

The Classification of Seaport-Hinterland In Johor Port and Port of Tanjung Pelepas

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Abstract

Hinterlands or lands located at the rear of ports play important role to support seaport activities by delivering cargo to and from seaports, cargo distribution and also attracting the import cargo from the seaport. In Malaysia, there are two major seaports in southern region peninsular Malaysia including Johor Port and Port of Tanjung Pelepas (PTP). These two major seaports are closely located with each other. This shows that probability of these seaports to cater same client is very high and may cause overlapping on hinterland area. This overlapping between these two seaports causes waste of resources, traffic congestions which subsequently reducing the competitiveness of seaports. Hence, this research has been conducted to clearly identify the importance of hinterland in southern region peninsular Malaysia and to clarify related elements to distinguish types of hinterlands in Johor region. In order to achieve these objectives, exploratory factor analysis (EFA) has been employed to evaluate the dimensionality of hinterland in Malaysian seaport especially in southern region. Availability of hinterland, prices of hinterland and management of hinterland have become key factors for seaports in this region to choose their respective hinterland for effective and efficient freight transportation operation. Moreover, this paper also has proposed a new dimension of hinterland in southern region which including short-range hinterland and far hinterland. The outcome of this paper is important to educate the seaports about their hinterland typology user as well as the respective hinterland operator in order to improve the client satisfactions in the respective region.

Keywords: Classification of Hinterland, Overlapping, Exploratory Factor Analysis, Johor Port, Port of Tanjung Pelepas

Introduction

Malaysia is prominent for its seaports which connected with to the international trade. Seaport is a subsystem of supply chain and provides a crucial link in the transport chain that make the flow of cargo smooth and easier along the freight chain. Further, seaports are keys of the elements in value driven system which contribute to supply chains by creating value added services to increase the competitive advantages in the transport chain (Robinson, 2002). Therefore, seaport

plays important role in Malaysia economic as well. This is evident by the enormous growth of ports and shipping activities in Malaysia over the years. Also, port and shipping are recognised as vital contributors in facilitating Malaysia's trade, hence crucial to its economic prosperity (MIMA, 2005).

In general, hinterland defined as 'places in which a transport terminal or one port, exchanges its services and deals with its customers (Waals and Wijnolst, 1998). In other word, hinterlands also has been defined as 'areas located at the back of the ports that play important role to support and delivering export cargos to ports and distributing and attracting import cargoes from the port' (Weigend, 1958). Therefore, based on these definitions, hinterland has become a significant component to determine the competitiveness of cargo prices as well as seaports.

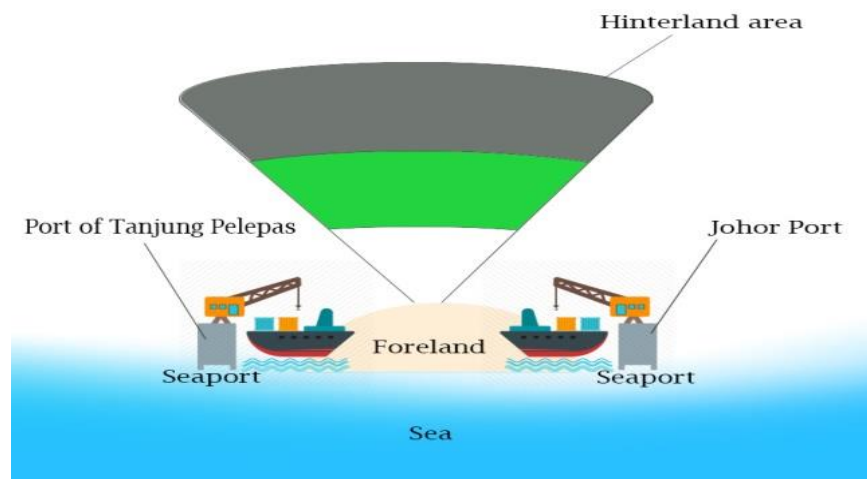


Figure 1: Foreland and Hinterland in Johor

Source: Author's 2017

Two major seaports in Southern region peninsular of Malaysia such as Johor Port and PTP are the backbone of the Malaysian international trade and economy besides Port Klang and Penang Port. Johor port is well known for handling non-container cargo such as bulk and liquid cargo. While in PTP, is one

of the world's fastest growing transshipment seaports, therefore they focus on transshipment handling with very small portion of import and export container (MIMA, 2007). This show that both port play important role to boost economy in Johor. Figure 1 shows the position of Johor Ports and PTP in the southern tip of peninsular Malaysia.

Hinterland Connectivity

Theo Notteboom simple definition of hinterland is an area containing the majority of export or import related businesses, which cannot be delimited because hinterland differs in terms of time, distance, transport mode and commodity (cited in Jeevan, 2016). It shows that hinterland support the development of port or in other word as a backbone of the port. With the well performance of the hinterland, it will encourage the port efficiency.

Seaport-Hinterland Connectivity

Seaport connectivity is a sub-network of the transport network with interdependent components including the hinterland, seaport and foreland; the connectivity is what captures seaports' abilities to manage flows between the foreland and the hinterland (Pafioti, 2014). According to De Langen and Der Horst container transport has become the most important cargo flow in seaport area. Containers are usually can be transported by road, rail or inland barges. Therefore, multimodal transportation is important for the smooth cargo flow in seaport and also distribution to inland terminal.

Generally, hinterland is important to distribute container or cargo to the inland terminal. Good hinterland connections to and from port are the main importance for fast and reliable delivery of cargo flows or containers (Houwen, 2009). This is show that hinterland is important to reach customer satisfaction and the performance of hinterland benefit to overall service of the logistic chain.

Types of Hinterland

Here are three types of hinterland which are the macro-economic hinterland, the physical hinterland and the logistics hinterland (Notteboom and Rodrigue, 2007). These types of hinterland are used to understand the spatial and functional nexus that hinterlands have become.

The macro-economic hinterland is a matter of transport demand in terms of origins, destinations and also the whole transactional setting in which the actors generating this demand evolve (Notteboom and Rodrigue, 2007). It simplifies the macro-economic hinterland as a set of logistical sites transport demand, transport supply, prices, exchange rates and interest rates to focus on production and others on consumption which commonly in distribution centres.

The physical hinterland is a matter for transport supply, both from a modal and intermodal perspective (Notteboom and Rodrigue, 2007). It considers the network of transport infrastructure, modes and terminals where connecting with the port to its hinterland. Plus, elements that support the physical hinterland is transport links and terminal and also the capacity of transport, seaport area, internal terminal and main corridor to cater unexpected volume of cargo or container.

The logistical hinterland is a matter of flows that how they organized and taking places of consider the existing macro-economic and physical settings. The main issues involve modal choice and the sequencing of maritime and inland freight distribution. The seaport-hinterland relationship is not only related to physical transport networks but also to global supply chain network (Jeevan.J 2016).

Criteria to classify hinterland territory network

Physical distance is a major criterion to transfer cargo or goods to and from the seaport. The foreland distance (maritime shipping) commonly account for

about 90% of the total distance while the hinterland distance (rail, barge and truck combination) account for the remaining 10% (Rodrigue, Slack and Notteboom , 2017). This shows that maritime shipping cover large share of the distance in hinterland marginal. The more distance between seaport and the production or manufacturer, the more additional cost will involve. In this case, there are two main distances can be evaluate in Johor Port and Port of Tanjung Pelepas which including short-range hinterland and far hinterland.

Time to/from seaport plays important role in order to define distance and costs. The competitiveness of a seaport is determined by a broad range of factors that all together significantly influence the port choice (Song et al. 2016). Therefore, when the locations of transport sinks/sources in the hinterland and the respective available transport options from/to the ports are known it is possible to calculate transport times and costs in the hinterland. Those can then be evaluated by the choice behaviour models for determining the chosen ports. Plus, customer will consider time reduction and punctuality base on the distance from the seaport. Distance and time to or from seaport will related to the punctuality and demand of seaport services.

Moreover, the accessibility to several transport mode measure that how easily the different inland transport infrastructures can be accessed from the seaport-hinterland to dry port. Road accessibility is focus on the nearest distance and also consider as the main transport in Johor for distribution. Besides, for the rail and barge integration concern the distance to the nearest system, daily capacity, frequency and reliability of the connection (Nguyen and Notteboom, 2016) .

With the on-going process of globalization and the exposure of international trade, the customers consider more about the whole transportation cost instead of just on shipping part in international freight transportation. Thus, lower cost and higher efficiency of port-hinterland transportation becomes an

urgent need (Rodrigue & Notteboom, 2006). Therefore, intermodal transport is important recently due to its potential to offer door-to-door service through the integration of various modes of transport in the logistic chain, improve coordination and services, and the development of intermodal interfaces (Hanaoka and Regmi, 2011). Intermodal freight transport generally defined as the use of two or modes to move a shipment from the origin to destination. Intermodal terminals around the globe give companies the flexibility and the economies of scale of using multiple of modes.

The connectivity to/from seaport is important in order for the how fast the cargo or container can be delivered to the end customer. Connectivity is including the transport connection such as road, rail and the linkage with inland freight facilities (Jeevan J., 2016).

Logistical preference is a concept which seaport makes the decision whether prefer to use rail or road as their transport to deliver cargo to customer. It is depends on the distance between manufacturer to the seaport area. Road transport is very popular mode of transport used by the suppliers and businesses to deliver cargo. One of the advantages having road transport is fast on delivery and also ideal for short distances. Besides, rail transport or railways is also important form of transport system. Railway is most dependable mode of transport because it is least affected by weather condition, high speed over long distance distribution and consider as the best choice for long distance traffic, can carry larger capacity and heavy cargo and also minimum chances of accidents and breakdown (Agarwal, 2017).

Commonly, people believe that the production centre which is close to the seaport will be easier to distribute cargo or container to end customer. However, improper in cargo or container can cause congested. Centrality is linked with the generation and attraction of movements, which related to the nature and level of

economic activities within the vicinity of the concerned terminal (Rodrigue, Slack and Notteboom, 2017).

Significance of Hinterland In Southern Region Peninsular Malaysia.

There are 11 indicators that lead to the importance of hinterland in southern region peninsular Malaysia which is transport demand, transport supply, logistical sites, interest rates, exchange rates, prices, transport links and terminal, capacity of cargo and land, intermodal, timing and punctuality and also supply chain management.

Method

This research was formed by EFA dimension reduction. . This method suitable for the readers to identified the valid factors. Besides, result extract from dimension reduction show that all the indicators that lead of the importance for hinterland in southern region peninsular Malaysia is valid and above 0.50.

This research is implements a few method to show the current territory hinterland and identify the categories use to classify the hinterland territory freight network in Johor. Quantitative method used in this research to examine the relationship between variables with the primary goal being to analyse and represent that relationship mathematically through statistical analysis. Quantitative research focuses on gathering numerical data and allowing for collection of data from a group of people or to show the classification of seaport-hinterland at Johor Port and Port of Tanjung Pelepas.

Next, exploratory factor analysis is used to analyse the data collection which is a statistical technique that used to reduce the number of variables and develop theoretical constructs. It is also used to examine the structure or relationship between variables and the respondent.

The design is about the contributing of classification seaport-hinterland at Johor Port and Port of Tanjung Pelepas. Primary data can be received by the first

hand from the constructs of questionnaire where a person collecting data through the respondent, while secondary data can get from the several journal, reports from industrial and article.

Discussion and Result Availability of Hinterland

Three components were formed by EFA explained the total variance 81.48%. For the first component which is availability of hinterland that generate by EFA, the highest indicator is transport supply (0.919), it explained that the infrastructures (capacity), services (frequency) and networks (coverage) that expressed as transport supply is important for the hinterland in Johor Port and Port of Tanjung Pelepas. During the data collection for this research, one of the expert explained that Port of Tanjung Pelepas have a sophisticated infrastructures (capacity), but because of the geographical factors in Gelang Patah area, it became one of the factors why there is less number of production centre in PTP's hinterland. Logistical sites (0.897), shows that depending use of comparative advantage of space, exploring sites for insuring better access to markets, easier to get the resources and labor is leading for importance for hinterland access in southern region peninsular Malaysia . The last indicators for this component are capacity of cargo and land (0.867). This is show that the more expansion of capacity cargo and land can generate more production and smooth flow in Johor hinterland. The value of reliability test for this component is 0.889.

Price of Hinterland

Efficiency of hinterland comprising interest rates (0.918), prices (0.800) and exchange rates (0.756). Interest rates give effect on the decision of our well spending and saving and also give huge effect on our health and vitality of the economy in business. Next, prices and exchange rate show that a country provide higher currency rate, the export will be more expensive than their imports in foreign market. As we know, Singapore have higher currency than Malaysia. Plus, Johor is near with Singapore and it gives big impact to Malaysian hinterland

development because export will be lower than import in this region. Pricing is another indicator for this component which determine our position and image in market place and important to know that your company is more or less competitive in the market place. The value of reliability test for this component is 0.843.

Management of Hinterland

The last component which is management of hinterland carries the highest indicator, is transport demand (0.912). Transport demand determines transport needed (truck or rail) whether it can be fully utilise or satisfied. The demand is important to the company to cater with the client/customer cargo order. It is also show the ability of hinterland in southern region to cater with the traffic at Johor Industrial area. The second highest indicator is intermodal (0.698). Well performance of intermodal transport is important for the door-to-door service through the several of modes of transport in the logistic chains. Next, the third indicator is supply chain management (0.689). It shows that if logistic company can manage their supply chain well, they will achieve customer/client satisfaction and directly show that supply chain play important role to ensure the success of company. The previous study also agreed that supply chain one of the part of most businesses and significant for company success and also client/customer satisfaction. The last indicator for this component is transport links and terminal (0.586), even though it is the least important it proves that the previous study was true about efficiency of transport link and terminal will create good flow of hinterland and also seaport. In Johor, the transport link between truck and rail still available even though most of the logistic company in Johor use truck as their main transportation to distribute their cargo. The value of reliability test for this component is 0.722.

Table 1: Importance of hinterland in southern region peninsular Malaysia.			
	<i>Component</i>		
	<i>Availability of Hinterland</i>	<i>Price of Hinterland</i>	<i>Management of Hinterland.</i>
<i>Transport Supply</i>	.919	-.150	.076
<i>Logistical Sites</i>	.897	-.251	.090
<i>Capacity of Cargo and Land</i>	.867	.328	.046
<i>Interest Rates</i>	-.090	.918	-.042
<i>Timing and Punctuality</i>	.155	.831	.438
<i>Prices</i>	-.426	.800	-.132
<i>Exchange Rates</i>	.418	.756	-.360
<i>Transport Demand</i>	-.073	-.100	.912
<i>Intermodal</i>	.019	-.448	.698
<i>Supply Chain Management</i>	.322	.244	.689
<i>Transport Links and Terminal</i>	.579	.162	.586
<i>Extraction Method: Principal Component Analysis.</i> <i>Rotation Method: Varimax with Kaiser Normalization.</i>			

Key elements to Classify Hinterland In Johor

There are 8 elements to distinguish and classify the types of hinterland in Johor but only 6 is valid value has been set up which is connectivity to/from seaport, logistical preferences for seaport to hinterland, distance from seaport, time to/from seaport, road accessibility to/from seaport and intermodal availability at hinterland area.

There are two components of the element to distinguish and classify the types of hinterland in Johor were formed by EFA (see table 2). These two components that formed by EFA explained the total 69.24% of variance. These two components categorised as short-range hinterland and far hinterland. The first group from 1st component 1 is classified as short-range hinterland which posses connectivity to/from seaport (0.928), it can be element to distinguish and classify the hinterland area because connectivity will create sufficient accessibility and resilient transportation system. Currently, the connectivity between production centre and seaport is in a good performance and there is no big issue regarding the connectivity between them.

However, lack of rail accessibility leading it towards time delivering will increase and also cannot cater the economy of scales if we to depend on truck only. Next, logistical preferences for seaport to hinterland (0.838). It shows the result that whether seaport prefer to use road or rail as their transportation mode for cargo delivery. Johor Port and PTP has their own rail system to connect between these seaports. It is easier for cargo or container transport directly to the each port with big amount of economy of scales.

The third highest element is distance from seaport (0.768). Far distance between seaport and production or manufacturer will include consuming higher cost for fuel consumption and also causing delays. During the data collection, one of the participant had addressed that manufacture, production centre and also customer must pay for GST (Goods and Service Tax before June 2018), it's a burden for the manufacturer and productions centre in terms of their fuel consumption and truck maintenance, tyre maintenance and daily maintenance. Last element for this component is time to/from seaport (0.534). It shows that time normally plays an important role to determine the company is efficient or not to meet on time delivery to the customer. Furthermore, Johor is depending on road accessibility, therefore, the company must efficient to handle incoming busy traffic

because certain roads and highway congested due to the heavy vehicle (truck) traffic. The value of reliability test for this component is 0.813.

Lastly, for the second group from component two is far hinterland which is possess road accessibility to/from seaport (0.917). According to the Núñez (2013), the distance to the nearest highway exit, average daily traffic and level of service is element to consider as road transport. The expert from Johor Port Authority denied that because this seaport is too depend on road accessibility. The development of hinterland in Johor, has caused many strategies to be emerged. For example, there are a lot of strategies in transportation blueprint 2010-2030 ISKANDAR MALAYSIA to overcome issue that may arise in future such as transform logistics infrastructure, revolutionize logistics industry and manage urban logistics.

Intermodal availability at hinterland area (0.676) is the second highest for this component. Intermodal availability is representing as the uses more than one mode of transport to delivery cargo from origin to destination. Johor faced some issue that relate with intermodal which is lack of intermodal choice. According to the transportation blueprint 2010-2030 ISKANDAR MALAYSIA, there are two issues; over dependence on road than rail regarding the lack of rail access to industrial areas and some terminals and industrial spatial locations lack of excellent connectivity and accessibility by road and rail. The value of reliability test for this component is 0.605.

Table 2: Contributing element to distinguish and classify the types of hinterland in Johor.

	<i>Component</i>	
	<i>Short-Range Hinterland</i>	<i>Far Hinterland</i>
<i>Connectivity to/from Seaport</i>	.928	.101
<i>Logistical Preferences for Seaport to Hinterland</i>	.838	-.004
<i>Distance from Seaport</i>	.768	.221
<i>Time to/from Seaport</i>	.534	.457
<i>Road Accessibility to/from Seaport</i>	-.106	.917

<i>Intermodal Availability at Hinterland Area</i>	<i>.373</i>	<i>.676</i>
<i>Extraction Method: Principal Component Analysis.</i> <i>Rotation Method: Varimax with Kaiser Normalization.</i>		

Classification Of Hinterland in Southern Region of Peninsular Malaysia

The classify area is measured from Pasir Gudang district to end of Segamat district (see figure 2). The total distance of these two districts is about 194 kilometres. Short-range hinterland and far hinterland is divided by two from the overall length of Pasir Gudang to end of Segamat. Therefore, short-range hinterland covered area from Pasir Gudang to Ayer Hitam (Batu Pahat) with total length of this area is 106 kilometres. The most frequent commodities that transport cargo from manufacture to Johor Port is finishing goods such as ceramic products and also agriculture. Besides, far hinterland covered area from Ayer Hitam to Segamat with overall length of this area is 97 kilometres also beyond of the district. Most frequent commodities transports from this area are agriculture such as rubber supply and aquaculture.

For the classification of seaport-hinterland at Port of Tanjung Pelepas is measured from Gelang Patah district to end of Segamat district. The overall length of this districts area from tip (Ayer Hitam) to top (Segamat) Johor is 185 kilometres. Thus, short-range hinterland and far hinterland is divided by two from the total length of Gelang Patah to end of Segamat. For short-range hinterland covered area from Gelang Patah to Kota Tinggi with total length of this area is 100 kilometres. The most frequent commodities that transport goods from this area is agriculture such pineapple, palm oil and also livestock supply. Besides, for far hinterland covered area from Kluang to end of Segamat with total length of this area is 85 kilometres and also beyond of Segamat district. Plus, the frequent commodities that transport goods from this area are aquaculture, finishing goods and aquaculture.



Figure 2: Research Finding (Short-range Hinterland and Far Hinterland)

Source: Author, 2018

Recommendation and Conclusion

In order to compete with neighbouring region such as Singapore, there are some recommendations from expertise and also some strategies to make our hinterland area efficient to cater seaports with efficient cargo movement which is crucial for regional economy and trade growth.

This research recommend to enhance the transportation facilities especially rail transportation. Rebuilt railway in Johor that suitable for the container nowadays because of the existing rail gauge is small and out-dated to cater the volume of container.

For the custom procedure, there are a lot of documents need to be complete before cargo can transport to the ship or truck. They also understand with the smuggling issues, but in business they need to minimum the cost and maximum the profit. "Every minute is a cost". Therefore, the investment in port is importance due to

have good facilities in ports and port efficiency to ensure the good flow in hinterland.

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