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Analysis of Student Travel Route Determination from Nongsa to Universitas Internasional Batam

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ABSTRACT

Batam is never quiet in traffic activities, especially when traveling to Batam International University. This is characterized by frequent traffic jams on two roads to campus, especially in the morning and evening. Regarding congestion factors that increase travel time, it contributes significantly to the traffic transportation process on the travel route to the campus of Universitas Internasional Batam, especially private vehicles. For this reason, an analysis of the accessibility of private vehicles is needed based on the existing travel routes in Batam to the campus of the International University of Batam. This analytical research is carried out based on time and distance—accessibility parameters based on the percentile statistical method. From the percentile table, the accessibility value is divided into three parts, namely high, medium, and low. The results of the analysis of private vehicles showed six route trips with high accessibility values, five travel routes with medium accessibility values, and seven routes travel with low accessibility values.

Introduction

Population growth and the development of the times from day to day increase human needs, including transportation. Using vehicles from one place to another is not only a necessity. However, for some people, it has become part of their lifestyle. Ease of accessibility to all places is an absolute thing in today's era of globalization. Public transportation that has makeshift facilities makes people more comfortable using private vehicles. This means that, in policy evaluation, a detailed analysis of the distribution effects of transport policy should consider the establishment of minimum standards of accessibility to key destinations and the extent to which these policies respect individual rights and prioritize disadvantaged groups, reducing inequality—opportunities and reducing transportation externalities. (Pereira, Schwanen, & Banister, 2017)

A sound traffic management system can reduce road user accidents. Unlike in our country, where there are traffic accidents almost every day, in developed countries, such as Germany, the accident rate of road users is extremely rare. Road users care for each other's safety, do not go ahead of each other, and obey traffic rules. The route of the streets in Germany is challenging due to the absence of traffic lights on roundabouts on the streets. The route poses a wide variety of complex traffic scenarios, including intersections with and without traffic lights, roundabouts, and narrow passageways with oncoming traffic (Ziegler et al., 2014)

Public transportation in Indonesia has long experienced critical times. From year to year, the interest is decreasing. Due to the need for more existing infrastructure, such as public transportation in Indonesia, many people want to go wherever several transportation options can be used. However, the amount of transportation used needs to be maximized by the construction of infrastructure that supports it. For example, the procurement of trans buses, but the stops provided are not convenient for waitpersons who use them. In response, the Department of Transportation established

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comprehensive guidelines for the design of accessible transport facilities. (Sze & Christensen, 2017). Therefore, passengers also have different interests in using public transportation routes together. In addition to the different characteristics of the trip. We propose a predictive engine that considers scheduled bus trips (routes) and 'source/destination' pairs and estimates travel time while taking into account historical data and real-time information flows transmitted by buses.(Gal, Mandelbaum, Schnitzler, Senderovich, & Weidlich, 2017)

Batam is a province of the Riau Islands with an area of 4,580 km2 with geography surrounded by the sea. Administratively, Batam City consists of 12 sub-districts out of 64 sub-districts where there are several sub-districts with a vast population, while in these districts, they become industrial areas. Because of this strategic position, Batam City has become rapidly developing, which causes a high level of economic and social activity. The high level of such activity requires public and private means of transport. (Halil, Utomo, & Agustin, 2019). So in some areas of Batam, there are often traffic jams. Therefore, development in Batam City is very rapid, especially for the streets, because there is often congestion from various routes. Our model handles as much available route data as possible to improve the accuracy of predictions of congestion occurrences (Tian et al., 2019)

This study aimed to determine the number of travel routes to the Batam International University campus and analyze the comparison of the level of accessibility of two-wheeled and four-wheeled vehicle users from each route based on time, distance, and speed.

Literature Review

The level of accessibility in the public transportation network system is still relatively low, including in batam city. This has led to increased use of private vehicles that are considered safe and comfortable. This difference demonstrates the importance of incorporating perceived accessibility as a complementary tool when planning and evaluating transportation systems (Lättman, Olsson, & Friman, 2018).

Public transportation modes in developed countries are usually younger using public transportation because of their punctuality and excellent level of service, and cheaper fares compared to private vehicles. However, the opposite is true in developing countries; people continue to use private vehicles even though they are more expensive because punctuality and comfort are not met by public transport. The results show a tendency toward greater integration of accessibility goals in transportation plans. However, some plans have accessibility-based indicators to guide their decision-making process (Boisjoly & El-Geneidy, 2017).

Some people choose public transportation modes not only based on cost alone but also based on travel time. Without us knowing it, mileage is related to travel time. This time of technological development demands everything to be fast-paced. Frequency, punctuality, intermodality, cost, and hygiene are attributes that significantly influence satisfaction in almost all models, meaning they can be considered core attributes for personal vehicle users (de Oña, Estévez, & de Oña, 2021). Therefore, people need a mode of public transportation that is not too fast but safe and comfortable. The other is to propose a simple measurement method based on the accessibility of public services, taking time and distance as a measure to understand social-spatial justice (Pitarch-Garrido, 2018).

In this case, public transportation is significant for everyone with different needs in accessing the biliary to a place or area they want. Therefore the ease of accessibility must be measured to express accessibility that everyone can enjoy. Furthermore, among the various particular needs of the elderly, mobility needs are becoming more critical as more and more people retire from driving, and thus

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require better trip planner options that can combine accessible public transport and walking routes to meet their mobility needs (Rahaman, May, Hamilton, & Salim, 2017).

A private vehicle is a mode of transportation personally used by a person that can be used and operated at any time according to one's wishes and needs. Private car ownership may become redundant (Heilig, Hilgert, Mallig, Kagerbauer, & Vortisch, 2017). However, at this time, the vehicle can be two functions. Once upon a time, it could be a private vehicle, and it could also be a public vehicle. We can see the number of travel services and online motorcycle taxis that use private vehicles to serve passengers between cities because this is considered comfortable with more expensive tariffs than public transportation. The possible adverse long-term implications of AV raise questions about policies' type, rate, combination, and response time and the role of urban and transportation planners in informing policy responses to these new mobility technologies (Milakis, 2019).

In general, the people of Batam City almost all use private vehicles. Karena is considered more comfortable to travel and relatively faster than public transportation. Therefore, people choose private vehicles not only based on cost considerations but also on travel time considerations. Despite traffic jams, people tend to prefer private vehicles. Regular private vehicle users in both cities agree that punctuality, frequency, information, and intermodality are among the five most important attributes of service quality (de Oña J., 2022). Almost all people have private vehicles, especially motorized vehicles, which can cause air pollution to increase around them. Private vehicles account for nearly half of the transportation's energy needs and are thus a prime target for climate change mitigation efforts (Long, Yoshida, Li, & Gasparatos, 2022). Air pollution can impact human health, plants, and animals. In addition, using private vehicles is more efficient than using public transportation. The results show that while a small percentage of car owners will choose to keep their vehicles, most will abandon them in exchange for mobility on demand (Pofuk, 2017).

Roads are a critical infrastructure because they connect one place to another, making it easier for us to do travel activities. The road also serves as a supporting factor for other activities. As in other cities, the construction of roads on tourist attractions impacts the area's progress. So it is required to provide suitable facilities and infrastructure for transportation. A typical urban environment consists of static road objects, including road pavements, roadside trees, traffic signs, light poles, and road markings (Ma et al., 2018). In this paper, the research hypothesis is that in the case of automated road vehicles, there is a significant possibility of endangering human life. (Derenda, Zanne, & Zoldy, 2018). Therefore, roads are always given traffic signs, traffic safety fences, road-owned area stakes, and regional fences belonging to the road. So that people are always careful in using their vehicles.

Method

The process of systematic scientific research must begin with the identification of the right problem. (Rifai, Hadiwardoyo, Correia, & Pereira, 2016) Primary data research refers to the actual situation (existing) by conducting surveys in the field. The survey by providing questionnaires to users of private vehicles. Data collection with questionnaires does not involve all users of private vehicles but rather using samples from the existing population. A population is a collection of the object under study. The population in this study was all private vehicle users in Batam City, which included the population of Batam International University.

Data is one of the main strengths in compiling scientific research and modeling. (Rifai, Hadiwardoyo, Correia, Pereira, & Cortez, 2015). The data used with the questionnaire survey is designed in two parts: the characteristics of respondents and the travel characteristics of personal vehicles. The respondent's characteristics contain questions related to the individual, such as the respondent's name, gender,

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address, age, Recent education, occupation, and income. The travel characteristics of a private vehicle contain questions such as distance, time, and cost.

Result And Discussion

Based on the results of surveys in the field, there are 18 private vehicle routes in the city of Batam with different distances.

Table 1. Private vehicle travel route to the campus of Universitas Internasional Batam

Line 1				
Hour	Road	Purpose	Distance (km)	Time (minutes)
04.00 pm- 04.05 pm	Jl. Dang Merdu	Hang Nadim Street	2.0	5
4.05 pm - 4.06 pm	Hang Nadim Street	Hang Tuah Street	1.0	1
04.06 pm – 04.13 pm	Hang Tuah Street	Jl. Sudirman	3.9	7
04.13pm - 04.21pm	Jl. Sudirman	Jl. Simpang Kabil	6.4	8
04.21pm - 04.28 pm	Jl. Simpang Kabil	Jl. Gajah Mada	3.7	7
04.28 pm – 04.39 pm	Jl. Gajah Mada	UIB	9.0	11
Average			3.8	6
Line 2				
Hour	Road	Purpose	Distance (km)	Time (minutes)
04.00 pm – 04.05 pm	Jl. Dang Merdu	Jl. Tengku Sulung	2.0	5
04.05 pm - 04.10 pm	Jl. Tengku Sulung	Jl. Raja M. Saleh	2.2	5
04.10 pm - 04.11 pm	Jl. Raja M. Saleh	Alikelana Street	1.0	1
4.11 pm - 4.17 pm	Alikelana Street	Orchard Boulevard Street	2.8	6
4.17 pm - 4.22 pm	Orchard Boulevard Street	Admiral Bintan Street	2.6	5
4.22 pm - 4.29 pm	Admiral Bintan Street	Franky Interchange	3.6	7
4.29 pm - 4.34 pm	Franky Interchange	Rochdale Interchange	2.6	5
4.34 pm - 4.40 pm	Rochdale Interchange	Interchange	3.1	6
04.40 pm – 04.42 pm	Interchange	Jl. Yos Sudarso	1.1	2
04.42 pm – 04.45 pm	Jl. Yos Sudarso	Jl. Bunga Raya	1.4	3
04.45 pm – 04.50 pm	Jl. Bunga Raya	City Park Street	2.0	5
4.50 pm – 4.55 pm	City Park Street	UIB	2.6	5
Average			2.7	4

In determining the parameters, the statistical method used is the percentile statistical method.

Table 2. Accessibility Value Parameters by Time

Accessibility parameters by time		
Accessibility	Time	Value
Low	> 8	1
Intermediate	7 - 4	2
Tall	< 3	3

The travel time in question is the time for one trip of each route per street from origin to destination. Low accessibility values are found in Jalan Sudirman and Gajah Mexists, with travel time ranging from 8-11 minutes. Meanwhile, a medium capacity is found on the roads of Dang Merdu, Alikelana, Laksamana Bdiamond, and Hang Tuah, with travel times ranging from 5 – 7 minutes. Moreover, high accessibility is found on Hang Nadim, Simpang Jam, and Yos Sudarso roads, with travel times ranging from 1-3 minutes.

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Table 3. Accessibility value parameter based on distance

Accessibility parameters by distance		
Accessibility	Distance	Value
Low	> 3.6	1
Intermediate	3.5 – 2.6	2
Tall	< 2.5	3

The distance is from each road that enters the travel route to the Batam International University campus. Low accessibility values are found on Simpang Kabil, Laksamana Bintan, Sudirman, and Gajah Mada roads, with an average distance of 3.7 – 9.0 km. Meanwhile, medium accessibility is found on Orchard Boulevard, Simpang Franky, Alikelana, and Simpang Rosdale roads, ranging from 2.6 – 3.2 km. Moreover, high accessibility is found on the Hang Nadim, Dang Merdu, Tengku Sulung, Bunga Raya, and Yos Sudarso roads, ranging from 1.0 – 2.4 km.

Conclusion

The results of data analysis after conducting a survey showed there are 18 private vehicle routes to Batam International University. The data was carried out for the distance of each road included in the campus travel route, where the distance with the nearest route is the Jalan Raja M Saleh, with a distance of 1 km. At the same time, the farthest distance is the Gajah Mada road to Batam International University, with a distance of 9.0 km. Therefore, the value of public transport accessibility to the campus of Universitas Internasional Batam is based on research data analysis based on time variables and distance with high accessibility values on vehicles private as many as six routes. Meanwhile, the medium accessibility value on vehicles is five routes. Moreover, the accessibility value is low on vehicles with as many as seven routes.

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