2 | North<br>South | 0.42 | 0.42 |
| 17 | J.L.'s Registers 1 | North<br>South | 0.65 | 0.65 |
| 18 | J.L.'s Registers 2 | North<br>South | 0.41 | 0.41 |
| 19 | Jl. Student Army | West<br>Timur | 0.35 | 0.35 |

Source: Field survey results and VISSIM simulation, 2024. Data was validated using statistical tests (variance and mean similarity tests)

Validation for the simulation data was carried out using the variance similarity test and the mean similarity test between the observation data and the simulation data. The results of this test are presented in the following table:

**Table 3. Results of the Similarity Test of Two Variances**

| | V/C Ratio Observation | V/C Model |
|---|---|---|
| Mean | 0.51 | 0.51 |
| Variance | 0.02 | 0.02 |
| Observations | 21.00 | 21.00 |
| df | 20.00 | 20.00 |
| F | 1.01 | |

| | |
|---|---|
| P(F<=f) one-tail | 0.49 |
| F Critical one-tail | 2.12 |

Source: Statistical analysis using the F-test based on observational data and VISSIM simulation model, 2024

Alpha testing of 5% or 0.05. The results of the Two-Variance Similarity test showed that P calculated 0.49 greater than 0.05, so the Homogeneous data variant.

**Table 4. Results of the Similarity Test of Two Averages**

| | V/C Ratio Observation | V/C Model |
|---|---|---|
| Mean | 0.507184054 | 0.50517046 |
| Variance | 0.021371141 | 0.021114211 |
| Observations | 21 | 21 |
| Pooled Variance | 0.021242676 | |
| Hypothesized Mean Difference | 0 | |
| df | 40 | |
| t Stat | 0.044767399 | |
| P(T<=t) one-tail | 0.482257729 | |
| t Critical one-tail | 1.683851013 | |
| P(T<=t) two-tail | 0.964515458 | |
| t Critical two-tail | 2.02107539 | |

Source: Statistical analysis using the t-test based on observational data and VISSIM simulation model, 2024

Alpha testing of 5% or 0.05. The results of the Similarity Two test showed that the average count of 0.0447 was outside the area than in Tables 1.6838 and 2.0221075 which means that H0 was accepted.

5. Transportation Network
   To determine the traffic performance in the Gilingan area, the scope of the transportation network to be modeled is first determined. In this study, the scope of transportation modeling includes roads, signalized and non-signalized intersections in the Gilingan area including Jalan Ahmad Yani, Jalan Kapten Piere Tendean, Jalan Tagore, Jalan S. Parman, Jalan Monginsidi, Jalan Colonel Sugiyono, Jalan Letjen Sutoyo, Jalan D.I. Panjaitan and Jalan Tentera Siswa. For signalized intersections, namely Simpang Gilingan, Simpang Ngemplak, Simpang Banjarsari, Simpang Balapan, Simpang Tugu Keris and Simpang Cengklik, as well as for non-signalized intersections, namely Simpang Ganesha and Pertapak Sebidang S. Parman.
6. Performance of Roads, Intersections and Crossings in Existing Conditions
   This subchapter discusses traffic performance in the Gilingan area in existing conditions. The traffic performance analyzed includes the performance of road sections, signalized intersections and traffic in the same area.
   The performance of road sections, junctions and crossings in existing conditions needs to be studied to find out the problems of the existing transportation network condition. This is then used as a basis to establish traffic management and engineering efforts in minimizing transportation problems in the Gilingan area.

**Traffic performance with multiple scenarios**

This study examines traffic performance in the Gilingan area by implementing traffic management and engineering efforts through three intervention scenarios. In scenario 1, although the installation of medians and sidewalks reduces the effective width of the road so as to increase the degree of saturation, APILL evaluation and intervention succeeded in reducing delays at intersections. Scenario 2 emphasizes parking control and optimization of parking facilities integrated with public transportation, thereby reducing obstacles and lowering the load of large vehicles, which has an impact on improving road performance and reducing delays at intersections. Meanwhile, scenario 3, with the application of a one-way system through the Giratory System, provides the most significant improvement, characterized by a decrease in the V/C Ratio from 0.51 to 0.49, an increase in average speed, a drastic reduction in intersection delay, and a decrease in congestion loss costs. In addition, the adjustment of signal phases at intersections—for example, phase reduction at Simpang Gilingan and Ngemplak—supports increased traffic efficiency. Overall, the intervention in scenario 3 is considered the optimal solution to improve traffic services in the Gilingan area.

**Differences in PKJI and Vissim Calculation Results**

Based on the calculation of the average network speed using the PKJI method and VISSIM simulation, there is a striking difference in the traffic intervention scenario in the Gilingan area. Under existing conditions, both methods produce the same speed, which is 35.89 km/h; however, in scenario 1, PKJI shows a decrease in speed to 35.49 km/h while VISSIM records an increase in speed to 36.76 km/h. Furthermore, in scenario 2, the speed increases to 35.74 km/h according to PKJI and 38.33 km/h according to VISSIM. Most significantly, in scenario 3, the application of the one-way system reduces the V/C Ratio so that the speed rises to 36.19 km/h according to PKJI and increases drastically to 43.26 km/h according to VISSIM. This difference reflects that PKJI tends to be conservative by assuming that increasing traffic volume always decreases speed, while VISSIM applies a more dynamic and realistic driver behavior model in adjusting to traffic conditions. Therefore, the selection of speed evaluation methods must be adjusted to the purpose of analysis and the complexity of the traffic conditions faced.

**Traffic Management and Engineering Classification**

1. Traffic Management (MLL)
   MLL focuses on managing traffic flow to improve efficiency without significant physical changes. Included:
   a. Evaluate APILL periodically and intervene when needed (adjust the traffic light system to be more optimal).
   b. Parking control along Jalan Ahmad Yani (managing parking to prevent congestion).
   c. Optimizing parking facilities (utilizing parking locations such as Tirtonadi Terminal, Ex Denbekang, D.I. Panjaitan, etc.).
   d. Integrating public transportation services (integrating public transportation to be more effective).

2. Traffic Engineering (RLL)
   RLL involves physical or technical changes to roads and traffic systems. Included:
   a. Installing road medians to prevent U-turns (changing road structures to reduce traffic conflicts).
   b. Provision of sidewalks as parking facilities to mosques (building new physical facilities).
   c. Application of Traffic Management & Engineering with Gyrotary System (changing traffic patterns to increase road capacity).
   d. Implementing a one-way system on several roads, such as:
      Jalan Ahmad Yani 3 → one way to the east.
      Jalan D.I. Panjaitan 1 → one direction to the south.
      Monginsidi 2 Street → one way to the west.

S. Parman 1 & 2 roads → one way north.

**Cost of Traffic Loss**

Vehicle operating costs (*VC*) are calculated based on the equation contained in the graph of the relationship between vehicle speed and vehicle operating costs (*VC*) as shown in Figure II.2. The speed used is the average speed of each scenario. The following is an example of calculating the vehicle operating cost (*VC)* for a passenger car in existing conditions, which is 35.89 km/h.

VC = 0.4937 V2 - 60.218 V + 2991.9
= 0.4937 $(35.89)^2$ - 60,218 (35,89) + 2991,9
= IDR 1,467/km

The cost of congestion is calculated based on the Relationship between Speed and Vehicle Operating Costs (Sugiyanto, 2012). For example, the calculation of congestion costs in the analyzed area is based on the total traffic volume of 30,266.2 smp/hour, with vehicle operating costs (VC) of Rp 1,467/km, existing speed (Va) of 35.89 km/h, ideal speed (Vi) of 50 km/h, vehicle time value (V') of Rp 4,278/hour, and vehicle queue time (QT) of 0.00655285 hours.

In the analysis of conditions in 2024, an increase in fuel oil (BBM) prices has been considered. For comparison, in 2012, the price of Premium was Rp 4,500/liter, while currently the price of Pertalite has reached Rp 10,000/liter, resulting in an increase of 122.22%. This increase certainly affects vehicle operational costs, which has a direct impact on the calculation of congestion costs.. The full results are as shown in Table IV.37.

**Table 5. Results of Calculation of the Cost of Traffic Loss**

| Condition | V (km/h) | VC (Rp/km) | N (smp/hour) | Vi (km/hour) | V' (Rp/hour.vehicle) | QT(hour) | CC (Rp/hour) | CC (Rp/year) |
|---|---|---|---|---|---|---|---|---|
| Excision | 35.89 | 1,467 | 30266.2 | 50 | 4278 | 0.006552855 | 10,678,511 | 2,947,269,062 |
| Scenario 1 | 35.49 | 1,477 | 30266.2 | 50 | 4278 | 0.006410108 | 10,408,085 | 2,872,631,544 |
| Scenario 2 | 35.74 | 1,470 | 30266.2 | 50 | 4278 | 0.006428144 | 10,461,600 | 2,887,401,504 |
| Scenario 3 | 36.19 | 1,459 | 30266.2 | 50 | 4278 | 0.003882909 | 6,345,256 | 1,751,290,584 |

Source: Calculations based on the speed-vehicle operating cost model

The results above show that the cost of congestion losses in existing conditions is Rp. 2,947,269,062/year, the cost of congestion loss in scenario 1 is Rp. 2,872,631,544/year, the cost of congestion loss in scenario 2 is Rp. 2,887,401,504/year and the cost of congestion loss in scenario 3 is Rp. 1,751,290,584/year.

**Optimal Traffic Management and Engineering**

From the 3 (three) scenarios described in the previous subchapter, namely the traffic performance subchapter with several scenarios, it can be known that the optimal traffic management and engineering to improve services in the Gilingan area, Banjarsari District, Surakarta City is in scenario 3 (three). Comparison of performance indicators between existing conditions and three traffic intervention scenarios in the Gilingan area shows that Scenario 3 provides the most significant improvement; The V/C Ratio decreased from 0.51 in the existing condition to 0.49, while the network speed increased, both according to the PKJI analysis from 35.89 km/h to 36.19 km/h, and according to the Vissim simulation from 35.89 km/h to 43.26 km/h. In addition, the time of intersection delay has also decreased drastically from 23.59 seconds per vehicle to 13.98 seconds per vehicle, and the cost of congestion loss has decreased from IDR 1,250,242 per hour in existing conditions to IDR 743,279 per hour. The results confirm that the implementation of Scenario 3 as a whole optimizes the performance of the traffic network and is the best option to improve services in the region.

## CONCLUSION

This study of traffic management and engineering in the Gilingan area, Banjarsari District, Surakarta City, reveals that Jalan S. Parman experiences high saturation with a service level of D, while Jalan Ahmad Yani, Captain Piere Tendean, Monginsidi, and local intersections exhibit service level C. Three intervention scenarios were evaluated: Scenario 1, optimizing APILL, medians, and sidewalks, slightly increased saturation but reduced intersection delay marginally; Scenario 2, focusing on parking control and public transport integration, maintained saturation and reduced delay modestly; Scenario 3, implementing a one-way system, achieved the best results by lowering saturation to 0.49, significantly cutting intersection delay to 13.98 seconds per vehicle, and reducing congestion costs substantially. Overall, Scenario 3 is the most effective for enhancing traffic flow and service in the area. For future research, it is suggested to explore the long-term impacts of the one-way system on surrounding neighborhoods and multimodal transport integration to ensure sustainable and equitable traffic improvements.

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