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Development of Ferry Port as a Complement of "Tol Laut": Case Study on Ferry Port of Ketapang

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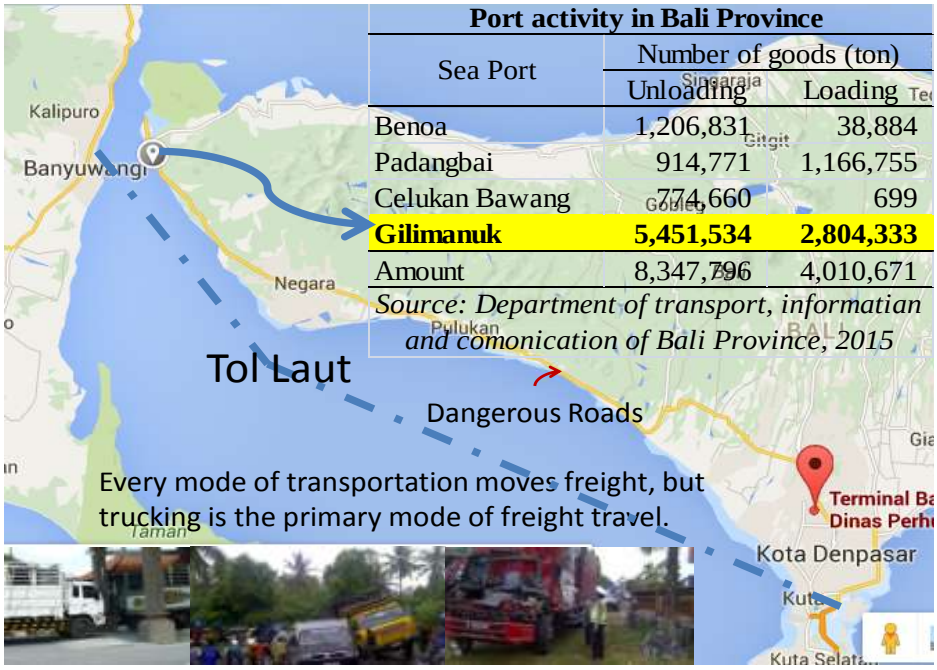
ABSTRACT :- High use of land transportation mode in Bali became burden to the road and unpredictable congestion especially in the main road connecting Denpasar and Gilimanuk in Bali. Effort in decreasing traffic density is by developing ferry port as a component for "Tol Laut". It requires behavior eploratory on freight trucks in choosing land or sea trips in Bali. This study is conducted by implementing focus group discussion with various freight stake holder and information from sources gained by using a set of semi-structured interviews (SSI) and on-the-spot field observation. Discussion conducted were: workshop "Lean, Clean and Green Cities Rationalizing Indonesian Urban Freight trough Inclusive Urban Development" in Jakarta (30 to 31 July 2015); Workshop "Rationalizing Indonesian Urban Freight Through Integrated Urban Development of Sarbagita Metropolitan in Bali" held by Coordinating Ministry for Economic Affairs of the Republic of Indonesia in Jakarta (1 to 4 august 2016) and discussion done with Pusat Studi Transportasi dan Logistik (PUSTRAL) Universitas Gadjah Mada in Yogyakarta (3 to 6 October 2016). Result from brainstorming and field observation shows that there is a need for steps in diminishing density and traffic accidents including decrease road damage caused by overloaded freight trucks in Bali.

Keywords :- Port Development, Tol Laut, focus group discussion.

I. INTRODUCTION

High use of land transportation mode in Bali became burden to the road and unpredictable congestion especially in the main road connecting Denpasar and Gilimanuk. Bali Island is 5.636 km^2 or just 0,29% of Indonesia consists of eight districs, one city and one province, dense population of 3,7 million people (BPS Bali Province 2013), limited natural resources, comprised of mountains which streches from west to east dividing the island into two parts which makes the road geometric condition narrow, zigzag and steep incline which unfit for big trucks with overload freight to pass causing accidents and damage to the road causing long and total congestion as shown on Figure 1.



Port activity in Bali Province

Sea Port	Number of goods (ton)	
	Unloading	Loading
Benoa	1,206,831	38,884
Padangbai	914,771	1,166,755
Celukan Bawang	774,660	699
Gilimanuk	**5,451,534**	**2,804,333**
Amount	8,347,796	4,010,671

Source: Department of transport, informatian and comonication of Bali Province, 2015

Figure 1 Land Transport (dangerous roads) and "Tol Laut" plans

Effort in dealing (diminish) this traffic density pressure can be done through two method, those are: improvements in transportation infrastructure and transportation management [6]. First method, also known as road base solution approach, aims to improve road capacity. Method already implemented by the government was widening the road and built short-cut to eliminate obstacles on horizontal alignment and vertical alignment. This method works well in enlarging traffic flows per time unit only in that specific location. However most of the projects is still can not be implemented because of huge cost constraints and limited land.

Second method, also known as vehicle base solution approach aims to streamline road benefits, by improving flow of goods and people per time unit. Effort implemented y government is by limiting vehicle's weight and impose sanctions on violator (overload). However from direct observation the fact is there are still a lot of overloaded vehicles and many accidents occured and congestion along the Denpasar-Gilimanuk road.

Other method that can be implemented is the use of sea transportation mode. However from the research [3] it turned out to be very little sensitivity to sea freight service attributes. In Figure 1 seen that more than 65% (5,451,534 tons) goods passing through Ketapang-Gilimanuk port which means most of the goods coming in to Bali by way of Denpasar-Gilimanuk road. While goods passing through Benoa port only 14%, Padangbai port 11% and Celukan Bawang port 9%.Sea transport indeed is cheap but it have many weaknesses. The main weakness is that it is not flexible and less friendly. So it need another form of transportation mode that have flexible movement and attractive. Ro-Ro ship as short sea shipping considered to be able to fulfil truck user demands, because it has service characteristic that is close to land transportation mode.In the context of government's desire to realize Indonesia as world maritime shaft in realizing Indonesian vision, currently is trying to accelerate the maritime sector development thorugh building "Tol Laut" infrastructure. The development of tol laut aims to improve national income based on Indonesia maritime economic development, including sea transportation service industry, nautical tourism, the development of maritime economic sector need to be encoureaged with adequate 'sea toll' infrastructure, including sailing infrastructure, port infrastructure and manufacture infrastructure. But this expectation is normative and have not yet been tested, because there is still no research regarding behavior of traveler in choosing transportation mode, for this research it is limitied to land transportation mode or tol laut .

From the problem stated above this study will explore the behavior of freight truck in choosing land transportation mode and tol laut for a trip in Bali and formulate in a qualitative model (see Figure 2). This model can be used as a base in estimating market potency and further used as an input for "tol laut" Ketapang port – Benoa port operational management.Focus group discussion (FGD) is a form of qualitative research in which a topic is discussed and discussed with a group. Besides that, this study also gathered information from sources gained by using a set of semi-structured interviews (SSI) and on-the-spot observation field. Discussions were held among others: the workshop "Lean, Clean and Green Cities Urban Freight Indonesian rationalizing trough Inclusive Urban Development" in Jakarta (30 to July 31, 2015); Workshop "rationalizing Indonesian Urban Freight through Integrated Urban Development of Sarbagita Metropolitan in Bali held by Coordinating Ministry for Economic Affairs of the Republic of Indonesia in Jakarta (1 to August 4, 2016) and discussions done with the Study Center for Transportation and Logistics (PUSTRAL) Universitas Gajah Mada Yogyakarta (3-6 October 2016). The study is still in the shape of exploratory (premilinary) since the sampling is not done in accordance with the rules of sampling techniques authorized by the theory. This is due to the limitations of cost and time, and also the lack of supporting data on travel patterns as a prerequisite to be able to determine the correct sample. However the number of samples taken at random is sufficient as the basis for the development of statistical models.

This study was conducted on a scale of individual (disaggregate). Which is considered as an individual or a unit decision is taken as a private individual truck driver. This model is a disaggregate behavioral models. This means that the ability of this model is limited to measuring the probability of choosing the mode of Tol Laut (ship) by an individual, at a certain level of service. To be able to know the number of demand on Tol Laut on market scale, additional aggregation studies need to be done. Research Methodology flow chart can be seen in Figure 2.

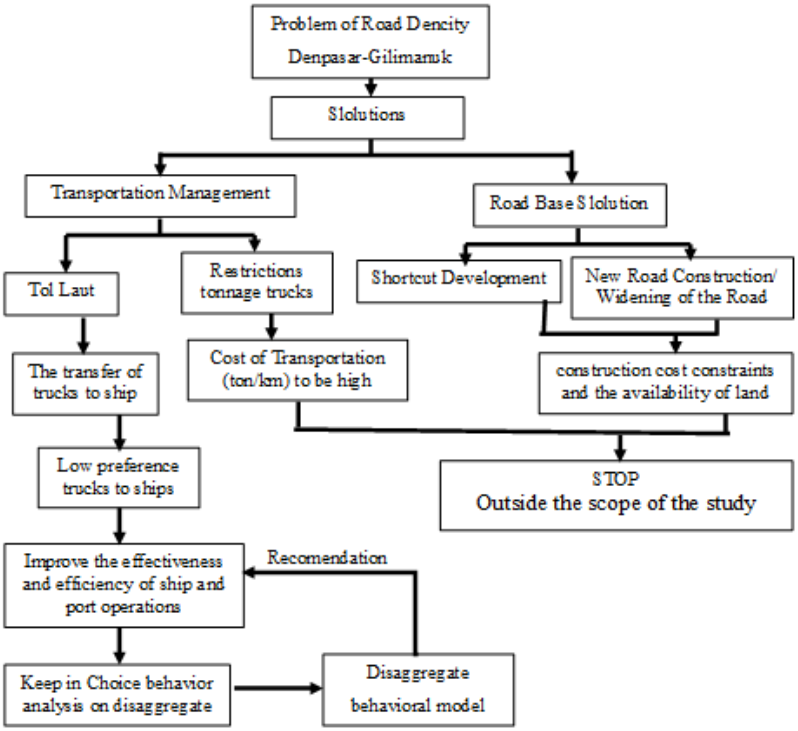


Figure 2 Research Methods

II. THE CONCEPT OF "TOL LAUT

Tol Laut is a nautical freight logistic concept initiated by President of Republik Indonesia, Joko Widodo which has been declared on 4th November 2015. This program aims to connect major ports in this archipelago country. With the connection between these ports, then smooth distribution of goods to rural areas can be realized.

Tol Laut is not a highway above the sea, it is a government program to provide certainty for all Indonesian people. Certainty in the sense of the presence of this tol laut we can ensure vessels coming and departing as scheduled on a regular basis. That even there is or no goods, the vessel must depart, just like busway. In this case the vessel operator (Pelni) certainly will not lose money because the government has set up a Public Service Obligation (PSO) to cover operating costs if the cargo ship deserted. To put it simply, it is subsidized.

This tol laut program is basically intended to start and pioneer sea transportation activity to be able to connect every port in Indonesia. Tol laut route is not a favorite route because comercial ferries are still not that active, and uncertain when it will dock. This program aims to drive economic movement, when scheduled private ferries operating, tol laut will move to another less favorite route. Until Indoensia eventually have scheduled fleets sailing from Sabang to Merauke, equal goods' price, established fixed supply of goods and the most interesting part is travelling around Indonesia would be cheaper. These ships should be painted and named "tol laut" for branding purposes, so that it would be easy to remember and familiar for the society.

Tol laut is an effective sea connectivity in the form of ships sailing regularly and scheduled from the west to the east of Indonesia [2] reveals that tol laut is not the sole solution for equitable development in Indonesia. First, it would also need development on Specific Economy Area in East Indonesia to ensure ships departing from the East to the West will not carry empty cargo because of the inexistence of industry there. Second, it is important to strengthen the networking connection between port and industrial area to ensure logistic cost is not expensive and sea network become the choice for industries.

Purpose of "Tol Laut"

The purpose of tol laut is to shorten transportation access and connect major ports in Indonesia, also to minimize road damage and create smoothness of goods distribution to rural villages.In the discussion that were done by Netherland Indonesia Student Community (PPI) stated their result on the efficiency of tol laut system. "Resul of study [2] shows that tol laut concept would increase the efficiency as much as 45 percent compared to the prior sea transportation route."

Reveals that investment needed for "road toll" reached Rp. 80 – 100 billion/km, while a 500 TEUs sized ship need Rp. 280 billion. Transport cost with land mode reached Rp. 3500/TEUs.Nm, while sea mode is more efficient as much as 35 percent with only Rp. 2300 TEUs.Nm. Sea mode loading capacity is much more effecitive than land mode, where a ship can load as much as 19.200 TEUs/ship/year, while truck can only load as much as 110 TEUs/truck/year. There is also environment externality that is produced by ships which is more environmentally friendly than trucks, where ships only produce CO_2 as much as 8 gram/ton.km, while trucks produced CO_2 as much as 50 gram/ton.km.

Service Concept of Tol Laut

"Sea freeway (Tol Laut)" is an ocean freight service with the amount and type of large vessels in accordance to the demand, through the main line the central corridor that connects the waters of Indonesia main ports (hub), accompanied by continuous lines (feeder) which connects the ports feeder (spoke). Tol Laut elements can be seen in Figure 3.

Source: exposure of the director of transportationBAPPENAS

Figure 3 "Tol Laut" elements

III. NETWORK DEVELOPMENT ON FERRY ROLL-ON/ROLL-OF (RO-RO)

The cause of the high cost of logistics in Indonesia, among others are because logistic transport depends on road transport or truck which become the cause to problems such as congestion and road damage. In an effort to cut logistics costs nationwide, one of the breakthroughs from the government is to revitalize ocean freight crossing for logistics in Indonesia. Therefore, freight ferry crossing is expected to shift the burden of the road and be a solution to overcome these problems.

Tol Laut of Port of Ketapang – Benoa Port

The integration of logistics and transport infrastructure, in particular freight transport is a complex problem. The complexity lies in the dynamics and uncertainty of associated component parameters in the existing system. The biggest support of Bali's economic growth is the tourism sector. The freight transport in Bali have a crucial part of the tourism trade. In this tourism business, every part must be done professionally because the aim of this business is how we can treat tourist with the best service. As such, freight transport should also have excellent services. Many of the streets in Bali were damaged by many freight trucks passing. It can interfere with the tourism sector in Bali. For that we seek a solution, the truck can be switched to ferries. This solution can cut the cost of logistics and support tourism by ferry distance.

Bali, in addition to being one of the gates of the distribution of goods from various regions, such as Java, Lombok, Sumbawa, Flores and NTB is also the region with the dominance of industries processing raw materials into semi-finished materials and finished goods. Because of that, Bali became a destination for raw materials industry and shipping industry which includes marketing products nationwide and even international

scale. This role requires the provision of adequate transport services and smoothly as a reliable supporter of economic and social development by reducing disturbance associated with rapidly increasing freight capacity seen from the size of the vehicle, load, and the volume of vehicles that most of the vehicles are old. This resulted in negative impacts such as traffic congestion, accidents, pollution and vibrations generated around transportation lines resulting in increased external cost. Problems of various infrastructure utilization can cause a decrease in the quality of service and shipping costs to rise. Logistics transport vehicles from Banyuwangi to NTT through ferry port that connects Lombok to Padangbai Bali as an exit-entry of goods and people in NTB then headed to NTT. "Later Tol Laut will connect the ports of Timor, Flores, Lombok, Bali and continue to Surabaya"

In Bali, the only access to transport carriage of goods only via ground transportation by truck, because until now there is still no train available and no rivers or lakes that are adequate for ships to sail for the transportation of goods. Some of the advantages of the use of the truck fleet is able to serve door to door because of high accessibility and flexibility, and intransit visibility is excellent. Despite the very limited road infrastructure and frequent traffic jams on the road beside the Denpasar-Gilimanuk relatively high trucking costs per ton kilometer compared to ocean freight.

Tol laut is an effective sea connectivity in the form of ships sailing in routine and scheduled from the west to the east of Indonesia. As the development goes, ferry fleet is utilized for mode switch from land transportation through the development of Coastal Shipping. The purporse of Short Sea Shipping (Tol laut) Ketapang (Banyuwangi) to Benoa port (Denpasar), are: 1). Alternative logistic distribution, 2). Decreasing overloaded road burden, 3). Saving cost (road maintenance, gas), 4). Minimize accidents, 5). Minimize gas emissions. However from direct observation there is still a lot vehicles not following the rules and there is still many accidents and traffic congestions along the Denpasar – Gilimanuk road.

The rapid growth of Bali's social economy in the decade of 2010's and physical size island of Bali, is actually very encouraging for people, especially entrepreneurs of transportation of goods to use Tol Laut. The distance to achieve from the port of Ketapang (Banyuwangi) to the port of Benoa is relatively close. Therefore, in terms of costs and flexibility of movement then Tol Laut can be competitive with other modes of land transport. It is time that sea lanes further optimized logistics transportation in order to support Tol Laut program.

With the operation of ferry transport is expected to reduce the burden and maintenance of highways, time efficiency and truck maintenance operating costs, shorter travel time and provide certainty on logistics transportation services. In addition to cut the cost of logistics, ferry transport can also support the tourism sector, among other things: reduce congestion in Bali, add a new route from Surabaya to Lombok tourism, and environmentally friendly.

Mode Choice Attribute

[5], states that the service level attribute hold a very important role in attracting transport demand. Among the attributes of the cost involved is a primary attribute that is very influential. Even all the attributes of service levels can be generalized through equality of common fare. Equality of common costs are a function of the rate, waiting time and comfort [6].

One of the difficulties in applying this function is the diffculty in setting the equivalence value of attributes that are non budgeting into cost, such as waiting times and comfort. Each individual may have different equivalence value, depending on his perception of the cost. To overcome this, to simply use alternative modes of analysis of short-term costs, which are expenses directly incurred (out of pocket cost). Since the information obtained by the individual is not necessarily perfect, the costs can be estimated more are approximate (perceived cost).

In a study of service attributes that are considered influential on sea or land modal choice are: 1). the difficulty level on parking of vehicles (trucks) at the destination, 2) waiting time required to get ships of Tol Laut to depart, 3). Travel time required by Tol Laut or ships to reach the goal, 4). Expenses incurred, covering all components of direct costs spent at the time of the trip.

From the observation it is visible the condition where the Denpasar-Gilimanuk road is solid and broken, a lot of accidents. But remain in demand. While, on one hand there are still many unused ships that should solve the problem but it is not desirable.

Ro-Ro and Ferry Terminals

Behavior maneuver the ship and ship hydrodynamics influenced greatly affect the productivity of the port [4], with the Tol Laut plan from Ketapang port, it is inevitable for Benoa port to improve themselves without reducing service in leading sectors, which is tourism sector.

From the results, a big problem in the national logistics located in the port, in this case low productivity problem. Docks are actually available if the productivity actually high but this time as seen many ships docked at the pier in Ketapang port or at the port of Benoa. Benoa port has strategic value as a supporter of sea transport connectivity in the province of Bali, especially in the tourism and fisheries sectors. But the port development plan is still not optimal.

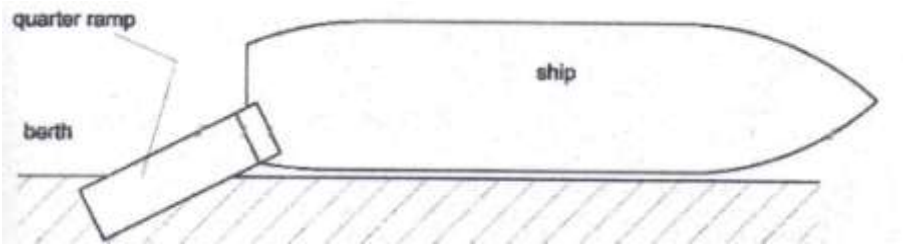
Based on the results of the brainstorming, the solution is not to build a new pier, but increase productivity by adding tools, improve terminal management, introduce modern information technology, personal training, and pricing. If port productivity is fimproved in accordance with the standard "best practice", there is no need to build a new pier, to support Tol Laut because it does not accommodate large sized ships. The high "inventory cost" because there is no certainty when the ship will dock at the pier and on the other hand there is high "waiting time", i.e. the length of the ship dock because of the low productivity of loading and unloading.

Ro-Ro ship is the future of logistics between the islands of Java to Bali by using Ro-Ro ships it can increase the frequency to transport trucks. The Ro/Ro ships are therefore comparable with ferries: they must have a facility to drive the cargo on and off the ship. Contrary to the ferry, which normally sails on short routes only, this type of ship serves on the longer routes.

The maneuvering with long trailers may be difficult, since much space is required which is not always available. The problems with high tide differences were solved by use of a pontoon between ship and quay as shown on Figure 4 Ketapang port in Banyuwangi.

Figure 4 Ferry Port of Ketapang in Banyuwangi

Ro-Ro applies to a specific category of cargo transport, whereby the road-trailers are driven on and of the ship. The following types of Ro-Ro transport can be distinguished, depending on vessel size and sailing distance.Developed from the traditional ferries, with travel times ranging from a few hours up to a day. Combination with passenger transport, including passenger cars and buses. Typical examples are the ferry lines between Ketapang port and Gilimanuk port in the Bali island. In "tol laut' this type of service is developed on short-sea route, from Java to Bali. To attain more flexibility in the allocation of a berth in a port, Ro/Ro ships were later on provided with a quarter ramp, which makes an angle with the axis of the ship and enables the ship to berth at any part of a straight quay [1] (see Figure 5).The carrying capacity of Ro/Ro ships is usually expressed in lane length, being the total length of the lanes in which the Ro/Ro cargo is placed on the different decks of the ship (standard width of 2.50 m).



Source: (H.Ligteringen and H. Velsink 2012)

Figure 5 Quarter ramp

IV. CONCLUSION

A comparation between land transport modes such as trucks which require lane "Toll Road" with other modes of transportation such as ships requiring sea route "Tol Laut", found that marine transportation modes (ship) have this level of efficiency and effectiveness which are better and environmentally friendly. One effort that can be done is to accelerate the development of infrastructure for "Tol Laut" with various prerequisites required.

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