The Asian Journal of Shipping and Logistics • Volume 31 Number 1 March 2015 pp. 109-134 •

The Challenges of Malaysian Dry Ports Development

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Contents

Abstract

This paper examines the functions and challenges of dry ports development in Malaysia through 11 face-to-face interviews with dry port stakeholders. The findings reveal that Malaysian dry ports are developed to accelerate national and international business, to activate intermodalism in the nation, to promote regional economic development and to enhance seaport competitiveness. Malaysian dry ports perform the function of transport and logistics, information processing, seaports and value-added services. Challenges facing Malaysian dry ports include insufficient railway tracks, unorganized container planning on the rail deck, highly dependent on single mode of transportation, poor recognition from the seaport community, and competition from localized seaports. This paper further indicates strategies for coping with these challenges and identifies future opportunities for Malaysian dry ports development.

Key Words : Malaysian Dry Ports, Container Seaports, Extended Gateways

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I. Introduction

Seaports are a subsystem of the supply chain and provide a crucial link in the transport chain that facilitates the flow of cargo. Seaports are key 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). Modern seaports should be lean, agile, focus on service orientation, flexible and highly integrated with intermodal terminals or logistics centers to cope with the constant unchanging business environment (Paixao and Marlow, 2003). Seaports are a part of a complex system of supra system because they interact with internal and external subsystems to create an effective process within the supply chain. The complexity arises in the seaport system because it is greatly affected by changes in world trade development, supply chain and logistics tendencies, advancement in maritime transport, technological development and interactions with various players either internally or externally (Cetin and Cerit, 2010). In order to preserve competitiveness in the business, seaports may have to change the logistics and transport structure and outsource these activities. Focusing on value added logistical concepts allow seaports to become familiar with the new environment (Langen and Lugt, 2007).

Prior to containerization, the seaport system was referred to as spatial evolution whereby the system consisted of a collection of seaports in a region that would compete or cooperate with each other (Rimmer, 1967). The system focused on competition between different terminal operators, and the interaction between hinterland and foreland (Weigend, 1956; Thomas, 1957). Technological improvements in multimodal transportation and better transportation infrastructure as a result of containerization have changed the connectivity between seaports and hinterland networks (Notteboom and Rodrigue, 2005). This is referred to as a borderless seaport because it emphasizes the functional development from a seaport to a seaport network with various degrees of formal linkages with other parties (Klink, 2000). The function of container seaports as intermodal hubs allows containers to be shipped long distances across the continent to fulfil market demand (Song, 2003). The concept of intermodal logistics and distribution networks, resulting from the changes in freight and logistics processes and challenges imposed by regional populations and

freight growth, has meant that the efficiency of container seaport systems is also determined by the integration of the inland freight distribution system. Therefore, the inland component of the seaport system becomes important in shaping performance and competitive strategies of seaports.

Dry ports as part of logistics centers have become fundamental elements of local, national and international transportation systems in regions with a high volume of trade (Rodrigue et al., 2010). A dry port can be defined as an inland setting with cargo-handling facilities allowing several functions to be carried out, for example: consolidation and distribution, temporary storage, customs clearance, and the connection between transport modes. By allowing agglomeration of both private and public facilities the interaction between different stakeholders along the supply chain is facilitated (Ng and Gujar, 2009). A dry port is also known as an inland intermodal terminal directly connected to seaports with high capacity transports means, where customers can leave and pick up their standardized units as if dealing directly with a seaport (Roso, 2009). This definition has been redefined as an extended container terminal gate (Veenstra et al., 2012). A dry port is a logistics node which improves cost-efficiency, environmental performance and the quality of hinterland network connections (Woxenius and Bergqvist, 2011; Cullinane and Wilmsmeier, 2011). The various definitions indicate that the purpose of dry ports is to support seaport operations in order to enhance its competitiveness in a complex system. Dry ports assist container seaport systems by transforming seaports' static supply chains into the adaptive business networks, which increases seaport competitiveness, robustness and facilitates the supply chain given the constant change in the global transport system (Vervest and Li, 2009).

Changes in global trade, logistics and supply chain systems have also had an impact on the Malaysian seaport system. Major container seaports such as Port Klang, Penang Port and Johor Port have experienced an increase in container traffic, with an annual growth rate of 14.8%, 6.94% and 8.64% respectively for the period 2008-2011 (Ministry of Transportation Malaysia, 2012). For example, in 2011 Port Klang handled 9.6 million TEUs and was ranked thirteenth amongst the top fifty container ports in the world, whereas Pelabuhan Tanjung Pelepas (PTP, the operator of Johor Port) was seventeenth amongst the world's top container ports with 7.50 million TEUs, a growth of 15.38% over 2010 (World

Shipping Report, 2013). To accommodate the growth of container traffic in Malaysia, container seaports need to improve their capacity, functions and services to supply chain networks and direct further development of existing networks (Rodrigue, 2008).

Dry ports in Malaysia have been developed since the 1990s and have increasingly played an active role in facilitating the nation's trade, enabling goods to be transported and distributed from seaports to their final destination. The development of dry ports is crucial in dealing with the dynamic changes in freight and logistic processes. Efficient and sophisticated value added services are essential to enhance the dry port's performance (Tsilingris and Laguardia, 2007). Malaysian dry ports have been positioned as the main extended gateways of major container seaports as a result of increasing throughput of container seaports. Nazery et al. (2012), revealed that most of the dry ports in Malaysia have insufficient infrastructure and facilities, thus their support for the adjacent seaports is limited. This is evidenced by a recorded low volume of containers handled by dry ports. Additionally, the services provided by Malaysian dry ports are not sufficient to fulfil customers' needs. According to Nazery et al. (2012), the distance from seaports, accessibility to the seaport, access to road and rail systems, linkage between and within modes of transport as well as unused railway tracks because of insufficient planning are some of the problems of Malaysian dry ports operation.

Owing to the limited academic research into the functions of Malaysian dry ports within the container seaport system, this paper investigates the role of Malaysian dry ports and the challenges they face from a container seaport system's point of view. This paper, through face to face interviews with important stakeholders, provides a clear picture of the development and operation of Malaysian dry ports and explores the current situation of dry ports in the complex seaport system. Strategies suggested by interviewees for coping with the challenges of operational efficiency in the seaport system are also addressed.

II. Experiences of Worldwide Dry Ports Development

Many countries have developed dry ports to facilitate trade and cargo flows between seaports and final destinations. Based on the experiences of

dry port development in Europe, Africa, America, and Asia, this section reveals the development of the dry port concept and reviews the function of dry ports in the seaport system, the challenges faced by these dry ports and the strategies for improvement. In Europe, Swedish dry ports play a significant role in the seaport system (Bergqvist et al., 2010) by being space providers, container buffering zones, intermodal transports zones, and value added logistics service providers to the containers (Woxenius and Bergqvist, 2010). In the Scandinavian region, dry ports have faced challenges such as the location of dry ports not being in the East-West corridor, a lack of skilled laborers, low capacity of rail links and limited length of rail tracks (Viser et al., 2009). Some strategies have been identified to harmonize the Scandinavian dry port operations. For example, the introduction of combined infrastructure such as road and rail networks increases freight volumes to seaports and at the same time reduces the traffic congestion in seaports. Scandinavian dry ports also introduce creative, innovative and competitive services to attract stakeholders to use their facilities (Bergqvist et al., 2010). A different approach has been implemented in Valencia dry port, Spain. This dry port introduces a Port Community System (PCS) to integrate different stakeholders in seaport operations and maritime transport by giving support, and managing information and administrative procedures in the dry port operation. The PCS covers the information from various stakeholders, particularly shippers, rail operators and seaports. This system produces an integration and coordination between dry ports and their clients (Dotoli et al., 2010).

Dry ports play a very important role in the African maritime industry because there are many landlocked countries in Africa and the establishment of dry ports is crucial to inland regions (Arvis et al., 2010). 'Forward-Ports' is a general term given to African dry ports because most of the dry ports act as cargo delivery stations with high speed and security. These forward ports not only execute the role of intermodal terminal but also balance the traffic between rail and road transportation, providing customs and border management services (Ahamed, 2010). However, Raballand et al. (2008) indicated that many dry ports are not well operated because of insufficient logistics infrastructure and inefficient services to the customers, which have led to poor connectivity to seaports and delays in container clearance. For example, a dry port in Egypt was unable to provide sufficient infrastructure, maintenance, and systematic legislative

and institutional processes to optimize their involvement in the seaport system (Vandervoort and Morgan., 1999). Therefore, governments in African countries, especially in Nigeria, South Africa and Tanzania, have initiated a strategy of upgrading the logistics infrastructure to improve dry port operations, aimed at enhancing the connectivity to seaports and reducing container dwelling time from 15 days to an international standard of 7 days (World Bank, 2008; Ahamed, 2010). This strategy increases the connectivity of seaports to their clients, smoothes cross border trade, and allows investment from private sectors to enhance trade competitiveness in Africa (Raballand et al., 2008).

In America, dry ports facilitate seaport container traffic flow and provide competitive inland services such as high level inland connectivity and seaport capacity expansion (Rodrigue, 2011). They act as regional distribution facilities with the capacity to segregate containers for various distribution centers through various modes of transportation (Bruce et al., 2013). For example, Chilean dry ports perform as logistics platforms in the logistics chain and have an extended capacity to accommodate the largest volume of container traffic and highest value of international trade in South America (Aversa et al., 2005). Other dry ports such as Virginia Dry Port in the United States and Los Andes Dry Port in Chile overcome issues of over congestion, increase the application of modal shifts and generate sufficient container volume to seaports (Bruce et al., 2013).

In China, fierce competition among seaports places pressure on the efficiency of the supply chain network, and hinterland connection is regarded as a major determinant for seaport competitiveness (Wang, 2009). In addition, in coastal cities, a strong need for urban development due to growing populations has limited the availability of land for seaport expansion. Therefore, Chinese seaport-based dry ports were developed for the purpose of capturing more cargo flowing along the inland supply chain and to relieve capacity constraints at seaports (Zhong, 2010; Beresford et al., 2012).The government invests in roads and rail networks to enhance the connectivity between seaports and dry ports to increase the volume of containers and to promote regional economic development (Qin, 2010).

In India, dry ports are known as container freight stations and inland container depots. The emergence of Indian dry ports has enhanced seaport competitiveness by reducing traffic congestion, improving Logistics Performance Index (LPI) and increasing capacity (UNESCAP, 2006). The

challenges of Indian dry ports include insufficient interactions between the stakeholders which provoke extra costs, overlaps in the schedules which can create bottlenecks in infrastructure planning. Hence, the strategies of information sharing between stakeholders, integrated facility sharing and coordination of facility development have been proposed to assist Indian dry ports in reducing unnecessary costs and generating a smooth flow in the daily schedule (Sahay and Mohan, 2009).

In general, challenges faced by dry ports in different countries vary. Therefore, the strategies to overcome those challenges may be different, but they have to ensure that the dry ports are able to fit into the complex seaport system (Vervest and Li, 2009). Dry ports must improve the interaction of various stakeholders operating with different objectives in the container distribution network, which will ultimately contribute to seaport competitiveness (Roso et al., 2009; Padilha and Ng, 2011).

III. Malaysian Perspective in Dry Ports Development

In Malaysia, four dry ports are currently operating to support seaport container terminal operations. The first dry port is Padang Besar Cargo Terminal (PBCT), which has been operating since 1984. PBCT encourages cross border trade between Thailand and Malaysia because it is strategically located between these two countries. PBCT's main role is to handle containers to and from Southern Thailand by train and road, which are then shipped through Penang Port and Port Klang. Almost 90% of containers originating from Southern Thailand were transported by road to PBCT and shipped through Penang Port (UNESCAP, 2006).

Ipoh Cargo Terminal (ICT), the second dry port in Malaysia, was established in 1989 and is located at a strategic inland location between Port Klang and Penang Port. ICT is a well- known dry port and helps to assist import and export services for a range of industries in Northern Malaysia. The third Malaysian dry port is Nilai Inland Port (NIP), established in 1995 and located between Port Klang and Johor Port. NIP offers range of value added services, facilities and space to support the growing container volumes at Port Klang in the central region and Johor Port in the south. NIP takes advantage of its strategic location in the center of peninsular Malaysia to offer shippers the facilities and provide the

necessary documentation for moving goods to and from seaports. This dry port has attracted many customers to use its services as a one-stop logistics center and a transshipment center to increase the competitiveness of the major seaport operation.

The fourth Malaysian dry port is Segamat Inland Port (SIP), which commenced operation in 1998. SIP offers facilities and services to manufacturers and traders in the southern region of peninsular Malaysia. The establishment of this dry port has made Johor Port and Port Klang the preferred ports of entry instead of going through neighboring ports. In fact, SIP has been developed as a national load center and transshipment hub (UNESCAP, 2006; Ministry of Transportation Malaysia, 2012). Each dry port has significant roles and responsibilities to container terminals in Malaysia as well as in the international transshipment of containers, providing feeder business to and from South Asia, Cambodia, Thailand and Vietnam. The Malaysian railway system provides rail freight infrastructure to support the movement of freight to and from seaport container terminals (Malaysian Railway Company, 2009). Table 1 summarizes the information on Malaysian dry ports.

IV. Methodology

In order to achieve the aim of this paper, semi-structured face-to-face interviews were conducted to collect information on the roles of Malaysian dry ports in the container seaport system and the challenges they face. A total of 14 potential participants in higher managerial positions and of sufficient knowledge in dry ports were invited for interview. They were selected from Malaysian dry ports, container seaport authorities and operators, and government bodies. However, due to individuals' availability and other constrains, this number reduced down with the consequence that 11 interviews were completed. The interviewees included four seaport managers, four dry port managers, two government managers and a logistics and distribution manager. On average, each interview took about 30-40 minutes. The interview questionnaire consisted of three parts, i.e. the role of dry ports in the container seaport system, the challenges of dry ports and the strategy to overcome the challenges faced by Malaysian dry ports with an overall aim to enhance seaport

competitiveness.

<Table 1> Dry ports in Malaysia[1)]

Dry ports	Mode of container distribution	Seaports connection	Location	Investment
Ipoh Cargo Terminal (ICT)	Road and rail	Port Klang, Penang Port & Johor Port	181 km south of Penang Port and 250km of Port Klang	Private & government
Nilai Inland Port (NIP)	Road	Port Klang & Johor Port	50 km South of Kuala Lumpur and 93 km from Port Klang	Private & government
Padang Besar Cargo Terminal (PBCT)	Road and rail	Penang Port & Port Klang	158 km north of Penang Port and 588 km north of Port Klang	Private & government
Segamat Inland Port (SIP)	Road and rail	Port Klang & Johor Port	212 km south of Kuala Lumpur and 188 km north of Port Tanjung Pelepas	Private & government

The data collected was analyzed using a systematic design based on the grounded theory method. This method is suitable for a case study as it enhances the construct validity of qualitative research through a clearly specified operation procedure (Parker and Roffey, 1997). A systematic design is used because it generates themes from data analysis through familiarization, reflection, open coding, axial coding and selective coding (Creswell, 2008). The use of qualitative software for data interpretation is not advisable because the software is unable to detect theoretical sensitivity, which is very important during interview sessions (Suddaby, 2006). Data categorization or themes have been generated using a systematic design, which is important to focus the meaning in the research context as well as being understandable by an outside audience (Gough and Scoot, 2000).

1) Compiled by authors

V. Results and Discussions

In the first part of the interview questionnaire, participants were asked about their perspectives on the role of dry ports in Malaysia, including definition and classification, objectives and functions. The results are discussed in sections 1, 2 and 3 respectively below. Subsequently, the results in relation to the second and third part of questionnaire, i.e. challenges and strategies of Malaysian dry ports, are addressed in 4 and 5. Discussions are based on categories or themes which have been developed through the data analysis process. All those codes are connected to explore the role of Malaysian dry ports in the container seaport system and provide a clear picture on the current situation for Malaysian dry ports.

1. Definition of Dry Ports in Malaysia

Based on the responses from the interview participants, three main themes have been identified from nine sub-categories to define Malaysian dry ports (Table 2). The three main types that define the functionality of Malaysian dry ports are regional intermodal terminals, an extended seaport and interface terminals. All participants defined dry ports in Malaysia as regional inland ports connecting seaports and hinterland through intermodal means. They also stated that Malaysian dry ports were established to assist seaport activities and to help manufacturers direct their containers to and from seaports in the shortest time and at the lowest cost in order to enhance seaport competitiveness. Dry ports in Malaysia are considered similar to seaports, but are located in urban areas, providing sufficient volume of containers to the seaports through various modes of transportation. The participants emphasized that dry ports are effective in their operation if they are located near manufacturing areas or industrial parks to support the container movement to and from a seaport without any hindrances such as traffic congestion or delays in container clearance. In addition, the utilization of dry ports by manufacturers or other stakeholders reduces the pressure on port facilities and alleviates capacity constraints faced by major Malaysian seaports.

<Table 2> A summary of definition of Malaysian dry ports[2)]

Type	Functionality
A regional intermodal nodes	• Regional inland ports • Inland transhipment ports • Inland terminals
An extended seaport	• Assist seaport activities to provide time and cost advantage for the container freight
An interface terminal	• Connect various modes of transportation • An interface between seaports and manufacturers

2. Objectives of Malaysian Dry Ports in Seaport Systems

The objective of dry ports is important as it directs the dry ports' role. The participants' responses to this interview question were analyzed and consequently five main objectives (themes) of dry ports have been identified (Table 3). The majority of the participants (91%) expressed that accelerating national and international business is the most important objective of Malaysian dry ports. For example, Perlis, a Malaysian state located in the northern tip of Peninsular Malaysia, is highly dependent on agricultural products but is economically less developed. PBCT has high investment in this state and promotes the development of cross-border transactions. This is evidenced by an increase in the volume of containers from southern Thailand to Penang Port since 2000. The volume of containers from southern Thailand via PBCT increased from 48,239 TEUs in 2000 to 100,371 TEUs in 2013. PBCT contributes 40% of the total containers to Penang Port (the data is obtained from an interviewee).

Manufacturers from southern Thailand prefer using PBCT as an intermediate to ship their goods to Penang Port rather than Bangkok Port because the distance between southern Thailand to Penang Port is nearer than that to Bangkok Port and there is shortage of capacity and capability to transport containers from southern Thailand to Bangkok Port. The inland transport service and infrastructure are better than that in Thailand. The second important objective of Malaysian dry ports, with 82% of interviewees' perspective, is to activate intermodalism in the country as

2) Compiled by authors

they become transport nodes linking seaports and the regions through multimodal transport. Other objectives, such as improving seaport competitiveness and boosting regional economic development were also considered by 64% of the interviewees. In addition, the participants expressed that Malaysian dry ports can contribute to the upgrading of transport infrastructure and they can create employment opportunities through investment. Six of the eleven participants (55%) stated that enhancing the effectiveness of national port policy was as an objective of dry port development in Malaysia.

<Table 3> Objectives of Malaysian dry ports[3)]

Priority	Objectives
1	Accelerate national and international business
2	Activate intermodalism in the nation
3	Improve seaport competitiveness
4	Boost regional economic development
5	Establish Malaysian port policy

3. Functions of Malaysian Dry Ports

The data analysis generated four themes in relation to the functions of dry ports, including transport and logistics function, information processing function, seaport function and value added service function. Most of the interview participants (91%) stated that dry ports in Malaysia performed the transport and logistics function by acting as intermodal nodes linking seaports and manufacturers in different regions. For instance, ICT connects three seaports Port Klang, Penang Port, Johor Port with various manufacturers in Perak state, Kedah state and Penang state. ICT divides its logistic area into three major zones according to distance. The perimeter of the first zone is less than 20 kilometers from ICT, while the second zone is between 20 and 30 kilometers, and the third zone is more than 30 kilometers. The total number of containers handled by ICT in 2013 was 40,100 TEUs compared to 35,000 TEUs in 2012 (the data was provided by an interviewee).

The cargo of the manufacturers/customers in the respective zone can be transported to and from the seaport via ICT through road and rail transport.

3) Compiled by authors

ICT provides 6 train trips per week to Port Klang with a capacity of 480 TEUs per week (the data is obtained from an interviewee). Malaysian dry ports distribute a significant volume of containers to Malaysian seaports. For example, 50% of ICT containers are transported to Port Klang, Penang Port and Johor Port, while 70% of the containers in NIP head to Port Klang and Johor Port. Seaport competitiveness can be enhanced by a reduction in container dwelling time in terminals, low inland transportation costs and high connectivity to the seaports. Thus, the function of dry ports as 'connecting stations' between customers and seaports has a significant effect on seaport competitiveness (Bichou and Grey, 2005).

The respondents state that Malaysian dry ports perform information processing functions such as custom clearance centers, immigration centers and police departments for domestic and cross border trades. They say that Malaysian dry ports also perform some of the seaport functions. They serve not only as warehouses for manufacturers, but also as container storage areas and customs clearance centers assisting seaports in managing import and export procedures. Consequently, Malaysian seaports are able to focus on their primary activities such as container loading/unloading and transshipment. The two functions that dry ports perform can benefit seaports by leaving them more space to accommodate cargo and allowing seaports to increase revenue by diversifying their business. For example, the interviewee from Port Klang expressed that Port Klang would have more spaces to support the National Vehicle Transit Centre (VTC) at the seaport if dry ports could play the above mentioned functions, and as a result more income could be generated from the center.

Some participants expressed that dry ports perform the function of value added services such as consolidation and deconsolidation centers and distribution parks. For example, in NIP, the service of consolidation and deconsolidation is provided to the nearest states such as Malacca, South Selangor, Seremban and Northern Johor. These states are known as manufacturing zones for electronics parts, food and agricultural products. The credibility of NIP providing space to the containers from another state and channeling it to the main seaport reduces delivery time and freight costs. Manufacturers from these regions utilize the services provided by NIP to gain time and cost advantages. Other services such as customs services, client's facilities, brokerage, forwarding agents and transportation

are highly required by stakeholders. Additionally, the Lost and Pilferage Policy initiated by NIP promises safety and security to the content in the containers. In ICT it also performs as a value added service terminal such as consolidation terminal, capturing containers flowing along the inland supply chain. It can operate on a just-in-time basis to decrease the freight costs of the manufacturer and enhance seaport competitiveness by reducing traffic congestion either from trucks or containers.

4. Challenges of Malaysian Dry Ports

The analytical results include five main themes related to major issues of Malaysian dry ports: transportation infrastructure and operations, container planning, competition, location and community. From a transportation perspective, insufficient railway tracks are the main challenge facing Malaysian dry ports. Most of the interview participants from seaport authorities and operators stated that the Malaysian rail system provides sufficient wagons but insufficient tracks to transfer containers from dry ports to seaports and vice versa. Participants from Penang Port, Port Klang, Johor Port, ICT, SIP and PBCT had the same view on this matter. For example, PBCT is facing space constraints due to the increasing number of inbound cross-border containers. The number of containers received from the southern Thailand catchment area is increasing and hence there is a need for faster clearances/movements of container at PBCT to allocate more space for additional containers. However, a single railway track is inefficient to carry a high volume of containers to Penang Port from PBCT.

In contrast to PBCT, respondents noted that NIP has no rail service to seaports. According to the interviewee from NIP, the volume of containers handled by NIP is not sufficient to be transported by rail. Currently, containers are transported via road haulage rather than rail between NIP and Port Klang because of the short distance. The interviewee further indicated that NIP handled 15,000 TEUs in 2000 and this increased to 175,000 TEUs in 2013. NIP currently has a sufficient capacity (500 trucks) to accommodate containers transported by road. The use of road haulage as the main mode of transportation produces more environmental issues such as air and noise pollution as well as increases traffic congestion in the seaport area.

Moreover, states such as Seremban, Malacca, Southern Selangor and Northern Johor are affected by the heavy traffic generated by road haulage. The intensity of transport movement in a small number of locations causes terminal congestion and spills over to the surrounding regions (Janic, 2007). In summary, the issues of insufficient rail tracks or using merely one mode of transport i.e. road affect the volume of containers handled by dry ports. Consequently, Malaysian dry ports' operations are considered ineffective in attracting customers to utilize their facilities.

From a container planning aspect, it is found that the containers on the railway deck from dry ports to seaports are not organized according to their vessel schedules. Once the locomotives arrive at the seaport, seaport personnel have to spend on average an hour or more to identify the right container to the right vessel. The seaport authorities interviewed believed that inappropriate planning of container staking on the train from dry ports can cause delays in container movement and can affect the schedule integrity of vessels. Schedule integrity is affected by a delay in intermodal transportation, unexpected production delays, and a shortage of container handling equipment that leads to an empty space in the vessel and ultimately affects the competitiveness of seaports (Vernimmen et al., 2007).

The function of dry ports as a modal shift or a transportation interface terminal contributes to cooperative freight distribution networks and has a significant effect on the environment, social and economic benefits, reducing congestion as well as improving competitiveness in the supply chain (Wisetjindawat et al., 2007). However, the interview outcome showed that some seaport operators and shipping lines do not favor dry ports located adjacent to seaports because of competition. In fact, many shipping lines rely on seaports to provide logistics services to manufacturers who send their containers directly to the seaports, and as a result, they have to compete with dry ports to cater to the local market. This situation has occurred in the southern region of peninsular Malaysia. The intention of seaports to dominate hinterland regional markets has resulted in dry ports becoming the competitors of seaports (Rodrigue et al., 2010).

Other challenges to Malaysian dry ports from location and community perspectives include long shipment distance to seaport due to the dry ports' non-strategic locations such as away from manufacturing areas; a lack of

significant recognition of their capability from seaports, manufacturers and other stakeholders; traffic congestion in the regional area; and delayed upgrading of transportation infrastructure in the regional city/town. Table 4 summarizes the challenges faced by Malaysian dry ports.

<Table 4> Challenges faced by Malaysian dry ports[4)]

Categories	Challenges
Infrastructure and operations	• Insufficient railway tracks (All) • No or limited provision of rail services (All) • Low capacity of train decks for carrying high volumes of containers (All) • Less participation of local haulages for short distance shipments (ICT) • No wide road access (All)
Container operation	• Inappropriate planning of container staking on the train deck resulting in time consuming for replanning/relocating the containers at seaports (PBCT) • Inefficient container transfer operations to seaports (PBCT) • No express clearance lane (All) • No facilities for empty containers (PBCT) • Insufficient spaces for accommodating increased volumes of containers (PBCT & ICT) • Frequent delays when transferring containers between transport modes (PBCT & SIP)
Competition	• A lack of cooperation with seaports to utilise the dry port's capability (SIP) • Reluctance of shipping lines to invest in Malaysian dry ports (SIP) • High competition with seaports in providing logistics service to dominant freight markets (SIP and PTP) • Competition between private hauliers (SIP)
Location	• Not located in a strategic location, resulting in a long shipment distance (SIP) • Located in the non-profitable zone for short distance distribution (ICT) • Less potential for land expansion (PBCT and ICT) • Located away from the manufacturing area (SIP)
Community	• Communities' concerns on noise and air pollution generated by road transportation (NIP) • Traffic congestion in some regional areas (NIP and ICT) • A lack of exposure of dry ports' credibility to the stakeholders (SIP) • The delayed upgrade on infrastructure in regional cities/towns (NIP, ICT and PBCT)

4) Compiled by authors

5. Strategies for Improving Malaysian Dry Port Operations

This section discusses several strategies for enhancing the integration of dry ports into the seaport system and further improving seaport competitiveness in Malaysia. A dry port is a physical infrastructure in intermodalism. It has to be well connected to transport networks to and from the seaport and regional industrial areas. Also, the ability to perform with various modes of transportation is one of the main prerequisites for dry port operation and development (Roso et al., 2009). As Malaysian dry ports have insufficient rail infrastructure and services, the Malaysian rail system may consider rail service provision in NIP to activate intermodalism in that dry port.

The combination of land haulage and train transportation could create a new dimension of container distribution in the dry port, and the volume of containers handled by NIP may be increased. Additionally, the introduction of a double track railway to increase the capacity and frequency is needed. The majority of the interviewees agreed that a double-track railway could increase the number of rail trips from dry ports to seaports and vice-versa. The presence of a double track railway would contribute to fast, high volume container movement. High frequency of train trips, just-in-time principles and easy clearance would see manufacturers utilizing these facilities in order to reduce their freight costs. Seaports maintain fast clearance to sustain a good reputation among shippers, so dry ports should have sufficient information about the estimated time of arrival (ETA), the estimated time of departure (ETD) and the sequence of the container on the train to ease the loading/unloading process. One interviewee estimated that the double track system could enhance train capacity from 80 to 100 TEUs and subsequently reduce the container's transit time from seven hours to four hours.

The participants stated that the involvement of local haulers to transport containers within a short distance is highly valued by dry port operators. For example, an interviewee stated that ICT faces a challenge to direct some of the containers to zone 1, less than 20 kilometers from the dry port, because most of the haulers prefer long trips to zone 2 or 3, i.e. 20-30 kilometers and above 30 kilometers from the dry port. Therefore, interviewees suggested that dry port operators should possess their own transport for container distribution in zone 1. As investment in dry port

infrastructure or facilities enhance the cooperation for dry port operations among the stakeholders (Qin, 2010), ICT's investment in road transport for container distribution would fulfil the need of its clients.

Seaport operators and the community should recognize dry ports as valuable components in the Malaysian container seaport system. Moreover, stakeholders' understanding of dry ports' operations will generate good team work between them. Seaport operators should consider dry ports as co-operators rather than competitors as they supplement seaports' functions. In fact, the assistance of dry ports to seaports can eliminate the competition among seaports (Rodrigue et al., 2010). For example, in one of the Malaysian container seaports, about 70% of its throughputs were transshipments. To maintain a competitive position as a transshipment container seaport, intermodal linkages of seaports to major consumer markets, diversity of other modes and access to inland transportation are important (Park and Min, 2011).

Therefore, assistance from dry ports is needed to enhance Malaysian seaport competitiveness and to compete with the other international neighboring seaports. Seaport reclamations are one of the main issues that keep haunting seaports due to the increase of containers in the maritime industry. Additional space is needed for container seaports to achieve a higher level of productivity and address the concerns of increasing demand from seaport stakeholders (Pellegram, 2001). Many seaports in Malaysia have undergone land reclamation processes within the past decade especially in Port Klang and Penang Port. The existence of dry ports may reduce port reclamation in the future because dry ports are able to provide seaports with the space to accommodate the growing volume of containers.

Of interest is that some interviewees suggested that Malaysian dry ports could act as Barter Trade Ports, specializing in handling import and export of cargoes such as grain, coal, light vehicles, sugar, and others from Indonesia, Thailand and the Philippines. The aim of Barter Trade Ports is to encourage inter-Asian trade which is very low, on average contributing between 18-24 % of the total trade. The participants believed that shifting the Barter Trade Port function to Malaysian dry ports may increase inter-Asian trade and create momentum in the existing cooperation between the regions such as Singapore-Riau-Indonesia (SIJORI), Indonesia-Malaysia-Singapore-Golden Triangle (IMS-GT) and

Brunei-Indonesia-Malaysia-Philippines-East Asian Growth Area (BIMP-EAGA) (Dollah and Mohamad, 2010).

Another strategy recommended by the interview participants to promote dry port operations in the seaport system is the provision of multiple value added services to customers. Most seaports in Malaysia urge dry ports to diversify their services with sufficient infrastructure. Table 5 shows interview participants' views on the fundamental requirements for Malaysian dry port operations, within which about 70% of those requirements were suggested by dry ports' main clients. They suggested that Malaysian dry ports should possess three requirements to improve operations.

As most dry ports in Malaysia lack infrastructure to attract and ensure a smooth flow of inbound container traffic in the future, the first requirement is operational infrastructure consisting of primary requisites, important requisites, differentiating requisites and miscellaneous requisites. The requirement of operational infrastructure is to focus on the facilities that enable dry port operations. Moreover, advanced logistics services are virtually absent in most of the dry ports, thus Malaysian dry ports need advanced facilities to provide value added services to satisfy customers' needs. The second requirement is personnel, as a reliable labor force is essential to execute operational procedures. This requirement is split into three major groups including warehouse staff, yard staff and safety and security staff. The final requirement is capital infrastructure, specifically the resources needed to operate infrastructure such as land, rail tracks, roads, warehouses, yards and others.

<Table 5> Requirements for Malaysian dry port operations[5)]

Operational infrastructure requirement	
Primary requisites	Container yard, customs, rail access truck, rail siding, express clearance lane, immigration & quarantine office.
Important requisites	Weigh bridge, truck parking bay, internal roads, cargo consolidation yard, external and internal road accessibility, and stacker cranes
Differentiating requisites	Bonded and non-bonded warehouse, stuffing and unstuffing yards, empty container and repair yards and clearance agents office

5) Compiled by authors

Miscellaneous requisites	Police station, fire station security office and cafeteria.
Personnel requirement	
Warehouse staff	Bonded and non-bonded
Yard staff	Container yard, stuffing and un-stuffing, consolidation, container repairs, physical check officers, express clearance lane officers, truck parking bay managers and stacker crane operators.
Safety and security staff	Customs officers, immigration and quarantine officers, security officers, police officers and fire fighting officers
Capital infrastructure requirement	
Land area, rail siding, rail access tracks, warehouses, weigh bridge, yards, customs office, immigration and quarantine office, internal roads.	

VI. Conclusion

Through face to face interviews with Malaysian seaport authorities, seaport operators, government officers and dry port operators, this paper presents the definition of dry ports in the Malaysian seaport system and explores the objectives and functions of Malaysian dry ports. The challenges confronting dry ports have been investigated, including insufficient railway tracks, unorganized container planning on the rail deck, use of a single mode of transportation, less recognition from seaports about the credibility of dry ports, competition from seaports and location. Several strategies have been suggested by interview participants for improving the reliability of dry ports and providing possible resolutions to those challenges. These include an acknowledgement from seaports on the function of dry ports and promoting cooperation, activating the concept of intermodalism in container delivery, well-organized and systematic container planning on the railway deck and an introduction of a double track railway system to increase train frequency and capacity and providing value added services with sufficient infrastructure. The recommendation to Malaysian dry ports is to develop intermodal supply

chains and logistics networks and to improve the competitiveness of seaports by enhancing seaport capacity, better hinterland networks, increased seaport-hinterland accessibility and seaport reliability, especially in modal shifting and schedule integrity. Furthermore, the development of dry ports in Malaysia amplifies the capacity of seaports to accommodate significant container traffic and throughput from foreland and hinterland.

Looking into the future, the opportunities for Malaysian dry ports are bright, especially the implementation of Malaysian Cabotage Policy, promoting the movement of containers between two domestic ports operated by Malaysian registered vessels through Port Klang. This policy will result in more containers being transported through feeder vessels to and from east Malaysia and will create more opportunities for dry ports to develop their role in the seaports system, which in turn will enhance the seaports ability to handle the high volume of domestic containers. Another reason for developing dry ports in Malaysia is that they can offer an opportunity to reduce traffic congestion in the Malacca straits. Containers from Port Klang, Penang Port and Johor Port can be distributed through the Trans Asian Railway network which connects Singapore, Malaysia, Thailand, Cambodia, Vietnam, Laos, Myanmar and Kunming in China. This connection known as Singapore-Kunming Rail Link (SKRL) will allow shippers to use Malaysian seaports as transit hubs for containers destined for Singapore and China through the Malaysian dry ports network.

Given these opportunities, Malaysian dry ports should pursue better efficiency to support container seaports and enhance seaports' competitiveness. Therefore, to overcome the current challenges facing dry ports is critical, both in terms of capital and operational infrastructure. Importantly, coordination and collaboration among dry ports, seaports and other important stakeholders can provide mutual benefits and promote Malaysian domestic and international trade.*

* Date of Contribution ; June 13, 2014
Date of Acceptance ; March 1, 2015

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