

PREDICTION OF FREIGHT TRANSPORTATION IN LAMPUNG PROVINCE

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ABSTRACT

The transportation of goods between Sumatra and Java using the highway mode that accumulate with local transportation will greatly burden roads in Lampung province. This research was conducted to predict the pattern and amount of movement of goods in the future. The modelling is conducted for the plan period up to 20 years based on growth predictions of geographical, social, economic and traffic flow. This study conducted a process of Sequential Demand Model (Planning Model 4 stages) by using software Transplan Version 8.

Transportation patterns in 2030 is predicted will be dominated by continuous trips with domination of movement from Java to South Sumatra, or otherwise. Both the transportation between internal zones and external zone to internal zone have a significant increase. The most strategic main line freight in Lampung for today and in the future is along the Bakauheni-South Sumatra and Bengkulu-South Sumatra both through toll roads, national roads, and railways.

KEY WORDS: prediction, freight transportation, transportation patterns.

1. INTRODUCTION

Road transport is the supporter system of the main internal transportation in Lampung province with highways as the main moda. This role is strengthened by an important function in supporting regional transportation systems across Sumatra and the interaction of passengers and goods between Java and Sumatra.

The development of transport system in Lampung province is planned to improve access to services in urban and central region of equitable economic growth. Moreover, to improve the quality and range of services of integrated network of transport infrastructure across the province of Lampung.

The geographical position of Lampung province located in the eastern end of the Sumatra island as well as the gateway connecting Sumatra and Java, will cause all transportation of passengers and goods which by road are going through Lampung province. This movement is accumulated by the movement between internal zones in Lampung Province which will further burden the existing road network in Lampung

province. This continuous movement (Sumatra - Java) is dominated by freight transportation.

The purpose of this study was to determine the pattern and the amount of movement of goods in the base year and the next few years, therefore the needs of the facilities which must be provided can be known to anticipate these developments. This study used a period of up to 20 years, which means that the results of this study can be used up to 2030 with the stages are: 2010-2015, 2016-2020, 2021-2025 and 2026-2030.

2. RESEARCH METHODOLOGY

Conventional transport models was used for prediction of traffic demand. The modeling is conducted for a period of up to 20 years where the traffic load adjusted for origin-destination matrix of the associated zones that have been adapted to the level traffic growth of modeling results. The results of the modeling include the prediction of traffic volume and traffic performance predictions in the future.

A process Sequential Demand Model (Planning Model 4 stages) was done in this research. The use of this model is based on some considerations: firstly, it is easy to control on each stage of the work; secondly, it has higher accuracy related to the simplification process is very limited when compared with the Direct Demand Model; thirdly, this model is very flexible to be applied to new cities studied ; and finally, it is in accordance with the ability of a computer program provided by the TRANPLAN Version 8.

Steps to run the program for TRANPLAN as follows:

- a) Creating and loading freight road network is not the route (Highway Network);
- b) Make a trip freight distribution as input on the process of loading;
- c) Imposition into the road network (Equilibrium highway Load);
- d) Make transyt network, the network of public transport routes in the route);
- e) Creating route network path (Build Path Transyt);
- f) Creating origin-destination matrix with public transportation;
- g) Imposition (Transyt Loading).

3. DATA AND INSTRUMENTATION

Several parameters were taken and adapted to the statistical report of the Central Statistics Agency (BPS) and the reports from the relevant authorities. Meanwhile, data from the primary survey more widely used in the process of validation and adjustment of multiple parameters.

The data used as input in the development of the model, are:

- a) The data of land use and zoning administration as a basis for establishing the zone trip system
- b) The data of Prior OD Matrix. In this case, using the data from the origin-destination survey, OD data in 2003, and secondary data from the results of previous studies;
- c) The data of condition of transport infrastructure, including: rail networks, stations, road networks, traffic management system, as a basis for the development of the transport network models;

- d) The data of population distribution, income, vehicle ownership, land use, PDRB, and data traffic as input for the attraction estimation and trip distribution as well as the validation OD matrix.

The study area is divided into several zones. For convenience, the zoning is based on administrative boundaries. Thus in this analysis defined 30 zones consisting of 27 internal zones and 3 external zone as shown in Figure 1.

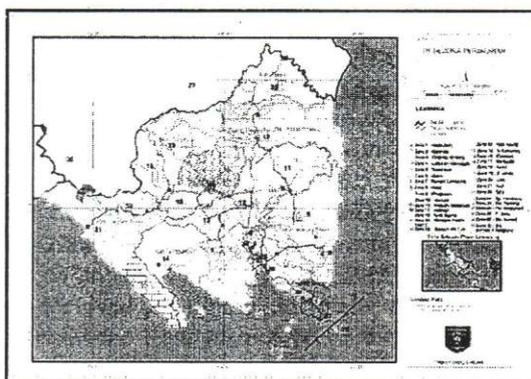


Figure 1. Zoning study area

Lampung province road network is divided into 30 zones, 1758 nodes and 4580 roads. Roads were included in this study are arterial roads and collector roads. Inlet and outlet is divided into three, namely the entrance of Bengkulu, South Sumatra, and from Java. Lampung province road network model is in autocad format then was entered into the base data as input Transplant program.

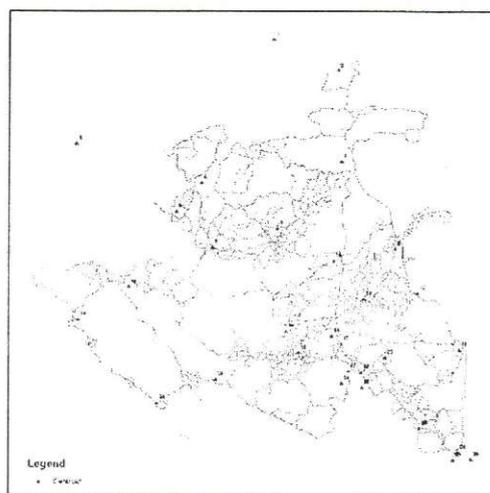


Figure 2. Road network in Lampung province

4. RESULT AND DISCUSSION

4.1 Freight Transportation in Base Year

In 2010 the average production of travel goods for each zone approximately 792 344 tons / day, with Bandar Lampung as the largest origin and destination of goods in Lampung province for 131 020 tons/day. In percentages, the movement in Bandar Lampung approximately 16.5% of the whole movement in Lampung province. Followed by Java amounted to 90,322 tons/day or 11.4%, and South Sumatra for 58 507 tons/day or 7.4% of the total freight movement in the province of Lampung and then Metro for 50 856 tons/day or approximately 6.4%.

Based on data generation and attraction, Origin Destination Matrix for goods is predicted for the year 2010 to 2030. This matrix noticed the vehicle travel patterns between regions. This matrix is processed from the origin destination survey (road side interview) and the results show that Bandar Lampung is the center of attraction which is become the destination from many surrounding areas. After that MAT is loaded to the road network in order to see the pattern of movement of passengers and goods in the road network

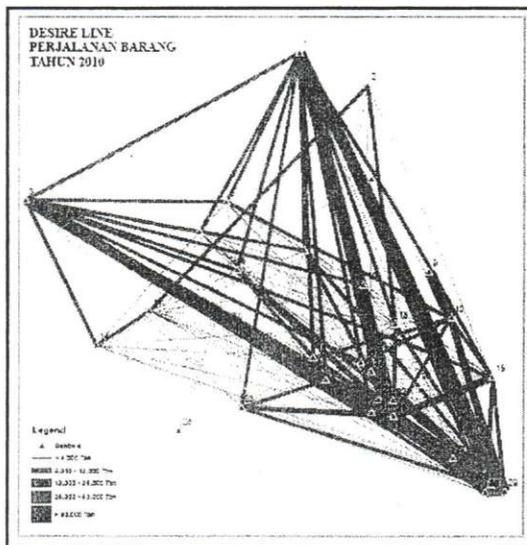


Figure 3. Desire line of transportation in 2010

Based on the analysis, show that the provincial capital of Lampung, Bandar Lampung (Zone 7) has a origin and destination of the trip dominantly, ie 131 020 and 77 148 tons/day. The transport in Lampung are also quite dominant come from Zone 28 (from Java

through the Bakauheni Port) of 90322 tons/day and 65680 tons/day), South Sumatra for 58507 and 53599 tons/day, Metro with 50856 and 38976 tons/day, and Bakauheni with 42,118 tons/day and 45,564 tons/day.

Based on the analysis of the survey results of OD national and other sources, there is information on the distribution of travel demand of goods to every available moda, shown on the image above. The prediction of this the moda use is intended only for the freight movement overland via the internal network in the area in Lampung where external movement generally to Java and Sumatra uses road modas, while to all other areas by sea. It appears that the current freight transport is still dominated by trucks on the highway, while the railway transport only accounts for no more than 10%.

Ideally, with the railway network development scenarios, as well as the utilization of the rail line, in the future the freight transport needs should be more accommodated by train. This is because train is much more efficient than road transport with trucks in case of the time and expense for regional freight movement.

Reducing the burden of road network in the future for Lampung province is an important strategy. This is because the condition of existing the road network in the province within the next 10 years will face big problems such as traffic congestions. Therefore the railways development is a good solution to overcome this problem and also to encourage the development marine transport system scenarios.

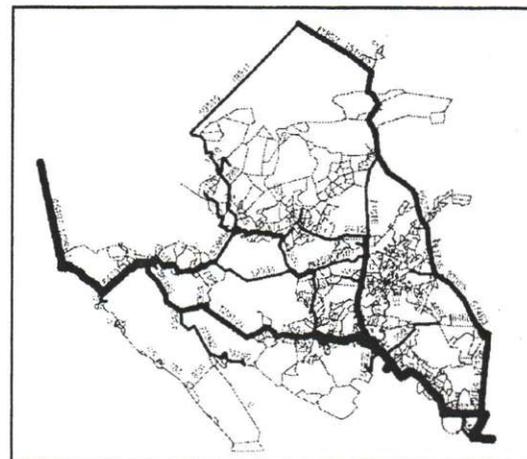


Figure 4. Results of loading to network

From the picture above can be seen that the most of goods movement by road from Bakauheni to Bandar Lampung then continue to Bengkulu, which amounted to 172 962 tons/day. While the movement of goods through Bakauheni to Bandar Lampung then continued until Menggala (Lintas Tengah) is approximately 139,412 tons/day. Movement of goods from Bakauheni through Lintas Timur is 97,375 tons/day. While the goods movement through road between Menggala to South Sumatra is 151,993 tons/day.

The imposition of provincial road network is relatively evenly and provide a relatively equal access to all parts of Lampung. That pattern can provide support for the achievement of room development which is more proportional, particularly for areas of the West Lampung and the East Lampung.

To assess the performance of the road network, use indicator of the volume of traffic per road capacity, which is known as Volume-Capacity Ratio (VCR).

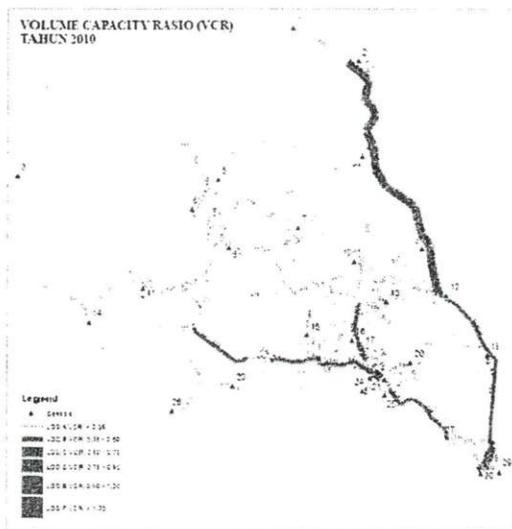


Figure 5. Volume Capacity Ratio in 2010

Figure 5 shows that currently some segments of Lintas Timur, from South Sumatra-Menggala-Tulang Bawang, have LOS C. While, the segments of Lintas Timur (Sukadana-Bakauheni), Lintas Barat (Kota Agung-Bandar Lampung), dan Lintas Tengah (Bandar Jaya-Bandar Lampung-Kalianda), have LOS B.

4.2 Prediction of Transportation

The movement of goods is projected for the next 5 years and so on up to the time of planning, which is 30 years old. Based on this projection could be seen the amount of movement which is happened, so that if it is charged to the road network, the road network that need to be addressed will be known, as well as its relation to other modas. From the desire line in 2015 can be seen the amount of movement that occurs increased about 1.2 times of the movement in 2010. But the movement pattern was relatively similar with patterns in 2010.

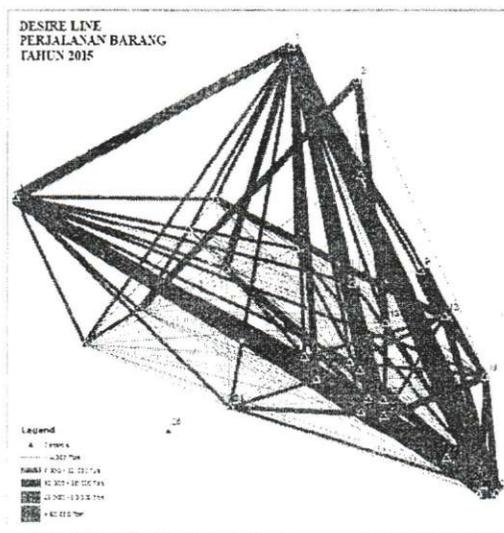


Figure 6. Desire line in 2015

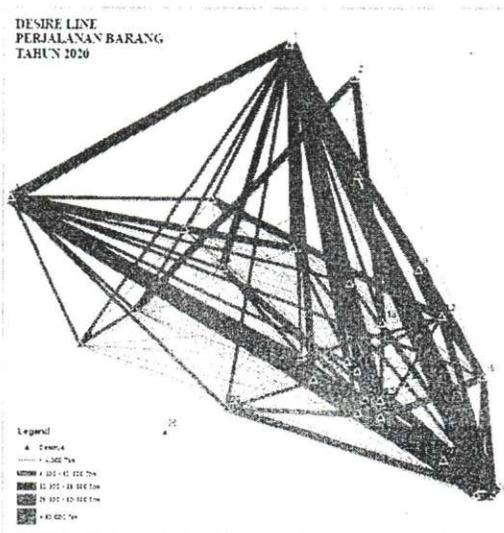


Figure 7. Desire line in 2020

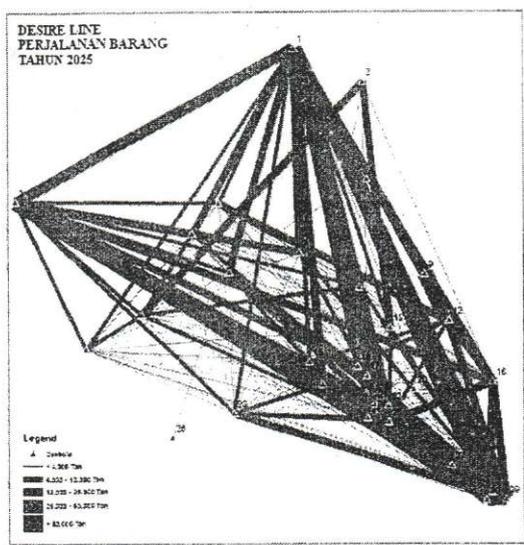


Figure 8. Desire line in 2025

The amount of continuous movement is going greater with the domination of the movement of Java-Sumatera, or otherwise. The amount of movement between the zones of internal and external zone to the internal zone is also seen to increase. This will burden the existing road network in the province of Lampung.

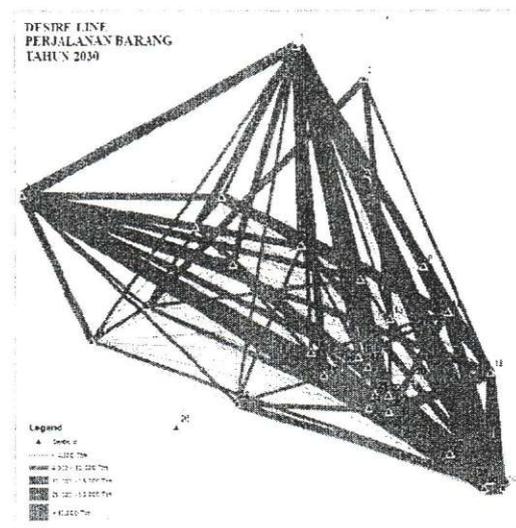


Figure 9. Desire line in 2030

Existing trip patterns are also predicted for the next few years, and it can be seen that the increase of movement amount happen on every street. The pattern has not changed much, but the increase of amount of movement can be seen

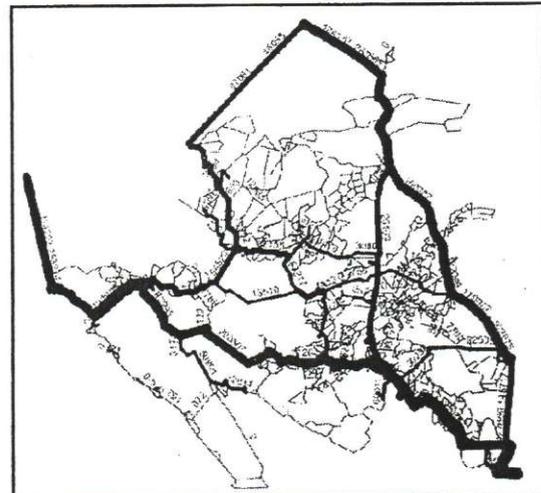


Figure 10. Loading to network in 2015

In 2015 the movement pattern is predicted to increase with biggest road loading on link of Bakauheni - Bandar Lampung , amounting to 393.606 tonnes/day, followed by Tanggamus towards Liwa for 393.274 tonnes/day. The movement of goods through Lintas Timur is at 265.665 tonnes / day, up to the road to South Sumatra. Another problem faced is the movement of regional which across Lampung province. The high volume of regional movements with the origin and destination regions outside Lampung has created road damage in Lampung province.

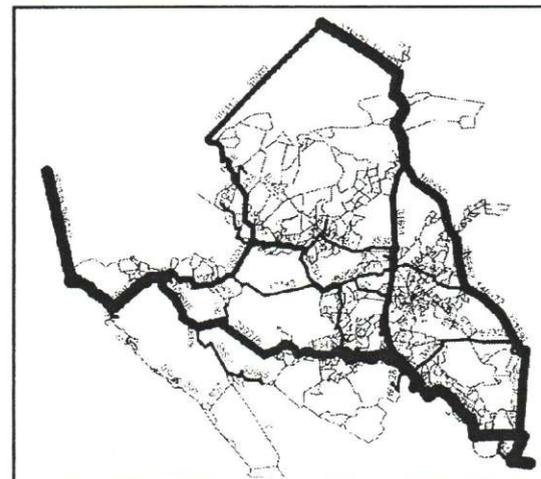


Figure 11. Loading to network in 2020

In 2020, the movement patterns of freight is predicted to increase with biggest road loading on link of Bakauheni - Bandar Lampung at 496 402 tonnes/day, which has an increase of

100.000 tons / day from the previous 5 years. Followed by a link of Tanggamus to Liwa at 383.463 tonnes/day. The movement of goods through Lintas Timur is accounted for 308.861 tonnes/day, up to the road to South Sumatra.

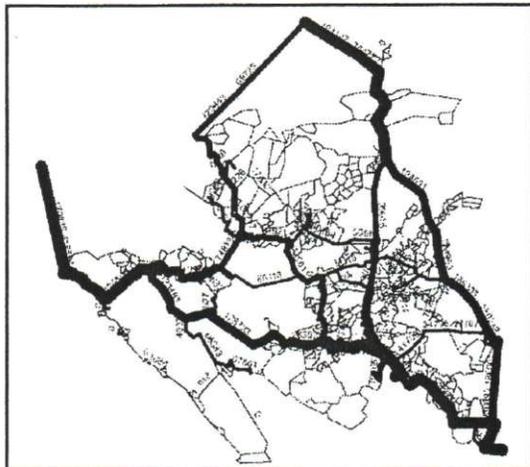


Figure 12. Loading to network in 2025

In 2025, the biggest movement of goods is predicted similar with the prediction of the previous year, namely on the link Bakauheni - Bandar Lampung ranged from 425.193 – 564.039 ton/day. The movement of goods from Bandar Lampung towards Bengkulu ranged from 399.134 - 435.976 tonnes/day. While the movements through Lintas Timur to Sukadana is 224.863-353.709 tonnes/day, and from Sukadana to South Sumatra is accounted for 251.370-384.772 tonnes/day.

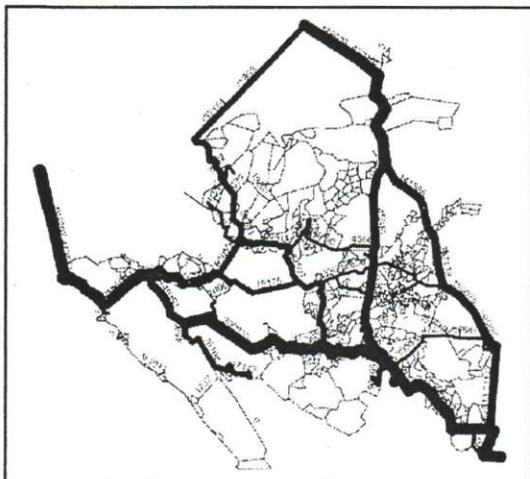


Figure 13. Loading to network in 2030

At year end 2030, the pattern of movements is still have a same trend that the biggest movement through the link of Bakauheni - Bandar Lampung ranged from 483,418 to 641,280 tonnes/day. From Bandar Lampung towards Bengkulu ranged from 428,528-473,544 tonnes/day. While the movements through Lintas Timur until Sukadana is accounted for 322,436-402,145 tonnes/day, and from Sukadana up the road to the South Sumatra ranged from 333,346 to 437,462 tonnes/day.

Several roads are in good condition so it can be passed by heavy vehicles without causing any damage. While some other roads were only able to be passed by vehicles which have axle loads is not too heavy, as a result, the transport of goods by heavy vehicles can only be served by certain road sections. In several sections, the traffic network is passing through the unfavorable geographical conditions and it needs alternative pathways to accelerate the trip.

Based on the characteristics of the transport of goods, it consists of industrial and agricultural / plantation transportations which use the moda of medium truck and pick-up. This indicates that the the transport of goods use vehicles which have medium axle load. This is because the center of industrial and agriculture/plantations are the areas that can only be reached by small-medium vehicles.

The condition above gives an overview of types of freight transport required by Lampung province, namely the transport of goods by vehicles having small-medium capacity and significant numbers (as evidenced by the amount of movement frequency is every day), so that it can reach out to all parts of Lampung. This provides an advantage, because network traffic required must not use the road with high bearing capacity, but the road can serve small-to-medium vehicles well and can reach out to all corners of the region.

4.3 Road Network Performance

The performance of the road network in the prediction of the year 2015 will be clearly shown in the figure. VCR value of each road segment as follows:

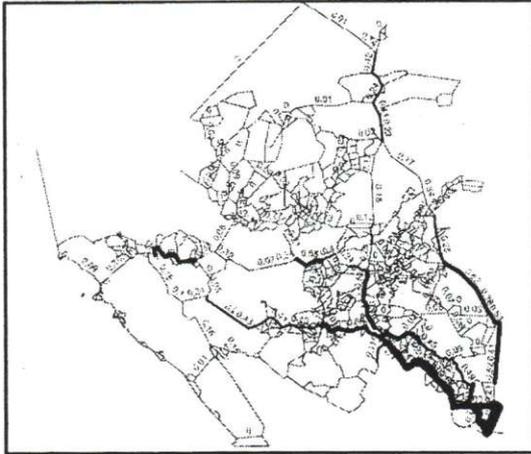


Figure 14. Value of VCR in 2015

It can be seen from the figure that the VCR value for the segment of Bakauheni to Bandar Lampung through the existing road is 0.89. Meanwhile, if the toll road is built, then the value of the VCR is turned into around 0.49. Value VCR roads connecting Bandar Lampung towards Pringsewu also increase to 0.66, as well as through Lintas Timur for 0.53. We can also see that the movement of traffic from Terbanggi towards Kotabum has VCR value by 0.55 and from Sumberjaya towards Liwa by 0.52. In addition, the value of VCR from Menggala towards Mesuji around 0.42.

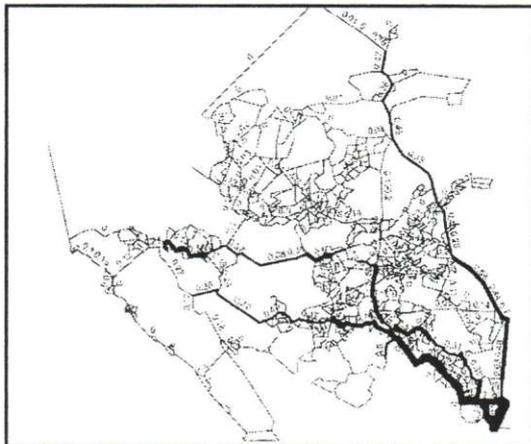


Figure 15. Value of VCR in 2020

In 2020 the movement of goods is predicted to spread evenly with the value of VCR of Bakauheni towards Bandar Lampung ranged from 0.81 to 0.9. VCR value for the segment towards Bandar Lampung Tanggamus around 0.79. The value of VCR for the transport in

Lintas Timur varied by 0.44 to 0.7. The substantial movement is also evident in link of Bandar Jaya towards Padang Ratu with VCR value of about 0.6, as well as the road linking Kenali and Liwa has the traffic volume at 0.56.

The increase of movement in 2025 can be seen more clearly with the indicator value of VCR (road performance) as follows:

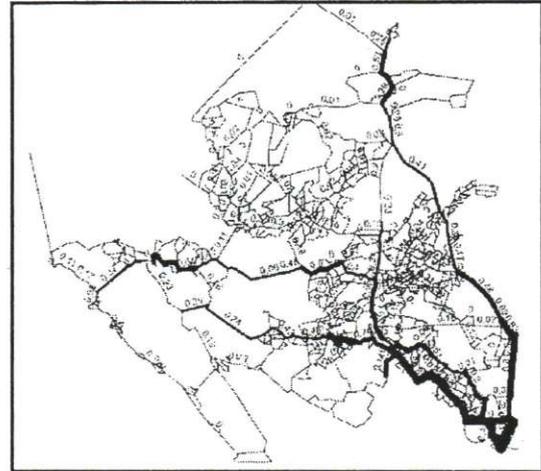


Figure 16. Value of VCR in 2025

The biggest changes of the value of VCR between 2020 and 2025 is the freight movement of Bakauheni towards Bandar Lampung which ranged from 0.9 to 1.52. This shows the road has been in a critical condition, eventhough some of traffics is divided trough toll road with VCR value of 0.61. In 2025, the movement of goods through the Lintas Timur has VCR value varying from 0.62 to 0.80.

While the roads of Bandar Lampung towards Tanggamus still has VCR value around 0.79. A substantial movement is also evident from Bandar Jaya towards Padang Ratu with VCR value of about 0.7. As well as road connecting Kenali and Liwa has traffic volume around 0.64, or has a slight increase from 2020.

The value of VCR for every street in the year 2030 can be seen graphically as follows:

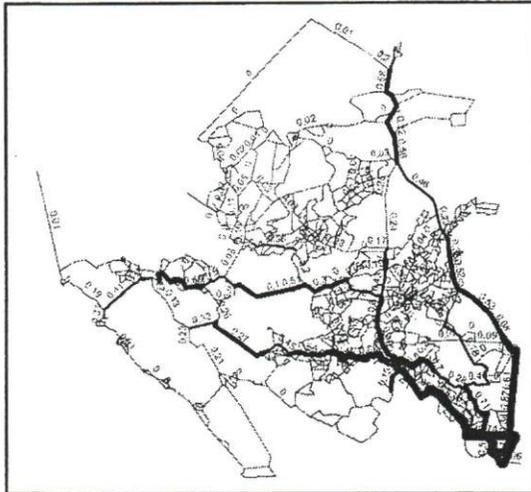


Figure 17. Value of VCR in 2030

The biggest changes of the value of VCR between 2025 and 2030 is the freight movement of Bakauheni towards Bandar Lampung which ranged from 1.0 to 2.27. This shows the road has been in a stagnan condition, eventhough some of traffics is divided trough toll road with VCR value of 0.80. In 2030, the movement of goods through the Lintas Timur has VCR value varying, with the highest VCR is 0.87. While the roads of Bandar Lampung towards Tanggamus still has VCR value around 0.82. A substantial movement is also evident from Bandar Jaya towards Padang Ratu with VCR value of about 0.91. As well as road connecting Kenali and Liwa has traffic volume around 0.89, or has a significant increase from 2025.

5. CONCLUSIONS

The conclusions that can be drawn from this study are as follows:

- 1) Most of the movement of goods in the base year (2010) through the national road from Bakauheni to Bandar Lampung, and continue to the Central Lampung were then divided into two directions, namely through Lintas Tengah and Lintas Timur toward South Sumatra.
- 2) The movement of freight in Lampung Province (both between internal zones and external zones) is dominated by moda of trucks on the highway, while the railway transport only accounts for no more than 10%.

- 3) The pattern of freight movement in 2030 is predicted that the domination of continuously movements from Java to Sumatera or otherwise will be greater. The number of movements both between internal zones and between internal and external zones will increase significantly.
- 4) Until 2030, the transport of goods from Java to Sumatera (inter-urban) were still dominant. It can be concluded that the main line of freight transport in Lampung, which is most strategic for now and in the future, is along the Bakauheni to South Sumatra and also Bengkulu either through toll roads, national roads, and railways.

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