The efficiency of semarang – pekalongan toll road in goods transportation

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The efficiency of semarang – pekalongan toll road in goods transportation

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Abstract. Trans Java toll road belongs to a strategic development program of the Indonesian Government. Towards toll roads, the time of travel can be shorted, hence the transportation cost becomes lower. Semarang – Pekalongan Toll road is part of the trans java program. It connects Semarang City and Pekalongan City. Semarang is identified as the trading city. In this city, many of product be promoted in the national or regional area. In the other side, Pekalongan is known as the centre of Batik. The connectivity between them aims to promote Batik to the large market. However, the travel cost by toll road is higher than by Pantura Road. By that fact, the toll road could be less efficient compare to Pantura road. Thus, this research wants to ensure the efficiency of Semarang – Pekalongan toll road. The research is conducted by deductive – rationalistic approach. The analytical method is statistic descriptives. Based on the analysis, the toll road is inefficient on goods movement in mid-distance (up to 100 km). The average cost of goods movement in the mid-distance in Pantura Road is 70 % lower compared to the toll road. Refer to that fact, the toll road pricing should be evaluated to improve efficiency.

1. Introduction

Trans java toll raid is one of the strategic national development of Indonesia. This road has been developing by 1984 until now. The length of that road is about 1.167 kilometres. Its begin from Merak to Banyuwangi. It has a goal to enhance the regional connectivity in Java Island. Good connectivity is necessary to improve economic growth and development. Through good connectivity, agriculture and manufacturing product can be spread to the market (other regions) fastly. Thus, the perishable product such as fruit, vegetables or meat can be sale in fresh. Good quality of product improving price product and revenue to the farmer.

Semarang – Batang toll road is the part of trans java toll road which connecting Semarang City and Pekalongan city. Semarang city is recognized as a regional and national trade centre. In the other hand, Pekalongan City is known as a cultural craft city. Pekalongan has much famous cultural product for example Batik Pekalongan. The unique characteristic of Batik Pekalongan is the contemporary design. It makes Batik Pekaloangan can be transformed into so many fashionable products such as a t-shirt, dress, bag, shoes, hat and so on. Moreover, by that pattern, Batik Pekaloangan occupy the young customer market. Refer to this fact, Pekalongan needs Semarang City as the marketplace of their product. Thus, the good connectivity between Pekalogan and Semarang City is the best approach to improve the local economy.

In 2020 the Semarang – Batang toll road is the best way to reach Semarang from Pekalongan or instead. The movement cannot end in Pekalongan directly because the exit toll of Pekalongan finished yet. Hence, to reach Pekalongan City, the traveller should be continued through the highway from the exit toll of Batang to the city centre of Pekalongan. Overall, the total length of the road is about 98,6

kilometres. With the average speed of a vehicle is about 80 km/hour, it takes 1 hour and 22 minutes. In the other hand, the older way to travel from Pekalongan to Semarang or instead is Pantai Utara Road. The length of Pekaloangan Semarang Pantai Utara Road is about 96,4 kilometres. It shorter than Toll road, however, need more time to travel through it. With the average speed of vehicle only up to 60 kilometres/hour, it needs 2 hours and 31 minutes. The limited speed availability os caused by so many side frictions on the Pantura Road.

Based on that fact, this research has a goal to ensure the efficiency of toll road compares to Pantai Utara road in terms of goods transportation. Efficiency means capital saving[14]. It means, uses the minimum capital to achieve the same output compared to other ways of production. Efficiency related to cost and process[10]. The toll road has a goal to make a time of transportation shorter than usual. By these concepts, to measure the efficiency of the toll road is a cost per time and compare it to Pantai Utara Road.

2. Method

The research regarding "The efficiency of Semarang – Pekalongan Toll Road in goods Transportation" is conducted by Deductive – Quantitative – Rationalistic. The deductive approach means this research use grand theory to identify the fact in the field study. Quantitative means, the data and collecting technique are countable and measurable. Rationalistic means the concept of defining hypothesis and variable is logic and rational.

Efficiency means resource-saving[14]. It is identified as more efficient when the production with fewer resources and different process or method result in the same output. Moreover, efficiency involves cost and method[10]. In the context of transportation, efficiency can be measured from the cost of distance. It involves fuel cost ad enter cost to reach a certain place[5]. This research is conducted by comparative analysis method. It compares the transportation cost by toll road and by Pantai Utara (Pantura road).

Comparison is a tool to ensure how much levels of toll road efficiency then Pantai Utara road. Its compare the mobility cost between them. The mobility cost consists of fuel cost and toll cost. When the toll road total cost is higher than Pantai Utara road, it means more efficient the Pantai Utara road. Moreover, it will compare to time of travel. Efficiency can be determined with the equation below.

$$E = \frac{O}{I}$$

E = Efficiency
O = Output
I = Input

On this context, the output is the cost of transportation and input is the time of travel.

3. Results and Discussion

Goods transportation from Pekalongan to Semarang or instead can be reached by two roads. The first road is Pantai Utara Road. The length is about 96,4 Km. With the average speed 60 km/hour, it takes 2 hours and 31 minutes of travel. Pantura Road was the main way of transportation in Java Island before toll road development. This road has many side frictions such as traditional market and other activity besides. The second way is Semarang – Batang toll road. To reach Pekalongan city, the travel should then be continued by Pantura road from Batang. The total distance of direction by toll road is about 98,6 Km. It takes 1 hour and 22 minutes with an average speed is about 80 km/hour.

In term of toll road entrance, the vehicles are distinguished to five groups. The first group consist of a car, pick up car and bus. The cost of the toll road from Semarang to Batang for this group is about Rp 75.000,00. The second group is a small truck. The cost of this vehicle as much as the medium truck that classified as group III. The cost is about Rp 112.500,00. The fourth group is a big track. The cost of a

toll road for the big track as much as lorry truck. Based on the toll road cost and fuel consumption, there is the total cost of transportation through the toll road.

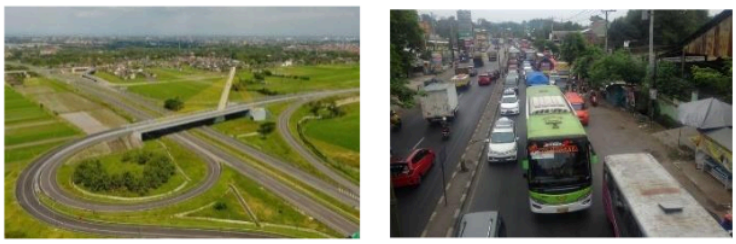

Figure 1 Toll Road (Left), Pantai Utara Road (Right)

Table 1. The Total Cost of Transportation by Toll Road

Group	Vehicle	Tol Cost	Fuel Consumption	Fuel	Price (l)	Fuel Cost	Total Cost by Toll
I	Car and Bus	75000	10 - 12 km/l	Gasoline *88	9000	88740	163.740
II	Small Truck	112500	2 - 3 km/l	Diesel (subsidi)	5150	253895	366.395
III	Medium Trcuk	112500	2 - 3 km/l	Diesel	5150	253895	366.395
IV	Big Truck	150000	2 - 3 km/l	Diesel	5150	253895	403.895
V	Lorry Truck	150000	2 - 3 km/l	Diesel	5150	253895	403.895

Based on the analysis, the lowest cost of transportation by toll road is about Rp 163.740,00. It is paid by the vehicle which belongs to group I. The highest cost of transportation is about Rp 403.895,00. It has to be paid by group IV vehicle (a big truck) and group V vehicle (lorry truck). Specifically, the detail of the costs are:

1. Group I spend Rp 75.000 for toll road enter cost and Rp 88.740,00 for a total of fuel consumption cost. The total fuel consumption cost refers to fuel price and consumption. The price of gasoline 88 in August 2020 is about is Rp 9.000,00. In term of fuel consumption, Group I consume 1 litre of fuel to run 10 Km. Aggregate, the group I of vehicle should spend Rp. 163.740.
2. Group II of vehicles should spend Rp. 366.395,00 in total. It consists Rp 112.500 for toll road enter cost and Rp 253.895,00 for a total of fuel consumption cost. The total fuel consumption cost refers to fuel price and consumption. The price of diesel in August 2020 is about is Rp 5.150,00. In term of fuel consumption, Group II consume 1 litre of fuel to run 2 - 3 Km.
3. Group III of vehicles should pay Rp. 366.395,00 in total. It contains Rp 112.500 for toll road enter cost and Rp 253.895,00 for a total of fuel consumption cost. The total fuel consumption cost refers to fuel price and consumption. The price of diesel in August 2020 is about is Rp 5.150,00. In term of fuel consumption, Group III consume 1 litre of fuel to run 2 - 3 Km.
4. Group IV spend Rp. 403.895,00.in total. It contains Rp 150.000 for toll road enter cost and Rp 253.895,00 for a total of fuel consumption cost. The total fuel consumption cost refers to fuel price and consumption. The price of diesel in August 2020 is about is Rp 5.150,00. In term of fuel consumption, Group IV consume 1 litre of fuel to run 2 - 3 Km.
5. Group V should pay Rp. 403.895,00.in total. It contains Rp 150.000 for toll road enter cost and Rp 253.895,00 for a total of fuel consumption cost. The total fuel consumption cost refers to

fuel price and consumption. The price of diesel in August 2020 is about is Rp 5.150,00. In term of fuel consumption, Group V consume 1 litre of fuel to run 2 - 3 Km.

In the other side, transportation through Pantura Road will take 96,4 km length. By this road, the driver no needs to pay anything else except fuel consumption. Based on the fuel consumption per km, the lowest cost is about 86.760,00. It is paid by the Group I of vehicle. The highest cost is about Rp 248.230,00. The highest cost is paid by group II, III, IV and V. The total cost of transportation by Pantai Utara road is in the table below.

Table 2. The Total Cost of Transportation by Pantura Road

Group	Vehicle	Fuel Consumption	Fuel	Price (l)	Total Cost by Pantura
I	Car and Bus	10 - 12 km/l	Gasoline *88	9000	86.760
II	Small Truck	2 - 3 km/l	Diesel	5150	248.230
III	Medium Trcuk	2 - 3 km/l	Diesel	5150	248.230
IV	Big Truck	2 - 3 km/l	Diesel	5150	248.230
V	Lorry	2 - 3 km/l	Diesel	5150	248.230

Comparing the cost of travel by those two roads, the Pantai Utara road is cheaper the toll road cost. It is 50 % lower than by toll road. The detail of efficiency are:

1. Group I pay Rp. 163.740 by toll road and pay Rp 86.760,00 by Pantai Utara Road. Compared to these facts, the efficiency of the Toll road is 52,99 % worst then Pantai Utara Road.
2. Group II spend Rp. Rp. 366.395,00 by toll road and spend Rp 248.230,00 by Pantai Utara Road. Compared to this fact, the efficiency of the Toll road is 67,95 % worst then Pantai Utara Road.
3. Group III pay Rp. 366.395,00 by toll road and spend Rp 248.230,00 by Pantai Utara Road. Compared to this fact, the efficiency of the Toll road is 67,95 % worst then Pantai Utara Road.
4. Group IV spend Rp. 403.895,00 by toll road and pay Rp 248.230,00 by Pantai Utara Road. Compared to this fact, the efficiency of the Toll road is 61,46 % worst then Pantai Utara Road.
5. Group V pay Rp. 403.895,00 by toll road and spend Rp 248.230,00 by Pantai Utara Road. Compared to this fact, the efficiency of the Toll road is 61,46 % worst then Pantai Utara Road.

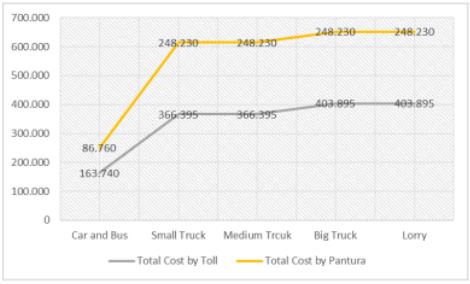

Figure 2 Transportation Cost

Every vehicle has maximal speed availability. The car could run on that road with a maximum speed of 80 km/hours. In the other side, in the Pantura Road, the average speed is become slower because of side friction on the road. The speed of vehicles is also influenced by the type of vehicle. The small and medium truck which carrying heavy things can run at average speed about 60 m/hours. Moreover, the

big truck and lorry truck can reach an average speed of 50 km/hours. Based on that fact, the efficiency of the toll road can be examined in the table below.

Table 3. The Efficiency of Toll Road

Vehicle	Time By Toll Road	Time By Pantura	Cost to Time By Toll	Cost to Time By Pantura	Efficiency
Car and Bus	1,23	1,61	132.852	54.000	246,02%
Small Truck	1,64	1,61	222.958	154.500	144,31%
Medium Trcuk	1,64	1,61	222.958	154.500	144,31%
Big Truck	1,97	1,93	204.815	128.750	159,08%
Lorry	1,97	1,93	204.815	128.750	159,08%

Based on the analysis, the average cost of transportation by timely achievement through the toll road is higher than the Pantura road. The cost of time travel is various based on the characteristic of vehicles. The results of cost for time are :

1. Group, I spend Rp 132.852, 00 per hour travel on the toll road and Rp 54.000, 00 per hour travel by Pantura Road. Based on this result, the efficiency of the toll road is 246,02% lower than Pantai Utara Road.
2. Group II spend Rp 222.958,00 per hour travel on the toll road and Rp 154.500, 00 per hour travel by Pantura Road. Based on this result, the efficiency of the toll road is 144,31% lower than Pantai Utara Road.
3. Group IIII spend Rp 222.958,00 per hour travel on the toll road and Rp 154.500, 00 per hour travel by Pantura Road. Based on this result, the efficiency of the toll road is 144,31% lower than Pantai Utara Road.
4. Group IV spend Rp 204.815,00 per hour travel on the toll road and Rp 128.750, 00 per hour travel by Pantura Road. Based on this result, the efficiency of the toll road is 159,08% lower than Pantai Utara Road.
5. Group V spend Rp 204.815,00 per hour travel on the toll road and Rp 128.750, 00 per hour travel by Pantura Road. Based on this result, the efficiency of the toll road is 159,08% lower than Pantai Utara Road.

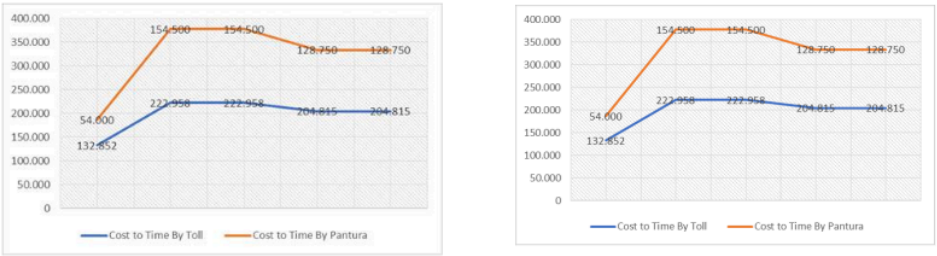

Figure 3 Cost of Travel Time (Rp/Hours)

Based on the analysis, the toll road Semarang – Batang is less efficient compare to the Pantai Utara Road to travel to Semarang to Pekalngan or instead. This result is also reflected by the driver preference. They prefer Pantura road to toll road. It causes of any condition, especially the cost of transportation. The detail of preferences are:

1. 65 % of the respondent (driver) choose Pantura road because the enter cost of the toll road is expensive
2. 50 % respondent considering chose Pantura road because the food price in rest area is higher than a normal place in the surrounding area of Pantura Road.
3. 55 % respondent thinks that the fixing cost of the accidental machine broke in the toll road is more expensive than in Pantura Road. When the car broke in toll road, they need a tow truck to take them to a car repair shop.
4. 85 % driver prefer to use Pantai Utara road when they transport manufacture product such as daily needs, clothes (including batik) and so on;
5. 60 % respondent considering use toll road when they transport the agriculture product such as fruit, vegetables and perishable product.

Based on that preference, the most common reason for avoiding toll road is the cost of transport, food and fixing or can be categorized as accommodation cost. Many drivers saving the transportation cost because they are substitute drivers. It means they are not permanent employees of a certain company. The company rent the truck to transport their product periodically. If the driver is the permanent employ of a certain company, thus the accommodation is provided by their company. By that fact, the permanent driver chooses toll road to transport the product.

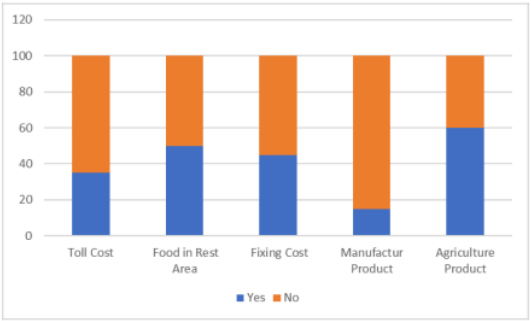

Figure 4 Transportation Preference4. Conclusion

4. Conclusion

The good connectivity between the city and regency in Java is important to enhance economic performance. Good performance can be reached with market expansion and improving accessibility of product transport. Both of them are embodied trough Trans Java toll road development by Government. In Central Java, the Batang – Semarang toll road is an important path to improve the Batik and local product selling to Semarang City. In the previous tome, Pekalongan City only can be reached from Semarang City through Pantai Utara Road. Toll road length is about 98,6 km, it is 2 km longer then Pantai Utara road. However, with the available speed, the toll road takes 1 hour and 22 minutes. Meanwhile, it will take 2 hours and 31 minutes when travel by Pantura.

Based on the time of travel comparison, the toll road is shorter than Pantai Utara road. However, the cost efficiency to time of travel is lower then Pantai Utara toll road. Based on the regulation, the vehicle on the toll road divided into five groups. Group I consist of pick up a car and SUV car, group II is a small truck, group III is a medium truck, group IV is a big truck and group V is Lorry. Each group has a different cost of toll road enter. In term of efficiency, the results are:

1. The efficiency of toll road For Group I is 246,02% lower than Pantai Utara Road.
2. The efficiency of toll road For Group II is 144,31% lower than Pantai Utara Road.
3. The efficiency of toll road For Group III is 144,31% lower than Pantai Utara Road.
4. The efficiency of toll road For Group IV is 159,08% lower than Pantai Utara Road.

5. The efficiency of toll road For Group V is 159,08% lower than Pantai Utara Road.

Based on the result, Pantura is efficient then toll road. However, between all of the group vehicle small and medium truck are more efficient than others to transport the goods or product. Refer to the research finding, the government should evaluate the toll pricing. If the cost can be cheaper, the efficiency could be higher. The inefficient Semarang – Batang (Near Pekalongan) toll road is reflected by driver preference. The driver prefers to travel by Pantai Utara road because of low accommodation. The only factor which the driver considers travel by toll road if the accommodation is provided d by the company and when they transport the agriculture product such as fruit, vegetable and so on. To ensure the factor behind the driver preference regarding toll road, the research about the main factor of it is necessary. Towards the research, the goals of toll road development could be achieved.

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