Analysis of Road Performance and Impact on Pasir Putih-Ocarina Bengkong Sadai Road Batam-Indonesia

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ARTICLE INFO	ABSTRACT
	Jalan Pasir Putih to Ocarina is a highway area that is strategically located because it is in the center of Batam city and this road is often passed by because it is connected to the Batam International Port, tourist attractions, places to eat or food court, malls, government offices, and many more. The advantage that exists on this highway is the efficient travel time from Bengkong to Batam Center it greatly saves travel time. Meanwhile, the weakness of this one highway is that it is prone to accidents, so the level of safety for road users is low. This case study was made to evaluate the road segment's performance level and its impact. The analytical method used is index performance analysis by comparing the performance of the current road segment with the expectations of road users with the performance of that segment. The research results show that the existing road performance average index is 2,36, then the average index of road users' importance is 1,16 and the average GAP index is. The purpose of making this case study is expected to increase the safety and comfort of road users.

1. Introduction

Roads are one of the important infrastructures in a country because they will greatly affect daily activities such as supporting the economic, educational, social, cultural, and other fields (Ilham Rafid Andito, 2022). That is why during President Jokowidodo's leadership he continued to boost infrastructure development and repair damaged roads so that the economy would not be hampered and create equity and balanced development between regions to strengthen national unity, strengthen national defense and security and realize the fifth precept, namely social justice for all Indonesian people (MD Nanda 2021).

Road damage in Pasir Putih can be caused by many factors, including stagnant water, often traversed by heavy equipment to overloaded heavy vehicles, changes in temperature and weather, unstable soil conditions, poor soil compaction, and construction materials. that do not meet the criteria. As a result, the Jalan Pasir Putih is cracked into holes and slippery in any condition because the Jalan Pasir Putih has much sand. The sand comes from the heavy vehicles passing by the construction projects being worked on. In addition to the road damage in Pasir Putih, there are other problems, namely unclear road regulations, that often cause accidents (Yehezkiel Immanuel, 2022).

Figure 1. Sandy Road on Jalan Pasir Putih

The figure 1 above shows that there is much sand on the road surface. This is due to the large amount of construction being done and the construction vehicles that are often passing by so that the material that is carried will always fall onto the road so that, over time the road is filled with sand.

Figure 2. Road Lane Used Together with the Opposite Direction

The Figure 2 above shows that there is 1 road segment consisting of 3 lanes that are used simultaneously with 2 currents or in opposite directions, so that the road becomes smaller or from 1 traffic with 3 lanes to 1 traffic with 1.5 lanes. As a result, the risk of accidents will be very high because in this area motorists often speed.

The Figure 3 above shows that it is difficult to make a U-turn around the vehicle. This is because the U-Turn is used by 3 vehicle flows where the maximum U-Turn current should be as much as 1 to 2 flows. The impact is that there are frequent disputes between motorists because their vehicles are scratched by other motorists' vehicles because of the impatient attitude of all motorists and are supported by the narrowness of the U-Turn.

Figure 3. The difficulty of turning around causes traffic jams, especially in the afternoon

The Figure 4 above shows an accident between a motorbike rider and a car driver on October 27, 2022. What causes an accident is that the driver needs to know if 1 road section is divided into 2 flows of vehicles. As a result, the car driver hits a motorist when he is about to overtake the vehicle in front of him. Based on the problems in the picture above, the issues on the Pasir Putih road must be reviewed for development and regulations because they can endanger road users or motorists.

Figure 4. Accidents that Happened Between Cars and Motorcycles on October 27, 2022

International standards for a road include safety and health systems, environmental standards, and quality management standards. Meanwhile, the road in Pasir Putih needs to meet safety, health, and ecological system standards, such as non-standard road width, damaged and slippery roads, unclear road markings, and a lack of supporting facilities for traffic activities. So, the Pasir Putih road must still be done correctly and adequately to meet international standards (Komang Agus Tri Putera. 2022).

The national standard for a road has several criteria, namely having a minimum road width of 1 lane 6.5 meters to 11 meters with a minimum speed of 15 km/hour to 80 km/hour. It also has arterial, collector, local, and environmental roads. Meanwhile, the road in Pasir Putih is only 7.5 meters wide per road flow. What's more, the road is made into 2 lanes, so one lane is only 3.75 meters wide, so the road on white sand must be built 1 more route to meet national standards (Komang Agus Tri Putera 2022).

The road standard that Riau Archipelago Province applies is the same as the national road standard, which is 6.5 meters per lane. The average width of roads that have been built in the Riau Archipelago; it ranges from 4-6 meters per lane. So, this proves that the streets in Riau Archipelago, including Jalan Pasir Putih, need to meet national road standards because they still need to set a road width standard nationally.

Batam is the most populous city in the Riau Archipelago, causing high traffic jams because people in Batam prefer private vehicles, and road expansion in Batam still needs to be completed. That's why the Batam government is now focusing on boosting road expansion projects at several points in Batam, including Jalan Pasir Putih -Ocarina. Unfortunately, the road expansion project in Pasir Putih-Ocarina was stopped for some reason. Because of this, the rules for using the road became chaotic along the Pasir Putih to Ocarina Road, where the road was only built in front of Aquamania, so it often caused accidents because 1 lane of the road was used together with the opposite lane. There were no lane limits to be traversed. So that the construction of the road in Pasir Putih-Ocarina does not refer to the procedure for calculating the geometry of urban and inter-city roads No. 038/TBM/1997, and the evaluation of road equipment does not refer to the module of the Department of Transportation regarding the placement of road equipment facilities (Yan Heri Fikri. 2019).

In this research, the problems that often occur are the frequent occurrence of accidents because the road for 1 current is used together with the current in the opposite direction, the width of the road does not comply with predetermined standards, and turning in front of Indomaret Pasir Putih is dangerous because it is used by 3 directions to road users so that there are frequent bumps and collisions with other motorists when making vehicle turns. This is, of course, related to the adverse effects caused by uncertain road rules, slippery roads due to sand, and narrow and damaged roads to pass, which causes congestion, especially during the day and night. This research aims to inform readers so that the Batam city government acts immediately to continue the construction of the Pasir Putih-Ocarina Road. Suppose the Pasir Putih to Ocarina Road is built according to national standards. In that case, it will make road users feel comfortable, and the risk of accidents will be low, increasing the pace of the economy in the Pasir Putih-Ocarina area.

2. Literature Review

2.1 Highway

Highways are an infrastructure that has a significant role in the development of education, the economy, and the development of a region. Therefore, the feasibility of roads as a means of connecting areas must be paid close attention to so they can run smoothly (Ega Purnama, 2022). To achieve this goal, the highway must be maintained and repaired to provide comfort. In carrying out a road construction project, obstacles must be faced, namely geographical problems, land conditions, financial problems, and other things (Mohd Yanis Anugrah. A, Firzan Firzan, Dian Febrianti. 2022).

One of the crucial aspects of the highway is having a road width according to national and international standards that have been set, as well as having clear road rules and road conditions if the road is smooth or not damaged and has a road width according to the standards and rules that have been set (Masitoh, Rozy, and Anwar, 2020).

So that this will have an impact on reducing the number of accidents and increasing the accessibility of road users, and increasing the volume of vehicles so that the economy in an area will increase. Conversely, suppose the road is damaged and lacks road width and rules according to predetermined standards. In that case, it will increase the number of accidents and reduce the accessibility of road users, so the economy in that area will decline (Luo, Song, and Wu, 2021).

2.2 Road User Safety

The safety of road users is an aspect that must be prioritized because this concerns one's life. To create security or safety for road users, there must be adequate infrastructure facilities, such as having clear traffic signs, street lighting, road width according to national standards, there are sidewalks, there are road markings, and other things according to the road terrain, that way it will create a safe and controlled road atmosphere (Wincent, 2022).

Traffic lights or signs also have a significant role on a road because their function is to inform road users of the road they are going to pass, and the function of traffic lights is to instruct road users when to stop and walk at an intersection. This has benefits because it can reduce the risk of accidents or the number of accidents. However, unfortunately, there are still many road users who violate these traffic signs because road users are impatient, and the weather could be more friendly when driving (Gabriel Immanuel, 2022).

To maintain the safety of road users, drivers using four to eight-wheeled vehicles must wear seat belts when driving, and so do passengers. must wear a helmet when going. This is useful in reducing the risk of fatal accidents (Ryan Maro, 2022).

2.3 Traffic Accidents

Traffic accidents are something that often happens in Indonesia, many things cause the number of accidents in Indonesia to be so high, namely driving at high speeds, violating traffic, driving while drunk and sleepy, driving after taking drugs, driving recklessly recklessness, overload, carelessness, not being able to drive a vehicle or not having a SIM, driving while playing on a cell phone or while calling, and other things (Vena Nuri Sumantri, 2022).

Accidents are not only caused by road users but also by road conditions or road planning and design that are built, and regulations set (Siti Noviantini Nurjannah, 2022), such as there are roads that have sharp turns and winding roads. There are roads with very steep ups and downs, and the most dangerous thing is that there are sharp turns on the descent road where the average accident often occurs in such areas because the driver is unable to control the vehicle he is carrying, the brakes fail, and other factors (Martinez, Sanchez, and Yañez-Pagans, 2019).

To reduce the number of accidents, road users must be proficient in driving their vehicles and focus on driving and pay attention to road signs so that they know the terrain that the driver will be traversing, understand the situation on the rules of the road, avoid calling or playing cellphones. In contrast, the vehicle is being driven, if the phone must be picked up, so stop the car on the side of the road so you can focus more on one point if you drive while on the phone, your focus will be divided, which will cause an accident (Zhang, et al., 2021).

3. Method

The research location is in Batam City, Riau Archipelago Province, on the white sand road to Ocarina, Bengkong Sadai District. For more details, can be seen Figure 5.
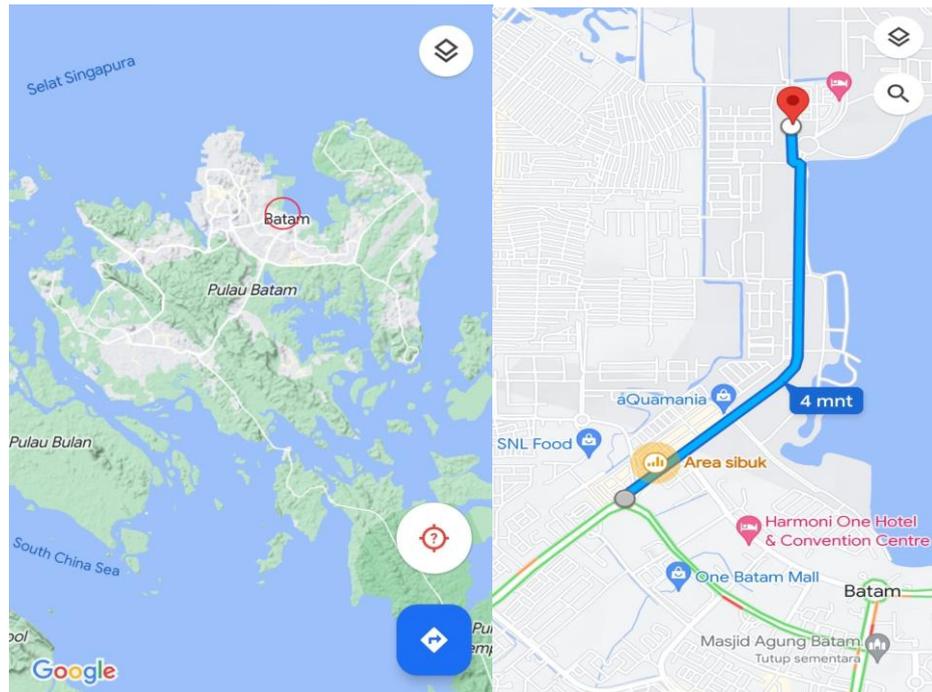
Figure 5. Research Locations

For research on the Pasir Putih-Ocarina Road, I used the Questionnaire and IPA (Index Performance Analysis) methods, such as collecting data on road users' opinions about the current performance of the road section and the expected performance of the road section based on a questionnaire that was distributed to a total of 100 respondents. The data will be used to determine the performance level of the road section (Christine, 2022).

4.   Results and Analysis

4.1 Characteristics of Respondent

Data obtained from 125 respondents; It is known that the results of most responses are from the age of less than 20 years with a proportion of 56%. The purpose is eating, shopping, vacation, work, and home. Data on Respondent Characteristics can be seen in Table 1.

Table 1. Respondent Characteristics

No	Characteristic		Value %
1	Gender	Male	52
		Female	48
2	Age	< 20	56
		21-30	21
		31-40	12
		41-50	11
		>50	0
3	Purpose	Works	20
		Shopping	8
		Holiday	15
		Sport	11
		Eat	25
		School	8
		House	13

4.2 Comparison of Importance and Performance Index

Comparison of performance and value of interest needs to be analyzed against Gaps because this will impact all fields and aspects. As shown in Table 2 below, if the value of the gaps is negative (-), the road does not meet road users' expectations. By knowing the value of the Gap, evaluation, and improvement can be carried out on the facilities and conditions of the existing roads.

Table 2. Comparison of Importance and Performance Index

No	Variable	Importance	Performance	Gap
A.	Safety and comfort	1,60	2,42	-0,82
B	Road conditions	1,16	2,44	-1,28
C.	Road cleanliness	1,13	2,38	-1,25
D	Road performance	1,23	2,46	-1,23
E	Road width	1,23	2,40	-1,17
F	One road section is used simultaneously with two lanes of vehicles from different directions	0,93	1,94	-1,01
G	Road and sidewalk facilities	1,46	2,44	-0,98
H	Traffic signs and road rules	1,10	2,46	-1,36
I	Street and sidewalk lighting	1,33	2,44	-1,11
J	U-Turn performance	1,06	2,40	-1,34
K.	Traffic performance at Indomaret intersection and Megamall intersection	1,16	2,42	-1,26
L.	Maximum speed rule	1,20	2,38	-1,18
M	Road repairs to increase economic	0.50	2,20	-1,70
	Average	1,16	2,36	-1,20

The table above shows the value of importance and good performance, which road users feel. From the table above, an average importance of 1,16 is obtained, which can be categorized as essential in all variables. In the performance category, the average performance is 2,36, which is categorized as a satisfied category, from the data above shows that they need to meet the expectations of road users.

The road surface on the white sand road is filled with sand and mud so that many motorists slip when trying to brake and turn in any weather, be it rain or not. then, the sidewalks should be installed using non-slippery granite material, especially if it rains. It will make the sidewalk users slip because it is slippery. For street lighting on the white sand road, it is also not bright enough, especially on the very dark sidewalks, making sidewalk users feel insecure and comfortable at night, and there are piles of trash along the side under the sidewalk, giving off an unpleasant smell when pedestrians pass.

White sand-ocarina road is very strategic because many modes of transportation cross it. This road is strategic because there is an international ferry port and natural attractions, and there are 3 to 4 malls close to the airport and to government buildings. From the data collected above, the government should immediately act to repair the White sand-ocarina road to meet the expectations of road users so that road users can feel safe and comfortable, which will also impact the economy in the region.

4.3 Index Performance Analysis

The IPA method used four quadrants of the total number of respondents, with the results shown in Figure 6 below. Quadrant I show the main priority, quadrant II must be maintained, quadrant III is a low priority, and quadrant IV is categorized as excessive.
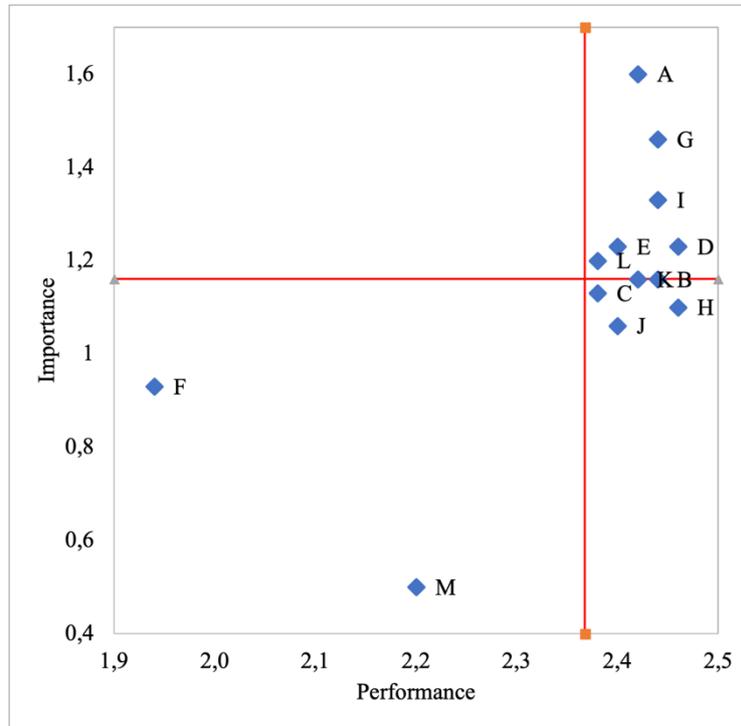

Figure 6. Result of Index Performance Analysis

From the results of the IPA analysis, there are eight indicators in quadrant I, namely road safety and comfort (A), road conditions (B), road and sidewalk facilities (G), road performance (D), road and sidewalk lighting (I), road width (E), Indomaret and megamall intersection traffic performance (K), and maximum speed limit rules (L). In quadrant III there are two indicators: one road segment used simultaneously with two vehicle lanes from different directions (F), and road repairs to increase economic (M). And in quadrant IV there are three indicators, namely road cleanliness (C), traffic signs and road rules (H), and U-Turn performance (J).

5. Conclusion

From the results of the performance comparison table and the importance comparison above, it is obtained that the highest importance comparison is in road safety and comfort with an index of 1.60, and the lowest is in road repair to improve the economy with an index of 0.50. then the highest performance comparison is found in the performance of the road section with an index of 2.46, and the lowest is in one road section used simultaneously with two vehicle lanes from different directions with an index of 1.94. My advice to the regional government of Batam City is to immediately proceed and accelerate the Pasirputih-Ocarina Road construction project for the benefit of the nation and state. Even though the potential for economic growth in the Pasirputih-Ocarina area is enormous, it will impact road users' safety if the infrastructure is adequate. It will then impact the area's residents' economy, so this great potential will be recovered if the government acts quickly.

Reference:

Annisa Megarestya (2022) UIB. The horizontal curved geometric design with autocad civil 3d on jalan Muara Wahau East Kalimantan.

Christine (2022) UIB. Level of service evaluation of pedestrian facility in tourism area: case study Jalan Braga, Bandung

Ega Purnama (2022) UIB. Analysis of road performance used Indonesia highway capacity manual 1997: A case jalan K.H Abdul Halim Majalengka-Indonesia.

Gabriel Immanuel (2022) UIB. The road performance analysis in jalan Laksamana Bintan, Batam-Indonesia.

H Firdaus (2022). Analisis Kelaikan Fungsi Jalan Nasional Secara Teknis Di Provinsi DIY

Ilham Rafid Andito (2022) UIB. The design of alignment horizontal using Indonesia highway design standard.

Komang Agus Tri Putera (2022). Analisis Faktor Dominan Penyebab Kecelakaan Lalu Lintas Pada Jalan Nasional Di Kabupaten Karangasem

Kurniawan, Utomo and Nola, Ritha and Martaleli, Bettiza (2020) Klasifikasi Jalan Primer pada Ruas Jalan Provinsi di Kepulauan Riau dengan Metode Support Vector Machine. S1 thesis, Universitas Maritim Raja Ali Haji.

Luo, Song, dan Wu (2021). Spatial disparaties in trade-offs: economic and enviromental impacts of road infrastructure on continental level.

M Rosadi (2023). Evaluasi Kinerja Kelancaran Lalu Lintas DiRuas Jalan Nasional Malang

Martinez, Sanchez, dan Yañez-Pagans (2019). Road safety: challenges and opportunities in Latin America and the Caribbean.

Masitoh, Rozy, dan Anwar (2020). Analisis geometrik jalan ruas jalan lingkar utara majalengka kabupaten majalengka.

MD Nanda (2021). Kajian Geometri Jalan Tambang Berdasarkan AASHTO

Melvin, M., Rifai, A. I., & Savitri, A. (2023). Analysis Performance for Evaluation of Schedule Irregularities on Bore Pile Foundation with FTA. *IJEBD (International Journal of Entrepreneurship and Business Development)*, *6*(1), 122-129.

Mohd Yanis Anugrah. A, Firzan Firzan, Dian Febrianti (2022). ANALISA PENGARUH FAKTOR INTERNAL DAN EKSTERNAL YANG MENGHAMBAT PELAKSANAAN PROYEK

Natasya Aurum Maharani (2022) UIB. The performance analysis of jalan Tengku Sulung in Botania, Batam-Indonesia.

Rachmadina, Y., Rifai, A. I., & Handayani, S. (2022). Traffic Management Effectivity of Bulak Kapal Underpass Development, Bekasi Indonesia. *Indonesian Journal of Multidisciplinary Science*, *1*(1), 369-382.

Resinta, T., & Rifa'i, A. I. (2023). The Traffic Jam Phenomenon at Traditional Village: A Case of User Perception in Batam, Indonesia. *LEADER: Civil Engineering and Architecture Journal*, *1*(1), 36-43.

Rifai, A. I., Hafidh, M., Isradi, M., & Prasetijo, J. (2023). Analisis kinerja Cold Paving Hot Mix Asbuton dengan Filler Portland Cement terhadap intensitas rendaman.

Ryan Maro (2022) UIB. The driver perception analysis of roundabout intersection: A case of basecamp intersection Batam.

Shui, S., Rifai, A. I., & Pamadi, M. (2023). The Analysis Performance of Project Delays in Pile Foundation Work.*IJEBD (International Journal of Entrepreneurship and Business Development)*, *6*(1), 172-182.

Siti Noviantini Nurjannah (2022) UIB. Geometric Design for National Road Sei-Duri-Mempawah section relocation, West Kalimantan Using AutoCAD 2D.

Vena Nuri Sumantri (2022) UIB. Impact of inter-urban street lighting on users perception of road Safety behavior: A Case of Jalan Majalengka-Rajagaluh.

Victory, J., Rifai, A. I., & Handayani, S. (2022). The Satisfaction Analysis of Local Public Transportation (Carry) Services at Batam, Indonesia. *Indonesian Journal of Multidisciplinary Science*, *1*(1), 69-80.

Wawan-Ukas (2019). EFEKTIVITAS PELAKSANAAN PERBAIKAN JALAN RUSAK DALAM UNDANG-UNDANG NOMOR 22 TAHUN 2009 TERHADAP KESELAMATAN PENGGUNA JALAN

Wincent (2022) UIB. The road performance analysis in jalan Ahmad Yani Batam using IHCM 1997.

Yan Heri Fikri (2019). Evaluasi Geometrik Dan Pelengkap Jalan Pada Ruas Jalan Batam

Yehezkiel Immanuel (2022) UIB. The road performance analysis of the Tuah Madani roundabout, Batam-Indonesia.