APPLICATION OF TRANSPORT DEMAND MANAGEMENT IN ADDRESSING ECONOMIC LOSSES DUE TO TRAFFIC CONGESTION (CASE STUDY OF GILIMANUK PORT DURING THE 2024 EID HOLIDAY)

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ABSTRACT

Gilimanuk Port is the gateway connecting Java and Bali. During the 2024 Eid holiday, traffic congestion extended 3.5 kilometers from the port entrance to the Denpasar-Gilimanuk Road, causing significant losses in fuel costs and travel time for travelers. This study aims to apply Transport Demand Management (TDM) strategies to roads near Gilimanuk Port during the Eid period to mitigate travel time losses due to congestion. The research utilized secondary data, including road maps and passenger numbers during Eid, along with primary data from road inventory surveys, public transport availability surveys, and pedestrian facility assessments. The analysis covered road performance, value-of-time calculations, and TDM implementation. The results showed that 53% of outbound vehicles from Bali were motorcycles, while inbound traffic was dominated by four-wheel vehicles and trucks. To address these issues, the study proposed several recommendations: establishing a buffer zone, building parking facilities, enhancing terminal accessibility, increasing ferry frequency, and improving vessel capacity. Of these recommendations, constructing parking facilities emerged as the most effective solution, reducing travel time losses by IDR 9,069,192 per hour in the study area. This suggests that strategically improving traffic flow and facility management can significantly alleviate congestion at Gilimanuk Port during peak travel seasons.

Keywords: gilimanuk port; traffic congestion; transport demand management; value of time

INTRODUCTION

Traffic congestion is a persistent and complex issue that continues to challenge urban areas across Indonesia, significantly impacting daily life and economic productivity (Rintawatia et al., 2023). Congestion arises when the volume of vehicles surpasses road capacity, resulting in slow-moving traffic or complete standstills (ITDP Indonesia, 2023). Seasonal or event-specific congestion, such as during the Eid holidays, further compounds this issue. These periods witness heightened population mobility, overwhelming transportation infrastructure, especially at critical transport nodes such as ports, airports, terminals, and train stations (Nadine & Imtiyaz, 2020). The root causes of traffic congestion in Indonesia are multifaceted, including inadequate road infrastructure, insufficient public transportation options, and heavy reliance on private vehicles. Rapid urbanization and population growth exacerbate these issues (Apriliyanto & Sudibyo, 2018). Seasonal congestion during Eid highlights the inadequacy of current infrastructure in accommodating surges in traffic demand. Addressing these challenges requires integrated solutions that combine infrastructure development with strategic traffic management (Putra, 2023).

The consequences of traffic congestion extend beyond inconvenience, affecting economic productivity, environmental sustainability, and social well-being. One critical metric influenced by congestion is the "value of time" (VoT), which quantifies the economic cost of time lost in unproductive activities, such as being stuck in traffic(Afrin & Yodo, 2020; Diao et al., 2021). Economically, prolonged congestion diminishes individual and collective productivity. Businesses face higher operational costs due to delayed deliveries and inefficient logistics. Individuals lose valuable time that could be used for work or leisure, reducing overall quality of life (Baqueri et al., 2016). For instance, (Sulistyono, 2022) estimated that traffic congestion in Greater Jakarta (Jabodetabek) resulted in annual economic losses of IDR 71.4 trillion, comprising wasted fuel approximately 2.2 million liters daily in six metropolitan cities and lost productive hours, amounting to 6 million person-hours per day. Socially, congestion increases stress, reduces community interaction, and diminishes urban liveability. Environmentally, it contributes to higher emissions and energy consumption. These cumulative impacts underscore the urgency of addressing traffic congestion through effective and sustainable measures.

Seasonal congestion during the Eid holidays is a recurrent issue in Indonesia, posing significant challenges to transportation systems and regional connectivity. A notable example is Gilimanuk Port, the main gateway connecting Bali and Java. This port becomes a critical transit point during peak travel periods, such as Eid. During the 2024 Eid holiday period (March 31 to April 7), over 236,000 travelers moved from Bali to Java via the Gilimanuk-Ketapang ferry route. This volume included 38,412 motorcycles, 20,003 private cars, 10,607 trucks, and 2,659 buses. Conversely, Bali received over 125,000 inbound travelers, including 3,902 motorcycles, 11,769 private cars, 12,102 trucks, and 3,053 buses (Tohamaksun, 2024). The resulting surge in traffic led to a 3.5-kilometer-long congestion on the Denpasar-Gilimanuk road. The congestion at Gilimanuk Port illustrates broader challenges associated with managing peak traffic at transportation hubs. Key issues include insufficient parking facilities, limited road capacity, and inadequate ferry frequency and capacity. Effective solutions are essential to ensure smoother travel experiences and mitigate economic losses during peak periods.

Transport Demand Management (TDM) provides a strategic framework to address traffic congestion by focusing on reducing private vehicle use rather than merely expanding infrastructure (BYLINKO, 2020). TDM promotes behavioral and systemic changes to optimize transportation systems through : Promoting Public Transport, Vehicle Sharing and Carpooling, Flexible Scheduling, and Technological Interventions (Sugrue & Adriaens, 2022). Unlike traditional approaches such as road expansion, which require substantial investments and time, TDM can be implemented more cost-effectively and yield quicker results (Bylinko, 2023). By combining "push" strategies (disincentivizing private vehicle use) with "pull" strategies (incentivizing public transport), TDM fosters a balanced and sustainable transportation ecosystem. The effectiveness of TDM has been validated through various international case studies. For instance, Bylinko (2021) demonstrated that TDM can shift transportation behavior towards alternative modes, leading to reduced travel time losses and emissions. Similarly, (Alonso-gonzález et al., 2020) found that TDM initiatives offering diverse transport options decreased the value of time from €10.80/hour to €7.88/hour, reflecting enhanced travel efficiency and reliability. These findings emphasize TDM's potential to effectively address congestion. By reducing vehicle volume and optimizing traffic flow, TDM not only improves mobility but also delivers significant economic and environmental benefits.

This study seeks to evaluate the effectiveness of TDM strategies in mitigating economic losses caused by traffic delays at Gilimanuk Port during peak periods like Eid. The research aims to identify practical and implementable solutions, comparing TDM with conventional approaches to provide evidence-based recommendations for policymakers and stakeholders. The findings are expected to contribute to the broader discourse on sustainable transportation planning in Indonesia, advocating for a paradigm shift from infrastructure expansion to demand management. By aligning with global best practices, this research underscores the importance of innovative strategies in addressing congestion challenges and achieving efficient, sustainable mobility systems.

METHOD

Research Approach

The problem identification process was conducted through observation and interviews regarding driver behavior data. The results from observations and field studies revealed the willingness of road users to use specific road segments and the types of vehicles used. Several studies were employed, including the following:

1. Literature Study
   A literature study is a research method conducted by reading, analyzing, and evaluating literature or written sources related to the research topic. Its purpose is to gain a deeper understanding of a specific topic and expand knowledge about the issues being addressed.

2. Field Study
   A field study was conducted through direct observation of the actual conditions and information from authorized institutions, particularly regarding accident data. An understanding of the description of motorcycle rider behavior was developed alongside the existing road policy programs, as well as their impact on traffic accidents.

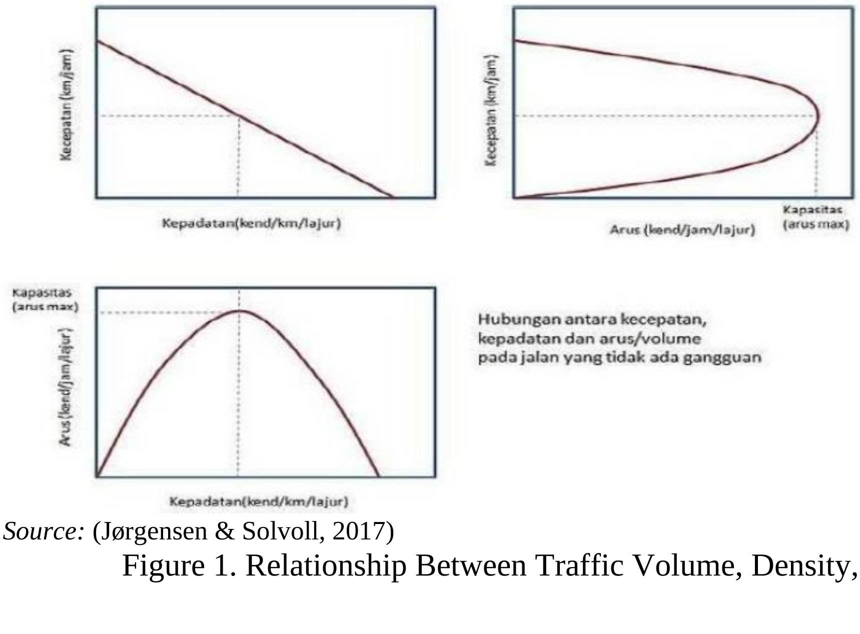
Collecting Data

In this study, two types of data were used: secondary data obtained from the Class II Bali Land Transportation Management Center and the Gilimanuk Port Technical Implementation Unit (UPT), which included road section map data and passenger numbers during the Eid season (the highest number of passengers in a single day). Meanwhile, primary data were collected through several surveys, including:

1. The road segment inventory survey
   The road segment inventory survey is the process of collecting data on the physical condition, existence, and characteristics of a road network. The data collected in this survey varies depending on the purpose and scale of the survey.
2. The public transportation willingness survey
   The public transportation willingness survey is a process to gather information about the community's readiness to use public transportation services.
3. The pedestrian facility survey
   The pedestrian facility survey is the collection of data on infrastructure related to pedestrians in a specific area. Its purpose is to evaluate the safety, comfort, and accessibility for pedestrians in carrying out their activities.

Analysis Data

1. Analisis Kinerja Ruas Jalan
   The performance indicators for road sections referred to here are the comparison of volume to capacity (V/C ratio), speed, and traffic density. These three characteristics are then used to determine the level of service (LOS). This is because flow, speed, and density are interrelated. The relationship between speed and density is linear, meaning that as traffic speed increases, more free space is required between vehicles, resulting in a lower number of vehicles per kilometer. The relationship between speed and traffic flow is parabolic, indicating that as the flow increases, speed decreases until a certain point at the peak of the parabola is reached, representing the capacity. After that, speed continues to decrease, and the flow diminishes as well. The relationship between flow and density is also parabolic. As density increases, the flow initially rises until it reaches a point of capacity. Beyond that point, as density continues to increase, the flow decreases.



Source: (Jørgensen & Solvoll, 2017)

Figure 1. Relationship Between Traffic Volume, Density, and Speed

Table 1.
Level Of Service Ruas Road Segment

Level of Service	Ratio V/C	Characteristic
A	< 0.60	Free flow, low volume, and high speed; drivers can choose their desired speed
B	0.60 < VC < 0.70	The traffic flow is stable, with speed slightly limited by traffic, but drivers can still freely choose their speed
C	0.70 < VC < 0.80	The flow is stable, and the speed can be controlled by the traffic.
D	0.80 < VC < 0.90	The flow is starting to become unstable, with low and varying speeds, and the volume is approaching capacity.
E	0.90 < VC < 1.00	The flow is starting to become unstable, with low and varying speeds, and the volume is approaching capacity.
F	> 1.00	The flow is hindered, the speed is low, the volume is above capacity, and congestion often occurs for extended periods.

Source: Minister of Transportation Regulation Number 95 of 2015.

2. Multicriteria Analysis
   By using Multicriteria Analysis, it is possible to compare the criteria in decision-making. The Pair Wise Comparison method is used for this analysis, where a team of experts is asked to assess the relative importance of each criterion being measured. The goal is to assign relative weights to the criteria. Before assigning weights to each criterion, the expert team scores the alternatives of each TDM strategy against each criterion. The results will then be multiplied by the average relative weight from the experts to obtain an accurate value.
3. Value Of Time Analysis
   In determining the time value analysis, the analysis uses the impact of road segment performance on the time value for each vehicle. In the Value of Time analysis, the 2023 National Per Capita Income of Indonesia is applied for the year 2024.

RESULT AND DISCUSSION
Inventory of Affected Road Network

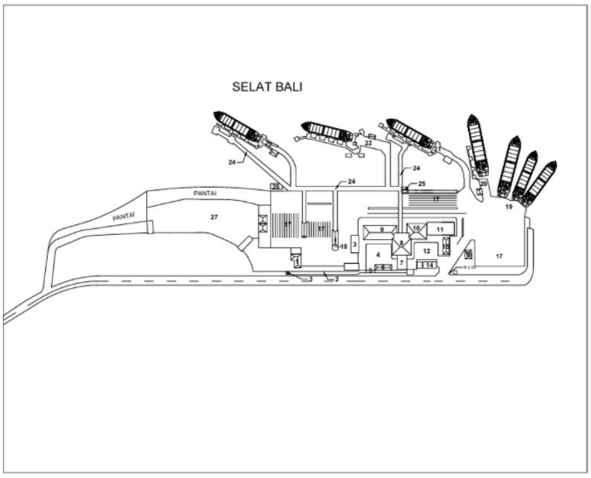


Figure 2. Existing Condition Layout of Gilimanuk Port

The Gilimanuk – Cekik Road section is a National Road located in Jembrana Regency, serving as a Primary Arterial Road. This road section is directly connected to Gilimanuk Port and is significantly impacted during passenger surges, such as those during Eid. The length of this road section is 3.04 km. Below is the existing condition of the Gilimanuk road section:

Table 2.
Inventory of Road Sections Based on PKJI 2023

No	Road Section	Basic Capacity CO	Adjustment Factor for Capacity				Capacity (C) Vehicles per Hour (vph)
			Lane Width FCLJ	Direction Separation FCPA	Side Obstacles FCHS	City Size FCUK	
1	Gilimanuk – Cekik Road Section 1	2800	2	1	0.9	0.93	4687
2	Gilimanuk – Cekik Road Section 2	6800	0.96	1	0.98	0.93	5950
3	Gilimanuk – Cekik Road Section 3	6800	0.96	1	0.98	0.93	5950
4	Gilimanuk – Cekik Road Section 4	6800	0.96	1	0.98	0.93	5950
5	Gilimanuk – Cekik Road Section 5	6800	0.96	1	0.98	0.93	5950
6	Gilimanuk – Cekik Road Section 6	6800	0.96	1	0.98	0.93	5950
7	Gilimanuk – Cekik Road Section 7	2800	1.29	1	0.9	0.93	3023
8	Cekik – Seririt Road Section	2800	1.14	1	0.9	0.93	2672
9	Denpasar – South Gilimanuk Road	2800	1.29	1	0.9	0.93	3023

Table 3.
Inventory of Cekik - Seririt Intersection Based on PKJI 2023

No	Road Section	Base Capacity CO	Adjustment Factor for Capacity				Capacity vehicles/hour
			Lane Width FCLJ	Direction Separation FCPA	Side Barriers FCHS	City Size FCUK	
1	Gilimanuk – Cekik Road Section 7	2800	1.29	1	0.9	0.93	3023
2	Cekik – Seririt Road Section	2800	1.14	1	0.9	0.93	2672
3	Denpasar – Gilimanuk South Road Section	2800	1.29	1	0.9	0.93	3023

Road Network Performance During Normal Period

In conducting this analysis, data was obtained through traffic counting surveys and classified turning movement counting, resulting in the performance assessment of road segments and intersections as follows:

Table 4.
Road Segments Performance Normal Period

No	Road Segment	Capacity (smp/hour)	Volume (smp/hour)	V/C Ratio	Speed (km/hour)	Density (smp/km)	LOS
1	Gilimanuk - Cekik Segment 1	4687	3201.36	0.68	45.49	24.32	C
2	Gilimanuk - Cekik Segment 2	5950	3036.64	0.51	47.27	11.16	C
3	Gilimanuk - Cekik Segment 3	5950	2932.86	0.49	47.45	20.02	C
4	Gilimanuk - Cekik Segment 4	5950	2984.32	0.50	47.37	22.21	C
5	Gilimanuk - Cekik Segment 5	5950	2958.36	0.50	47.41	21.10	C
6	Gilimanuk - Cekik Segment 6	5950	3031.78	0.51	47.28	24.22	C
7	Gilimanuk - Cekik Segment 7	5950	3031.26	0.51	47.28	24.20	C
8	Cekik - Seririt Road	2672	1228.02	0.46	47.80	4.22	C
9	Denpasar - Gilimanuk (South Section)	3023	1786.84	0.59	46.44	27.33	C

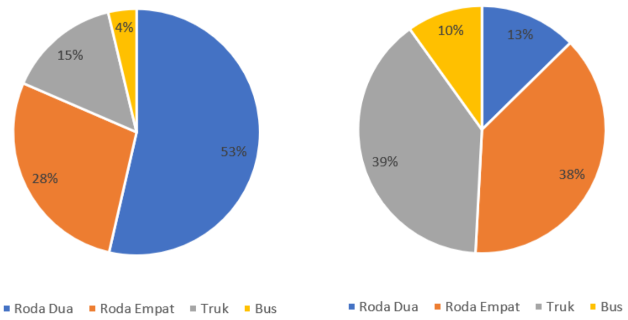
Table 5.
Cekik - Seririt 3-Way Intersection Performance Normal Period

Name	Degree of Saturation	Intersection Delay (seconds)	Queue Probability (%)
Cekik - Seririt 3-Way Intersection	0.46	8.44	7% - 17%

This value indicates the level of utilization of the intersection's capacity. A degree of saturation below 0.8 signifies that the intersection operates efficiently, with no significant congestion. At 0.46, the intersection is operating well below capacity. And The analyzed road segments are operating efficiently with stable traffic conditions. The highest V/C ratio (0.68) occurs on the Gilimanuk - Cekik Segment 1, indicating it experiences the highest traffic load but remains within acceptable limits. Meanwhile, the Cekik - Seririt Road experiences the lowest density and V/C ratio, suggesting the lightest traffic.

Road Network Performance During Eid 2024

Data yang didapatkan melalui KSOP Gilimanuk, BPTD Kelas II Provinsi Bali, dan Dinas Perhubungan Provinsi Bali akan dikomparisasi dan digunakan sebagai data kinerja ruas jalan dan simpang masa lebaran tahun 2024. Didapatkan hasil analisis sebagai berikut :



(a) (b)

Figure 3. Percentage of Vehicle (a) Lefting Bali (b) Entering Bali

The pie charts illustrate the distribution of vehicle types exiting and entering Bali during the 2024 Lebaran period. For vehicles leaving Bali (left chart), two-wheelers dominate, accounting for 53% of the total, followed by four-wheelers at 28%. Trucks make up 15%, while buses represent the smallest portion at 4%. In contrast, for vehicles entering Bali (right chart), trucks dominate at 39%, closely followed by four-wheelers at 38%. The share of two-wheelers decreases significantly to 13%, and buses account for 10%. This shift indicates a notable difference in traffic patterns, where the majority of outgoing traffic consists of individual or small vehicle types, while incoming traffic is dominated by logistics vehicles and group transport, likely influenced by holiday travel and the transportation of goods during the Lebaran period.

Table 6.
Road Segments Performance During Eid 2024

No	Road Segment	Capacity (smp/hour)	Volume (smp/hour)	V/C Ratio	Speed (km/hour)	Density (smp/km)	LOS
1	Gilimanuk - Cekik Segment 1	4687	7013,09	1,50	14,63	53,28	F
2	Gilimanuk - Cekik Segment 2	5950	6652,25	1,12	24,22	24,45	F
3	Gilimanuk - Cekik Segment 3	5950	6424,90	1,08	25,19	43,86	F
4	Gilimanuk - Cekik Segment 4	5950	6537,63	1,10	24,71	48,65	F
5	Gilimanuk - Cekik Segment 5	5950	6480,76	1,09	24,95	46,23	F
6	Gilimanuk - Cekik Segment 6	5950	6641,60	1,12	24,26	53,06	F
7	Gilimanuk - Cekik Segment 7	5950	6640,46	1,12	24,27	53,01	F
8	Cekik - Seririt Road	2672	2213,01	0,83	31,56	9,24	D
9	Denpasar - Gilimanuk (South Section)	3023	3914,36	1,29	19,74	59,87	F

Table 7.
Cekik - Seririt 3-Way Intersection Performance During Eid 2024

Name	Degree of Saturation	Intersection Delay (seconds)	Queue Probability (%)
Cekik - Seririt 3-Way Intersection	0,83	15,21	13% - 31%

During Eid 2024, most road segments, particularly along the Gilimanuk - Cekik route and Denpasar - Gilimanuk (South Section), experience severe congestion with LOS F. In contrast, the Cekik - Seririt Road operates under relatively better conditions (LOS D). Meanwhile, the Cekik - Seririt 3-Way Intersection, under normal traffic, shows moderate delays and congestion. These findings emphasize the need for improved traffic management and capacity enhancements during peak travel periods like Eid.

Road Network Performance During Eid 2025

To find out the performance of the road network during Eid 2025, it is necessary to know the production of trips and vehicles during Eid 2021 - 2024, as follows:

Table 8.
Gilimanuk Port Production from 2021 to 2024

Year	Operating Ships	Trips	Passengers	Vehicles	Date
2021	32	232	24,479	8,131	May 4, 2021
2022	32	202	58,953	18,979	April 30, 2022
2023	32	212	66,224	20,669	April 19, 2023
2024	35	231	77,867	24,621	April 7, 2024
Average Growth Rate	3.13%	0.33%	56.92%	53.81%	

The table illustrates the production data of Gilimanuk Port from 2021 to 2024, covering the number of operating ships, trips, passengers, and vehicles. During this period, the number of ships increased from 32 to 35 units, while the number of trips remained relatively stable, with an average growth rate of only 0.33%. In contrast, the number of passengers and vehicles experienced significant surges, growing at average rates of 56.92% and 53.81%, respectively, indicating a rapid increase in transportation activity. In 2024, the number of passengers reached 77,867, and vehicles amounted to 24,621 units.

Table 9.
Road Segments Performance During Eid 2025

No	Road Segment	Capacity (smp/hour)	Volume (smp/hour)	V/C Ratio	Speed (km/hour)	Density (smp/km)	LOS
1	Gilimanuk - Cekik Segment 1	4687	10787,08	2,30	5,77	116,71	F
2	Gilimanuk - Cekik Segment 2	5950	10232,05	1,72	8,97	53,56	F
3	Gilimanuk - Cekik Segment 3	5950	9882,36	1,66	10,46	96,08	F
4	Gilimanuk - Cekik Segment 4	5950	10055,76	1,69	9,72	106,57	F
5	Gilimanuk - Cekik Segment 5	5950	9968,28	1,68	10,09	101,28	F
6	Gilimanuk - Cekik Segment 6	5950	10215,67	1,72	9,04	116,23	F
7	Gilimanuk - Cekik Segment 7	5950	10213,92	1,72	9,05	116,13	F
8	Cekik - Seririt Road	2672	3403,91	1,27	20,27	20,25	F
9	Denpasar - Gilimanuk (South Section)	3023	6020,81	1,99	2,08	131,16	F

Table 10.
Cekik - Seririt 3-Way Intersection Performance During Eid 2025

Name	Degree of Saturation	Intersection Delay (seconds)	Queue Probability (%)
Cekik - Seririt 3-Way Intersection	1,28	23,39	19% - 47%

Recommendations for Handling Traffic Congestion During Eid Transport

Bagian ini menyajikan kumpulan rekomendasi yang telah diidentifikasi dari berbagai penelitian dan studi sebelumnya terkait penanganan kemacetan pada masa angkutan Lebaran. Data dan informasi ini mencakup strategi teknis, kebijakan lalu lintas, manajemen transportasi, serta praktik terbaik yang telah terbukti efektif di lokasi lain.

1. Buffer Zone Implementation on Road Segments Around Ports

Creating a buffer zone around the port area can reduce congestion by providing space for vehicle queues, alleviating traffic jams, and separating traffic flows. This strategy can decrease delays by up to 30%." (Jane, 2021; Nadhira & Basuni, 2021)

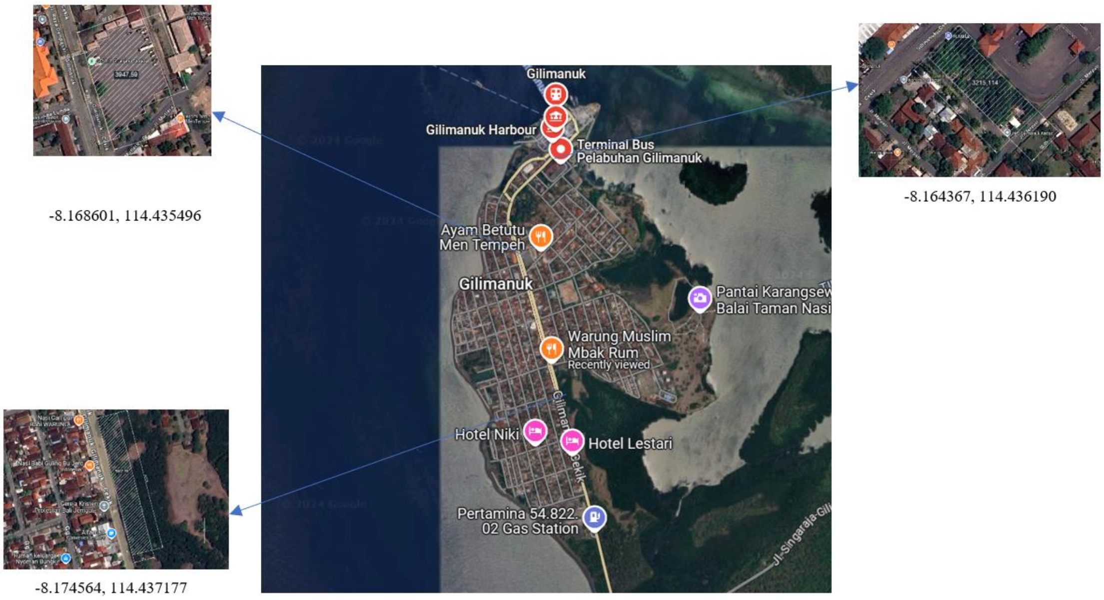


Figure 4. Recommendations for Buffer Zone Points as Temporary Parking Areas

2. Construction of Parking Buildings for Private Vehicles
   Building parking facilities within or around the port area helps reduce road congestion by providing organized parking spaces, preventing roadside parking that obstructs traffic. This strategy can reduce congestion by up to 40%, depending on the location and demand. (Alcantara et al., 2015; Sadeghi et al., 2018)

Figure 5. Recommendation for the Construction of a 3-Layer Parking Building

3. Improving Accessibility Between Ports and Gilimanuk Terminal via Overhead Pedestrian Walkways (JPO)
   Improving pedestrian accessibility by constructing pedestrian overpasses (JPO) can reduce the need for road crossings at busy intersections, resulting in smoother traffic flow. This

strategy can increase travel time by up to 15% (Sunitiyoso et al., 2022).

Table 11.
Criteria for Determining At-Grade and Grade-Separated Crossing Facilities

P (People/hour)	V (Vehicles/hour)	PV²	Recommendation
50 - 1100	300 - 500	> 10^8	Zebra Cross or Pedestrian Platform
50 - 1100	400 - 750	> 2 x 10^8	Zebra Cross with Waiting Area
50 - 1100 > 1100	> 500 > 300	> 10^8	Pelican Crossing
50 - 1100 > 1100	> 750 > 400	> 2 x 10^8	Pelican Crossing with Waiting Area
> 1100	> 750	> 2 x 10^8	Grade-Separated Crossing

Source: Technical Planning Guidelines for Pedestrian Facilities, Bina Marga (2023)

Based on the number of pedestrians and vehicles per hour during the Eid condition, the appropriate pedestrian crossing facility is the grade-separated crossing (Pedestrian Overpass).

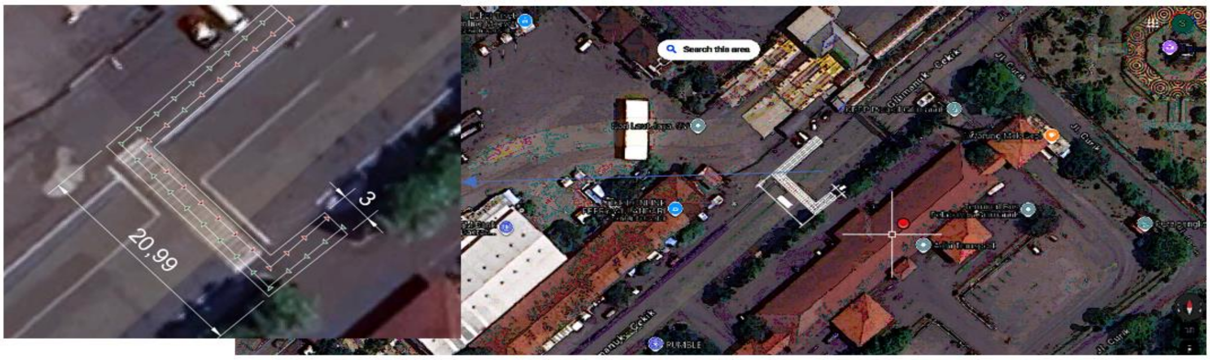


Figure 6. Pedestrian Bridge (JPO) Recommendations

4. Increasing the Frequency of Ships Between Gilimanuk Port and Ketapang Port
   Improving the frequency of ferry services between these ports can reduce congestion during peak hours, especially during major holidays such as Eid. This strategy is linked to a 25% reduction in vehicle queues (Sunitiyoso et al., 2022).
5. Increasing the Capacity of Ferries to Accommodate More Vehicles and Passengers per Trip
   By increasing the ship capacity, more vehicles and passengers can be transported in a single trip, reducing waiting time and congestion at the port terminal. This strategy can reduce congestion by up to 30% during peak travel periods. (Jørgensen & Solvoll, 2017).

Comparison of Value of Time (IDR/Hour)

To determine the value of time for a journey, the National GDP per Capita for 2023, which is USD 4,940.5, is multiplied by the current exchange rate of IDR 15,914.24, resulting in a National GDP per Capita of IDR 78,624,303. Therefore, the value per minute is IDR 79/minute. The following is the analysis result:

Table 12.
Analysis Results of Value of Time Based on Road Network Performance

No	Scheme	Value of Time (IDR/Hour)
1	Existing	1,033,058.5
2	Eid 2024	4,457,893.4
3	Eid 2025	22,672,979.1
	Recommendation for Implementing Angleb 2025	
4	Buffer Zone	15,871,085.3
5	Parking Building	13,603,787.4
6	Gilimanuk Terminal Accessibility	19,272,032.2
7	Increased Frequency	17,004,734.3
8	Increased Ship Capacity	15,871,085.3

Buffer Zone (IDR 15,871,085.3) and Increased Ship Capacity (IDR 15,871,085.3) have relatively lower VOT values, but they are still much higher than the VOT value for the Eid 2024 period (IDR 4,457,893.4). This indicates that while there have been improvements, further enhancements are needed to achieve optimal conditions. Gilimanuk Terminal Accessibility (IDR 19,272,032.2) and Increased Frequency (IDR 17,004,734.3) are more effective compared to the Eid 2025 situation, but they are still not enough to significantly reduce the VOT value. The Parking Building (IDR 13,603,787.4) offers a greater reduction in VOT compared to some other recommendations, but it is still insufficient to achieve optimal efficiency for Eid 2025. Overall, a combination of these recommendations will have a greater impact in reducing the gap.

CONCLUSION

This study seeks to evaluate the effectiveness of Traffic Demand Management (TDM) strategies in mitigating economic losses caused by traffic delays at Gilimanuk Port during peak periods, such as Eid. The findings reveal that the value of time during Eid 2025 reaches IDR 22,672,979.1 per hour, significantly higher than the IDR 1,033,058.5 per hour for existing conditions. Recommendations, including the implementation of buffer zones, parking buildings, improved terminal accessibility, increased frequency, and ship capacity, show potential to reduce the value of time to between IDR 13,603,787.4 and IDR 19,272,032.2 per hour. These results highlight the effectiveness of TDM strategies in reducing congestion and economic losses, compared to traditional infrastructure expansion. The study contributes to the broader discourse on sustainable transportation planning in Indonesia, emphasizing a shift from infrastructure development to demand management, in line with global best practices, to address congestion challenges and promote efficient, sustainable mobility systems.

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