INFUSION OF DRY PORTS IN MALAYSIAN CONTAINER SEAPORT SYSTEM: A PREPARATION TOWARDS UNPREDICTABILITY IN TRADE SYSTEM

Jagan Jeevan
[a]Faculty of Maritime Studies, Universiti Malaysia Terengganu,
Kuala Nerus 21030 Malaysia, E-mail: jagan@umt.edu.my

Monizaihasra Mohamed
[b]School of Maritime Business and Management, Universiti Malaysia Terengganu,
Kuala Nerus 21030 Malaysia, E-mail: monizamohamed@umt.edu.my

Violeta Roso
Chalmers University of Technology, Division of Logistics and Transportation,
Göteborg 41296 Sweden, E-mail: violeta.roso@chalmers.se

ABSTRACT

A container revolution which arose from economic liberalisation together with globalisation have thought the importance of regionalisation in order to survive in this rapidly changing economic trend. Malaysia which faced a tremendous implication from these economic transitions, have pressurised the seaport system in the nation by affecting its competitiveness level. In order to preserve it competitiveness level, the concept of regionalisation has been adapted in this region. Hence, dry ports have been aligned in the Malaysian container seaport system to ensure seaports have additional capacity and flexibility to cope with the trend of world economic system. Therefore this paper, analyses benefits of dry ports in the Malaysian container seaport system to various key stakeholders. By conducting face-to-face interviews with experts in the shipping industry as well as with support from secondary data, this paper analyse the opportunities that these dry ports poses for future development. In addition to this, this paper also reveals the possible strategies that can be adapted by these specific intermodal terminals for operational enhancement in the nation's trade system. The findings indicated that the presence of dry ports provide substantial benefits to stakeholders in the seaport system such as reducing waiting times for ships, increasing the efficiency in transport chain, preventing long customs clearance at seaports, balancing road and rail transport for container distribution and decreasing total freight cost. Furthermore, accessibility to the international transportation network and the government's international and national economic development plans are additional opportunity owned by dry ports in this region. Moreover, some recommendations have been provided especially on the aspect of transportation, inter/intra-regional planning, interoperability, location, collaboration planning, marketing, safety and security as well as dry port service diversifications. These findings indicate that dry ports in a reliable inland network assist seaports and other stakeholders to increase their sustainability in the dynamic maritime trade.

Keywords: Dry port, Malaysia, Seaport, Competitiveness, Stakeholders, Spin-off benefits

1. INTRODUCTION

The location of Malaysia in the South East Asia (SEA), situated along the Malacca Straits with the almost three quarter of the total land mass in this region is covered by maritime water significantly emphasise the importance of maritime trade to this nation (Jeevan et al,

2015). Moreover, Malaysia land which is separated into West and East Malaysia by the South China Sea, sharing land and maritime borders with Singapore, Thailand, Vietnam, Brunei, Indonesia and Philippines causing this region playing a significant role in international trade by interconnecting shipping routes among the SEA regions towards east and west part of the globe.

Therefore, the infrastructure development strategy which highly reflected to the international trade has been started from 1976 (Third Malaysian Plan, 1976). From that period, in every Malaysian Plan which preparing the fund allocation will ensure sufficient fund channelled to develop the trade infrastructure in the nation. Besides physical development, introduction of corporatisation and privatisation policy haveblooming the development of maritime trade in the nation. As a consequence of these phenomena, Malaysian major container seaports which consisting of Port Klang and Port of Tanjung Pelepas (PTP) are ranked twenties and below among 50 container seaports in the world since 2013.In addition to these seaports, Penang Port also categorised as main container terminal in the nation. Besides aim at the deep sea vessels, this seaport also providing substantial services to the short sea shipping in order to cater coastal regions including to main seaports in West Malaysia, Thailand, Singapore as well as Indonesia (Loon, 2009).

The transpositions of containers from foreland to seaportshave been well executed by Malaysian container seaports. It was clearly depicted in the container volume handled by these seaports from the 1990 until 2014. For example in Port Klang, the container volume has been increased dramatically from 496,326 TEUs in 1990 towards 10.9 million TEUs in 2014. On the other hand, the throughput in PTP also has increased in for 412 times from 20,689 TEUs to 8.4 million TEUs. Moreover, the same throughput pattern has been discovered in Penang Port by the sharp increase of container throughput from 222, 440 TEUs to 1.2 million TEUs in 25 years' time period (MOT, 2014). Although, the development of container throughput in this region is remarkable but, unfortunately the capacity of seaports to handle currently increasing and to meet future demand is not sufficient. According to Jeevan et al. (2015), the total TEUs in major Malaysian seaports have been surpassed by the existing capacity in the seaport. By realising the exact scenario, the addition capacities from inland freight facilities or dry ports are highly required to balancing the seaport capacity against the total TEUs.

The changes in the macroeconomic environment including the changes in trade system, logistics system and supply chain system have affected the competitiveness of the container seaports (Jeevan et al, 2017). Any changes in the global trade will directly affecting the competitiveness of the seaports. This mainly because, seaports as a main logistic node required ample of time to adjust its nature towards the new agenda in the global trade. For example, although containerisation has been developed six decade ago, but it reached Malaysian waters in 1973. The capacity development, infrastructure planning, policy implementation have delayed this region to enjoy the significant outcome from containerisation (Jeevan et al, 2017). In nutshell, being in a rigid environment, seaport required significant amount of time to align with current development in trade, supply chain and logistics system. This delay will affect the competitiveness of respective seaports especially losing their clients to their competitors.

Therefore the dry port is needed to support the seaport operation and achieve high competitiveness due to the changes in the environment. The emergence of dry ports with agility and flexibility assist seaport to adapt with abrupt changes in the global trade without affecting its competitiveness. Dry ports as a replicate entity of seaport in various location, wide-range services and linked to seaport increases the intensity of terminal operator service coverage in a particular location (Hesse & Rodrigue, 2004). Although dry ports manage to imitate the seaport function in different location, provide additional capacity and increase the flexibility of seaport to adapt with new changes due to globalisation but, the question is '*What are the benefits generated by the dry ports to the key stakeholders'*? This will be the main research question of this paper. The aim of this paper is to analyse the implication of dry ports

in the Malaysian container transportation supply chain. Secondly this paper also will examine the potential opportunities for Malaysian dry port development in the future and recommendation for further improvements.

2. METHODOLOGICAL DESIGN

To analyse opportunities for Maalaysian dry ports the reseachers have conducted face-to-face interviews relevant stakeholders such as experts in the shipping industry. The primary data has been support with secondary data in the form of reports and internal and external documents. Participants targeted in this paper were from upper level management from seaports (4 participants), dry ports (4 participants), Ministry of Transportation (1 participant), Malaysian Railway (1 participant) and one participant from Malaysian Marine Department (see Table 1). Availability and accessibility to the participants as well the position of the participants relevant to the research topic were considered by several consultations series with senior officials from Ministry of Transportation.

Convenience sampling, one of the non-probability sampling techniques in qualitative sampling (Teddlie & Yu, 2007), was used for this paper. The intention of convenience sampling is to select the eligible participants who are willing and available to be interviewed within the sampling frame (Klassen et al, 2012). Convenience sampling is carried out by locating potential respondents who meet the required criteria and selecting them on a first-come-first-served basis until the sample size proportion is full (Robinson, 2014). In addition, multiple approaches have been implemented in this paper to enhance the ability to assess the validity of findings as indicated by Creswell (2013). These approaches are including triangulation (cross-case analysis to test the findings during the interview session), reflexivity (the ability to examine oneself without emotional struggle or conflict of interest), member checks technique (data were sent to the research participants to obtain their feedback) and spending a prolonged time in the field (to develop in-depth understanding of the phenomenon).

3. THE DRY PORT CONCEPT

According to Roso et al (2009) a dry port "is an inland intermodal terminal directly connected to a seaport, with high-capacity traffic modes, preferably rail, where customers can leave and/or collect their goods in intermodal loading units, as if directly to the seaport". This definition is used as a reference in this research as it is commonly cited in academic papers and defines the concept as unique. Dry ports coul generate numerous benefits – economic (e.g. lower transport cost), environmental (e.g. reduction of harmful emissions), and social (e.g. regional development). A dry port as an intermodal transportation node attracts industries in the area once good logistics soultions are available and as such is an important element for regional development (see e.g. Bask et al, 2014; Andersson and Roso, 2015; Lättilä et al, 2013). It can stimulate the development of intermodal transportation due to increased use of rail for longer ditances with consequent economic benefits (Roso, 2013; Jeevan et al, 2015, Hanaoka and Regmi, 2011) and has great potential to improwe services along the transport chain since the dry port should oper service usually available at the seaport (Bask et al, 2014; Andersson and Roso, 2015, Roso et al, 2015).

The concept can potentially benefit all actors of the transport system in various ways (Roso et al, 2009). Seaports could gain better inand access i.e. faster cargo transportation to final destination and greater coverage of the hinterland which altougether can lead to higher competitive advantage (Bask et al, 2014, Hanaoka and Regmi, 2011). Furthermore, availability of a dry port could result in faster movement of container to inland destinations and free valualble operational space at the seaport that could increase the seaport terminal capacity and concequently productivity so that biger containerships might call at the seaport (Black et al, 2018). Efficient dry ports are particularly important for landlocked countries since those facilities are their "indirect access" to the sea (Black et al, 2013) and customers in those remote

landlocked regions can get better access to new import and export possibilities (Jeevan et al, 2015). Environmental benefit comes mostly from shift from road to rail but also due to the fact that CO2 emissions generated by trucks queing at the gates are significnalty decreased (Roso et al, 2009, Black et al, 2018). Lower environmental impact has been argued among the researchers and there are different potentials for emission decrease such as by 25% (Roso, 2013), 32-45% (Lättilä et al, 2013) or even up to 80% such as in the case covered by Khaslvaskaya and Roso (2019).

4. OPPORTUNITIES OF MALAYSIAN DRY PORTS

Interview participants (*all participants*) indicated that Malaysian dry ports have opportunities for future development because of the accessibility to international transportation networks and the government's international and national economic development plans. The following sections provide an in-depth explanation about these opportunities and their implicationson dry ports.

Table 1. Profile of interview participants and interview durations

No.	Identity code	Participants	Years of experience	Designation of respondents	Academic qualification	Organisations	Interview session	Duration of interview
1.	*FIP 1	Seaport authority	16 years	Executive-container division	Bachelor degree	Penang port	09:15-10:30	75 minutes
2.	FIP 2	Dry port operator	9 years	Corporate manager	Bachelor degree	Padang Besar Cargo Terminal	11:20-12:15	55 minutes
3.	FIP 3	Railway operator	12 years	Operation manager	Bachelor degree	Malaysian Railway	15:10-16:20	70 minutes
4.	FIP 4	Dry port operator	8 years	Assistant manager	Bachelor degree	Ipoh Cargo Terminal	14:15-15:05	50 minutes
5.	FIP 5	Government body	15 years	Assistant manager-shipping and port division	Bachelor degree	Marine Department	08:30-10:05	95 minutes
6.	FIP 6	Dry port operator	10 years	Branch manager	MBA	Nilai Inland Port	09:00-09:45	105 minutes
7.	FIP 7	Seaport operator	21 years	Advisor-division of planning and development	MBA	North Port	10:20-12:30	130 minutes
8.	FIP 8	Dry port operator	7 years	Manager	Bachelor degree	Segamat Inland Port	16:15-17:00	45 minutes
9.	FIP 9	Government body	15 years	Assistant manager-shipping and port division	MBA	Ministry of Transportation	09:30-11:35	125 minutes
10.	FIP 10	Seaport operator	8 years	Marketing manager	MSc.	West Port	15:20-16:30	70 minutes
11.	FIP 11	Seaport operator	11 years	Operation executive- container division	Bachelor degree	PTP	12:05-13:00	55 minutes

Source: Authors

4.1 Accessibility to international transport networks

Malaysian dry ports are able to connect with other regions in South East Asia through rail and road networks (*FIP 2 & 7*). For rail networks, the Singapore-Kunming Railway Link (connecting Singapore, Malaysia, Bangkok, Phnom Penh, Ho Chi Minh, Vientiane, Yangon, Hanoi and Kunming), Trans-Asia Railway Link (connecting across Asia and Europe) and Malaysia-Thailand Landbridge (connecting Malaysia and Thailand) are three major networks connecting Malaysian dry ports (*FIP 6, 9, 11*). The North-South Expressway connects Malaysian dry ports with Thailand and Singapore through road networks. The majority of interviewees (*91%*) expressed that both transportation networks have exposed dry ports to international markets by, for example, encouraging the freight network between Thailand, Malaysia and Singapore. The connections provided by international transport networks offer a great advantage and an opportunity for dry port development to enhance the continuity in container trade to and from seaports in Malaysia. The availability of these international transport networks provides the potential for fast container delivery and pick up from domestic and international freight markets and an increase in container volume in seaports is expected. This implies that more effort needs to be expended into how to take advantage of the international transport network to gain more crossborder trade through the dry ports to seaports.

The recent idea initiated by the Chinese Government, One Belt One Road (OBOR), in 2013 may provide another opportunity for Malaysian dry ports. The OBOR initiative consists of trade and infrastructure development via land and maritime routes connecting East Asia with Europe (Hong, 2015). The land route of this international transport network provides a bright future for Malaysian trade and contributes to the development and further improvement of the existing transportation infrastructure in Malaysia. Figure 1 shows how Malaysia is connected with the OBOR network.

Figure 1. Malaysia connection with OBOR network
Source: Adapted from Jeremey (2014)

The Singapore Kunming Railway Link and Trans-Asia Railway Link enhance the main opportunities for Malaysia to be involved in China's OBOR network. The OBOR rail link will start at Xi An and move towards Moscow and other parts of Europe. According to Hong (2015),

the main agenda of OBOR is to improve trade facilitation, exchange customs cooperation, integrate the application of e-commerce between nations and develop modern service in crossborder transactions. Therefore, utilising Malaysian dry ports in the container transactions may help to meet those objectives. Once the OBOR initiative is implemented, the container volume from China, Europe and South Asia can be transported by rail to Malaysia. In that case, Malaysian dry ports will be highly utilised to enhance the quality of crossborder transactions as well as improve the proportion of rail freight. By opening trade links with the OBOR network, the impact of dry ports on seaport trade volume and capacity, which currently is not significant, may be positive.

4.2 Government's international and national economic development plans

The locations of Malaysian dry ports along with international or inter-region freight corridors between Malaysia, Indonesia, Thailand and Singapore are a great opportunity for dry ports (*FIP 3, 4, 9*). These international freight corridors or inter-region freight corridors, known as the Indonesia-Malaysia-Thailand Growth Triangle and the Indonesia-Malaysia-Singapore Growth Triangle, offer a substantial opportunity for Malaysian container seaport systems. The locations of Malaysian dry ports have a significant impact on container seaport performance. Utilising the development of the international economic corridors, the dry ports close to the border such as Padang Besar Cargo Terminal (PBCT) (close to Thailand) and Segamat Inland Port (SIP) (close to Singapore) will have a good opportunity to further enhance seaport competitiveness through the border transactions.

The development of national freight corridors is evenly focused on central, northern, southern and east coast regions. The focus of those corridors is to improve infrastructure and logistics sectors in Malaysia. There are ample opportunities around the regions along the freight corridors, and demand for efficient and effective freight transportation systems. However, the current limited rail services are not economically viable for a dry port to cater additional volumes of containers either from domestic or international markets. Therefore, the development of national freight corridors provides a good opportunity for the government to invest in rail freight infrastructure and improve rail freight, which will generate and balance the economic development especially in the north and on the east coast of Malaysia.

In general, the inland transportation component in Malaysia is dominated by road rather than rail. The dry port users indicated that road and rail transportation were equally important for inland container transportation. This response indicates that dry port users demand both modes of transportation to gain competitive advantage, especially from time and cost perspectives. Hence, the exposure from international and national freight corridors can be utilised as an opportunity to develop rail freight transportation, reduce pressure on the road networks and provide significant benefits to dry ports.

The Malaysian Government has introduced the Logistics and Trade Facilitation Master Plan (2015–2020), which proposes the development of last-mile connectivity of seaports and the establishment of Public Private Partnership (PPP) for Malaysian rail operations and infrastructure investment (EPU, 2015). The development of transport infrastructure in this plan offers opportunities for equal development of rail and road freight transportation. Therefore, it will increase the connectivity between seaports and the hinterlands, including dry ports, and provide a great opportunity for seaports to cater to inland markets to enhance their capacity and trade volume in the future.

Figure 2 positions Malaysian dry ports in relation to the two opportunities outlined above as well as previously mentioned opportunities. Accessibility to international transport networks is

the combination of OBOR, the Trans-Asia Railway Link, the Singapore-Kunming Railway Link and the Malaysia-Thailand Landbridge. These networks provide an opportunity for Malaysian dry ports to be involved in crossborder transactions for the containers transported by rail from China, Europe, South East Asia and South Asian regions. In addition to the rail network, Malaysia is also well positioned for international trade via the road network. The North-South Expressway connects Malaysia, Thailand and Singapore. The Malaysian container seaport systems are exposed to international trade to and from inland regions by rail and by road.

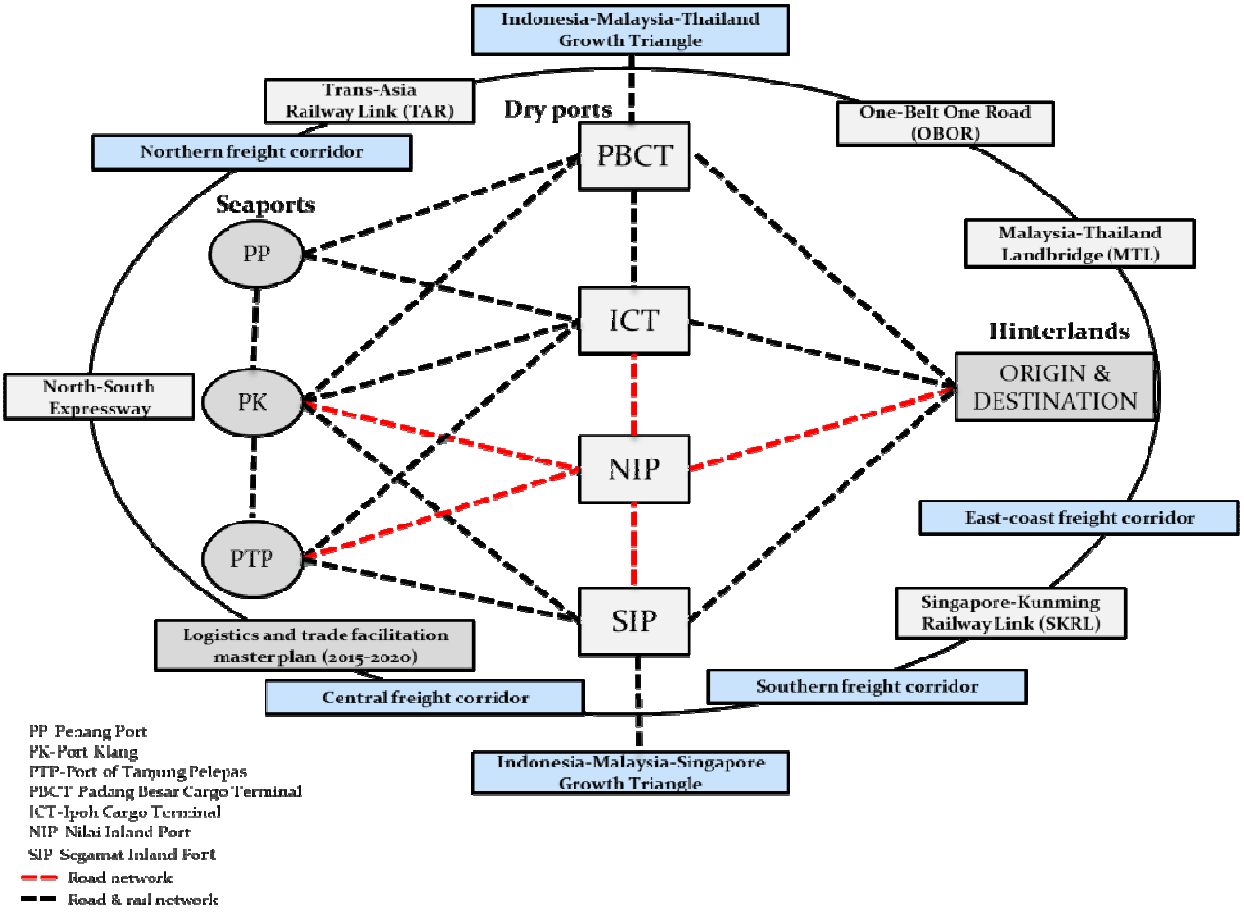

Figure 2. Prospects for Malaysian dry port development
Source: Authors

The government's international and national economic development plans are the combination of the international plan and the national plan, both of which provide substantial benefits to Malaysian container seaport systems. Firstly, the international economic development plan is the combination of the Indonesia-Malaysia-Thailand Growth Triangle and the Indonesia-Malaysia-Singapore Growth Triangle. Both of these international development plans are intended to facilitate and promote trade among the members, strengthen the infrastructure linkages to support integration, develop human resource competencies and enhance public-private sector collaboration,increase transport infrastructure, particularly road and seaports, and streamline the customs procedures for freight transportation between these three regions (IMT-GT, 2012).

The combination of these international plans with the national plan, such as the northern, central, southern and east coast freight corridors, provides a clear linkage between international

and national connections (*FIP 1, 9, 10, 11*). The aim of this national development plan is also aimed at improving the transportation system, infrastructure and human capital development. Therefore, Malaysian container seaport systems may utilise this opportunity to improve the rail network (double track), develop the road network (highways and wide roads) and upgrade the facilities in dry ports.

The accessibility to international transportation networks and the government's international and national economic development plans combined with the Logistics and Trade Facilitation Master Plan (2015–2020) promote the development of intermodal transportation within and beyond the regions. Strategies to improve the performance of dry ports in the container seaport system should be considered.

5. DIRECTIONS FOR MALAYSIAN DRY PORTS' DEVELOPMENT

Given the opportunities addressed in the previous section, Malaysian dry ports have great potential to facilitate the nation's freight task in the future. Hence, the extent and scope that dry ports presently contribute to container seaport competitiveness are limited to seaport performance, seaport services provision and expansion of container seaport hinterlands through some influencing factors of dry port operations including locations, providing capacity, information sharing and supplementary and value adding services, transportation connectivity, and government policies. Considering the utilisation of those opportunities by overcoming those challenges, this research provides strategies in the following sections for Malaysian dry ports' development and operations to enhance container seaport competitiveness.

5.1 Improvement in rail freight system

In Malaysia, only 20% of the rail system is double track and 90% of the total tracks are narrow gauge (Amos, 2009). As a result, the rail capacity is limited and it is not possible to increase the capacity easily. Hence, it is suggested to introduce more double track railways which will be helpful in improving the frequency and capacity of Malaysian rail systems. This view has been expressed by all of the interviewees participating in this paper. At present, the capacity of Malaysian trains carrying containers is only 60 TEUs/trip, lower than the world average of 66 TEUs/trip recorded in 2011 (Woodburn, 2011).

According to the perceptions of Malaysian railway and seaport operators, as expressed in the interviews (*FIP 4,6,9,11*), it is anticipated that the introduction of double track railway would increase train capacity from 60 TEUs/trip to 120 TEUs/trip, which is likely to promote more rail freight volume in peninsular Malaysia. The introduction of an electrified double track system in 2008 in China has increased the capacity of rail freight up to 90%, providing good evidence that such a strategy would be successful (Bullock et al, 2009). The introduction of a double track railway system improves container handling capacity in dry ports and convinces more users to utilise the existing dry ports in the container transportation chain at the same time as accelerating the percentage of rail freight involvement in the freight transportation chain.

5.2 Providing options for east coast Malaysian freight transportation

One of the aims of dry ports is to decrease traffic on the roads by utilising the rail network (Daniela & Sciomachen, 2014). However, this is impossible to achieve in the whole of Malaysia because container freight has been highly dominated by road transport rather than rail since 1996. The road freight biased trend shows that rail freight has been left far behind as compared to road freight and requires an urgent development plan, in particular on the east coast. The planning for rail link development should not concentrate solely on the west coast of peninsular Malaysia as it

needs to be evenly developed around the nation. According to all participants the structured and even planning of railway capacity would open a new market for Malaysian trade and improve the container volume of dry ports on the east coast of Malaysia. It also could be capitalised upon to improve economic development, especially with regard to the East Coast Economic Region (ECER) Development Plan (Tenth Malaysia Plan, 2011).

The development of train capacity strengthens the dual mode transport function in container delivery from seaport to clients. Further, the option for users to select their preferred mode of freight transportation reduces the pressure on roads and provides significant benefits for seaport trade volume. The initiative of the Logistics and Trade Facilitation Master Plan (2015–2020) can be utilised to develop rail freight transportation on the east coast of Malaysia. According to EPU (2015) and (*FIP 2,3,8,9,10*) this plan is expected to increase rail freight containers in Malaysia. Hence, this plan could be an opportunity for Malaysian dry ports to develop their rail links evenly across peninsular Malaysia.

5.3 Increasing the proportion of modal split

It is important for dry ports to have appropriate modal split to gain cost reduction in freight transportation (FDT, 2007), reduce the dependency on single mode transportation (Kapros, 2003) and compete with seaports and inland depots (Ng et al, 2013). An example is Poznan dry port in Poland which connects with seaports and inland regions with a modal split of 42:58 between rail and road for container distribution, thereby benefiting the dry ports' clients and transport operators who are able to make decisions in allocating an adequate proportion of containers to both modes of transport (Kim et al, 2011). The almost equal container portion between road and rail provides efficient freight transportation to clients in different zones, reducing the freighting cost and also reducing the pressure on road freight transportation.

However, in Malaysia, currently the transport modal split between rail and road is about 1:99, which is significantly imbalanced. The Nilai Inland Port (NIP) is without rail connection and while SIP is close to a rail network it is without a rail terminal in the dry port. These dry ports need to be supported by investing rail infrastructure as PBCT and ICT have to improve the effectiveness of container delivery and pick up from various distances, cater to the east coast market and reduce the dependency on single mode freight transportation. To tackle the problem of an extremely imbalanced modal share, the government has projects in place to improve rail infrastructure, such as upgrading the single track rail to electrified double track systems in the north-south rail link to enhance the train capacity and increase the speed of container transfer to and from seaports and vice versa (*FIP 7&11*). When completed, the rail operator should increase the number of services linking seaports to hinterlands, including dry ports, and encourage stakeholders to utilise the rail network.

5.4 Vertical integration in freight transportation

The dry port ICT has faced an issue that the haulier is reluctant to deliver containers to a short distance destination (*FIP 3& 11*). This issue can be overcome by using vertical integration, i.e. dry ports own and operate their haulier services. It is suggested that ICT invests in the haulier business and provides its own transportation services for coordinating container distribution over short and long distances through road and rail transport respectively. Dry ports with their own haulier services avoid the issue that container delivery/pick up within the zone is considered to be non-profitable by external haulier providers. Qin (2010) argues that this mutual understanding helps to build the trust between dry ports and their clients.

5.5 Implementation of Milk-Run Logistics system

The milk-run logistics approach is an alternative strategy for ICT if it is unable to invest in and own hauliers. Milk-run logistics is recommended to reduce the transportation cost, provide greater accuracy of just-in-time goods delivery, and improve the vehicle loading rate by implementation of high agility and flexibility (Chen & Sarker, 2014). Milk-run logistics always begins with the longest distance and finishes at the shortest distance to the location of origin (Borjesson & Lindberg, 2014). Thus, ICT may utilise a long-distance haulier to collect the containers from short distances.

Without milk-run logistics, 8 trips (T) are involved for the import (inbound containers) and export (outbound containers) processes through ICT (see Figure 3). For the import process, the trip starts from ICT to the seaport (T1 & T2), then distribution is made to zone 1 before returning to ICT (T3 & T4). The process occurs for zones 2 and 3 (T5, T6, T7& T8). However, with the application of milk-run logistics, the trips are reduced from 8 to 6. During container import through ICT, the haulier will move from dry port to seaport and return to the dry port (T1 & T2). After customs clearance, the container will be directed to zone 3 (T3), then to zone 2 (T4), zone 1 (T5) and finally to the dry port (T6). During the export process, the haulier will collect the container from zone 3 (T1), proceed to zone 2, zone 1 and finally to ICT (T2, T3 & T4). After clearance and value adding procedures, the container will be transported to the seaport and then return to ICT (T5 & T6). Through this strategy, ICT can reduce the trips from 8 to 6 and overcome the short distance container distribution/collection issues during import and export. This strategy manages to utilise dry port existing capacity, improve the punctuality in container transportation as well as assist seaports to optimise dry ports' capacity to improve their trade volume.

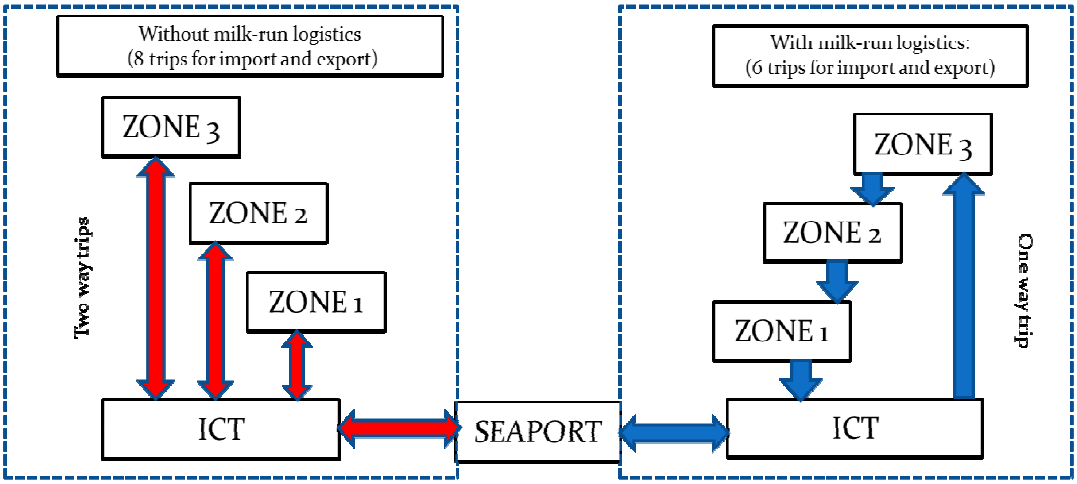

Figure 3. Milk-run logistics at ICT
Source: Authors

5.6 Utilisation of intra & inter-regional economic development

The intra-regional economic development plans North Corridor Economic Region (NCER) and Iskandar Malaysia (IM), focusing on northern and southern Malaysian regions, prioritise logistics and infrastructure development in these regions (Ngah, 2010). Additionally, inter-regional economic development plans Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT) and Indonesia-Malaysia- Singapore Growth Triangle (IMS-GT) aim to strengthen infrastructure linkages, enhance public-private sector collaboration and generate investment in transport

infrastructure especially on road, seaports and other freight transportation facilities (IMT-GT, 2012).

According to (*FIP 5,7,8 &10*) These economic development plans provide opportunities for the private sector, in particular foreign investors, to invest in Malaysia's transport infrastructure including dry ports. Therefore dry ports PBCT and NIP, which are within the freight corridors, should take this good opportunity to attract investment that would enhance their capacity to handle not only laden containers but also empty containers. The experience in Vietnam provides a good illustration of this strategy. The Government of Vietnam channelled high investment in infrastructure and transport corridor development to Vietnamese dry ports. As a result, 13 dry ports in Vietnam have sufficient capacity to handle 6 million TEUs by 2020 and 14 million TEUs by 2030 to support 150 seaports in the region (Nguyen, 2014).

5.7 Emphasing on the application of interoperability in the freight chain

Information sharing between players in the container seaport system assists in operational integration of container distribution between different players in the container seaport system. Monios and Wilmsmeier (2014) claim that it is the commercial nature of the maritime industry that leads to one stakeholder's information not always being available to another stakeholder due to the complexity along the chain and low quality of links. This argument applies to Malaysian seaport systems as currently information on container distribution is not always accurate or received in a timely manner by seaports.

As indicated by the interview participants (*FIP 1,3,9,10&11*), the information disintegration among key players in the seaport system resulted in on average one to two hours to relocate and rearrange the containers according to the vessel's schedule at seaports. This situation will lead to increased empty space in the container vessel and damage the reputation of the seaports among its clients. Information sharing between dry ports and seaports for container freight movements can enhance seaport performance by reducing the waiting time of vessels in seaports, subsequently reducing the vessel turnaround time and avoiding shipping lines from demurrage charges. There is a need to utilise information communication technology to coordinate information within the Malaysian seaport system.

Currently, not all players in the Malaysian container seaport system are connected within a single information platform. Port Klang Authority (PKA) has developed its own electronic supply chain system called Port Klang Net (PKN). However, this network only connects PKA with other operators within the port, i.e. West Port and North Port (Eleventh Malaysian Plan, 2016). This system is not connected to other key stakeholders along the supply chain, and cannot achieve an efficient information coordination process in the transport chain. Therefore, the players in the container transportation chain need to be connected with a single information exchange network to improve the efficacy of information flow and sharing.

Some countries in the world have introduced the Port Community System or similar to coordinate information along the seaport system. For example, Spain introduced the Port Community System (PCS) to manage information exchange and integration among the different actors including dry ports in container seaport systems, and it is an effective solution for container planning and management (Dotoli et al, 2010). The government in Malaysia should consider cooperating with seaports, dry ports and other stakeholders in the system to invest in such an information integration platform.

5.8 Dyadic integration via location pooling

Space for managing empty containers is another challenge for Malaysian dry ports. As indicated by some interview participants (*FIP 1,5 & 6*), there is a need for dry ports to expand for managing empty containers. However, not all dry ports have available space for expansion and development. For example, PBCT does not have additional space to accommodate empty containers either at present or in the future. Therefore it is difficult for PBCT to accommodate empty containers from Penang Port, Port Klang and southern Thailand. On the other hand,NIP has additional land for future development, implying that the dry port has capacity to accommodate future increased trade. Dry ports have to prepare to accommodate additional demands or requirements in the future. Location pooling between dry ports in Malaysia may be able to help dry ports overcome the space limitation for managing empty containers.

Location pooling is a space-sharing strategy between inland terminals. A terminal with ample space may allow the accommodation of overflow containers from closely located inland terminals. It is suggested that dry ports in Malaysia create network links with other types of intermodal terminal to establish cooperation in managing containers. For example, there is an inland clearance depot near to PBCT called Bukit Kayu Hitam Inland Clearance Depot, which is located 44 kilometres from PBCT. It could be a suitable choice for location pooling and overcoming the space limitation at PBCT.

Additionally, there is a depot called Sungai Way Inland Clearance Depot, located within 50 kilometres of NIP, which could be utilised for location pooling. The location pooling strategy between dry ports and inland depots creates a new collaboration in freight distribution strategy and empty container management. A collaborative cooperation through location pooling among dry ports and container depots improves the effectiveness of the supply chain (Simatupang & Sridharan, 2002). Hence, location pooling with inland depots to accommodate empty container in PBCT and NIP provides an alternative to deal with space restrictions at dry ports.

5.9 Enhancing the capability of dry ports

Dry ports need to improve their capability to facilitate container freight in the container seaport system by providing space for laden and empty containers and perform seaport functions in inland. The interviewees (FIP 3,9,10&11) suggested three pre-requisites for Malaysian dry port operations, i.e. operational infrastructure, personnel requirements and capital infrastructure. Dry ports need to improve these fundamental requirements in order to perform as an extension of seaports. Without having sufficient fundamental requirements, dry ports are unable to be utilised by seaports or other clients.

A well-operated dry port enriches the confidence of the clients to use this terminal during their transaction (Woxenius et al, 2004).Additional space in PBCT, ICT and NIP and variety of services in SIP are urgently required to gain the trust of the clients. The users always have very high expectations of dry ports, especially with regard to variety and quality of the services to meet their expectations. A well-operated dry port will simultaneously attract more clients towards these intermodal terminals.

Dry ports providing value adding services not only benefit customers in inland regions but also enhance their competitiveness to compete with seaports (Haezendonck et al, 2014). The strategy to enhance Malaysian dry ports' capability could be focused on the provision of value adding services because currently these are mostly absent in most of the dry ports, according to the interviewees. Malaysian dry ports need advanced facilities to provide value adding services to satisfy customers' needs. As evidence, Brazilian dry ports managed to reduce the competition between seaports, attract additional clients and revealed their capability in the transport chain after they diversified their activities and provided a range of value adding services to the clients.

A reliable labour force used by dry ports is essential to execute operational procedures. Appropriate professional labour is recommended to overcome issues in container planning. However, this strategy can also be adopted by Malaysian dry ports to excel in the competition. Highly trained labour in dry ports reduces unnecessary mistakes and operational defaults which would obviously reduce the delays and lead to smoothness in seaport operations. As evidence, research from FDT (2007) indicated that a professional workforce with the right level of capabilities is required to operate the dry port to reduce delays at seaports. Similarly, the involvement of professional manpower at PBCT may reduce the operational defects, attract additional clients from Thailand and improve the punctuality of containers' delivery to Penang Port.

5.10 Seaports & dry ports collaborations

Competition with seaports is a challenge for Malaysian dry ports. The interview outcome showed that some seaport operators and shipping lines do not favour dry ports located adjacent to seaports because of competition, such as the case with SIP and PTP in the southern region of peninsular Malaysia. 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. To cope with this challenge, strategies such as enhancing the capability of dry ports and cooperation between seaports and dry ports may provide a better solution for dry ports.Collaboration between seaports and dry ports overcomes the competition between these terminals. Dry ports and seaports have to build a cooperative relationship between them for container freight distribution in the container seaport system.

Collaborating with other dry ports and other intermodal terminals may be able to increase the utilisation of dry ports that have a disadvantageous location. Collaboration between dry ports increases the connectivity to move container freights to and from seaports. The above view was expressed by an official from SIP dry port during the interview session. The juxtaposition of SIP and NIP needs to be utilised to overcome the underutilisation issue in SIP. These dry ports are located close to each other. Therefore, cooperation between these dry ports to increase space utilisation in SIP would reduce the container turnaround time and empty container movement on land which cause traffic congestion and pollution. Moreover, cooperation between this seaport and dry port would expand the seaport network in inland areas, especially in the east coast region. Currently, NIP has no space capacity for empty containers. On the other hand, SIP is the largest dry port with large space availability. If NIP were to share the space at SIP, this cooperation would lead to SIP being fully utilised and the space issue in NIP can be overcome.

In particular, the container seaport PTP is the main investor in SIP dry ports. Therefore, it is suggested that PTP should utilise the potential capacity of SIP through building a good cooperative relationship. Cooperation between seaport and dry port can be developed by increasing the multimodal facilities at the dry port. SIP currently has a low frequency of rail freight services which creates difficulties for shipment. In the Netherlands for example, the development of cooperation between seaport and dry port have been utilised to develop multimodal facilities in the dry ports and improve the freight movement to and from dry ports (Ecorys 2011). Similarly, the investment from PTP can be used to develop rail freight transportation to and from SIP. This might reduce the complications associated with long shipments and increase the demand of this dry port among the other key users.

SIP and PTP could follow the cooperation strategy that has been implemented in China. Seaports and dry ports in this region have been cooperating to develop logistics information, infrastructure construction, consulting, capital investment, personnel training and technology

development. Through this cooperation, the Xi' An dry port has managed to develop a better information system and has improved integration between the different management departments of transport, customs and e-commerce.

In addition to seaports, Malaysian dry ports face competition from shipping lines, resulting from the intention of shipping lines to dominate the hinterland market. However, it is very complicated for a shipping line to dominate land-side transportation and ocean transportation simultaneously because of significant differences in cost, asset utilisation and responsiveness (Haralambides & Acciaro 2010). Therefore shipping lines need to incorporate with dry ports to reduce the disadvantages of sole domination in both foreland and hinterland. The cooperation between seaports and dry ports could initiate a mutualistic-relationship between seaport and dry port and consequently reduce the competition between them, accelerate the awareness of the importance of dry ports in the container seaport system as well as increase the recognition of dry ports' function in Malaysian container freight transportation.

5.11. New site allocation for dry ports

The less strategic location of a dry port may cause the key players in the container seaport system to be unable to utilise the dry port's facilities during container transportation from seaport to hinterland and vice versa (*FIP 4 &7*). The location of dry ports not only influences dry port operations but also seaport performance. In Malaysia three dry ports, namely PBCT, ICT and NIP, are situated at a very strategic location. However, SIP is located away from manufacturers and this has caused a very low record of container volume to seaports despite the fact that it is the largest dry port in the nation. The flash floods in Segamat district, close to SIP, have resulted in a significant loss in transport infrastructure and facilities, approximately USD263 million every year since 2007. This annual natural disaster significantly affects SIP's operation, especially in freight transportation to and from the dry port. To overcome the challenges faced by SIP, the following strategies, including utilising dry ports in the container transportation chain, cooperation with other dry ports and location shifting, are recommended.

Referring to the experience of Swedish dry port Amal, this dry port was shifted to a new location owing to the fact that it was not able to overcome the challenges of accessibility, connectivity and physical infrastructure (Woxenius & Bergqvist, 2010). This research suggests that SIP dry port may be shifted to another location, Gemas, if the challenges SIP has faced cannot be overcome. Gemas dry port is proposed because it is close to Port Klang and located at a rail link junction connecting Padang Besar in the north, peninsular-Singapore in the south and the east coast of Malaysia (see Figure 4).

As shown in Figure 4, Gemas dry port has the potential to provide a transport link between east and west coast Malaysia and generate additional containers from the east coast freight corridor to Port Klang and PTP. This new transposition of SIP to Gemas would be expected to boost trade from the South China Sea and the east coast of peninsular Malaysia and, most importantly, it would be away from the zone of flash floods, making it far safer than in its current location. Shifting SIP's location to Gemas dry port may provide a positive impact on the remaining four components in seaport competitiveness including increasing service variations for seaports, improving seaport-hinterland proximity, increasing seaport trade volume and enhancing seaport capacities which are not currently impacted by the location of dry ports.

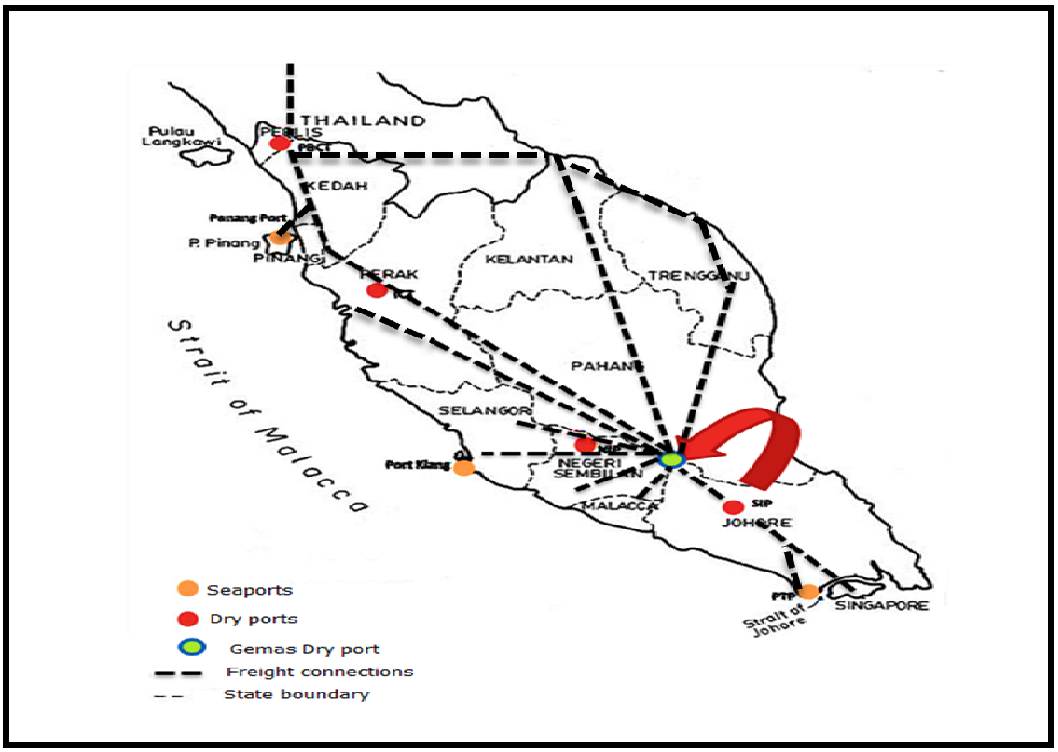

Figure 4. Transposition of SIP to Gemas dry port
Source: Adapted from Chen et al (2015)

5.12 Comprehenasive freight transportation development

SIP dry port is located away from the manufacturing area and as a result it is underutilised owing to insufficient cargo sources. Given this challenge, SIP needs to be optimistic and develop its own attractiveness by providing services that are different from those of others, such as using Radio Frequency Identification (RFID), technical advice for customised services, packaging services based on local market taste and language as well as advanced value adding services, as indicated by Andersson & Roso (2016), to garner more users to use the dry port. The location of dry ports equipped with sufficient multimodal support manages to reduce freighting cost, reduce the pressure on road transportation, enhance rail freight and consequently overcome the location issue of dry ports. According to (*FIP 1 & 6*) The development of even multimodal transportation may attract users from the east coast, southern region and also from the Singapore market. Of importance, the availability of international freight corridors, including IMS-GT and the southern regional freight corridor, provide an opportunity for the development of SIP dry port especially in terms of transportation facilities, economic development, standardisation of customs procedures for crossborder freight transportation and development of transport infrastructure.

Pollution and traffic congestion in Port Klang, NIP and PBCT are some of the crucial challenges caused by dry ports. In order to ensure the mission of Malaysian dry ports are parallel with the general scenario of dry ports, an even development of freight transportation is urgently required to produce a significant effect on reducing pollution and overcoming traffic congestion. The development of rail freight transportation along with wide roads will decrease the domination of road freight in ICT and NIP, thereby reducing the pressure on roads, reducing traffic congestion and pollution, and providing more space for frequent road repair and upgrading processes. This indicates that a single solution to freight transportation manages to overcome other substantial negative implications which affect dry port operations. The availability of various opportunities

such inter/intra freight corridors, the Logistics and Trade Facilitation Master Plan and others, as indicated in Figure 2, may provide the impetus for policy makers to plan and develop freight transportation development in this region.

5.13 Dry port marketing

The exposure of Malaysian dry ports to the players in the container seaport system and the community is not significant according to the interview findings, in particular, SIP. This is because SIP has a disadvantageous strategic location away from manufacturers. Therefore, it is suggested that SIP dry port needs to undertake a marketing strategy to increase its exposure to the relevant stakeholders. Basically, the marketing strategy will be the appropriate strategy to overcome underutilised capacity, improve operational efficiency and increase the business revenue (Cahoon, 2007). Therefore, four major components as indicated by Cahoon (2007) including promotion, community liaison, trade and business development and Customer Relationship Management (CRM) need to be enforced in Malaysian dry ports to increase the awareness of this terminal among the users. Specifically, Murati (2013) and Cahoon (2007) have listed advertising, publicity, public relations, sales promotions, personal selling and word-of-mouth communication as promotion mix that are relevant to communicate the existence of port terminal to new and existing users, to notify the contribution of port terminal to the local community as well as to share information with port sector and industry.

Dry port markets comprises of potential and current customers with different characteristics, needs and perceptions towards the service being offered. Therefore, to build market awareness, it is also important for SIP dry port to have a clear picture of customers' needs and value perceptions towards dry port (Wang et al, 2013). Cahoon (2007) for example, claimed that being customer-focused is one of the perceptions that customers have towards a port. Dry port with customer oriented is perceived as concentrating on customers' businesses, having a customer orientation and serving customer needs. To undertake customer-focused market orientation, the marketing strategy criteria such as customer care, service customisation and diversification is suggested need to be prioritised at the dry port. The benefits of being customer-focused such as through offering service customisation and diversification is seen to be a basis for building client relationship (Bock et al, 2016) and lead to a larger potential client pool and higher rates of growth (Eckardt et al, 2018).

5.14 Safety and security

During the interview, a respondent mentioned that cargo smuggling (FIP 5) is one of the main concerns at the Malaysia-Thailand border. Therefore, the border dry port should perform strict immigration and quarantine examinations. Currently, the concerns from the participants were about the human resources to manage safety and security procedures in the dry ports. However, they did not mention the requirement of safety equipment or devices for security screening, especially at the borders.

For example, the application of RFID at the borders may improve the confidence of international shippers to meet the expectation of domestic customers in Malaysia. According to Masek et al. (2016), the application of RFID at the borders may reduce some redundancy during cross border transactions and simultaneously increase the reliability of services by reducing the transit time, providing a high frequency and providing convenience for the customers to track the condition and location of the cargo. Based on the expected outcome from RFID, the application of this device needs to be implemented in all dry ports to ensure the reliability and the safety of the cargo.

The impact from RFID will result in simplification of technological activities during border-crossing transactions. According to Fabian (2013) the nature of this technology, which is flexible, brings cost savings and benefits for carriers and their customers. Therefore, considering the implementation of RFID technology as a centralised centre of information sharing between international and domestic players in the container seaport system would be a practical idea.

5.15 Diversification of dry ports functions

Barter trade generally refers to trade activities between opposite shores of the Straits of Malacca (see Figure 5). Barter trade recorded 84,000 vessels in Malacca straits from 2004 until 2010, contributing approximately 18–24% of the total trade in Malaysia. In addition to Port Klang, Penang Port and PTP, Malaysian minor ports such as Port Dickson, Muar seaport and federal seaports such as Malacca port are involved in barter trade between Thailand, the Philippines and Indonesia. To enhance the traditional inter-Asian trade, the procedure of barter trade is not governed with rules as strict as those at seaports (Shahryari & Ibrahim, 2009). According to one interview participant, barter trade becomes an advantage to the traders who undertake some illegal activities. The participant also added that the inspection of the cargo for barter trade is not compulsory unless required. There is no immigration clearance for the barter trade and it has become a major concern to the general public due to the increased illegal immigrant and smuggling cases.

Figure 5. Barter trade flow in Malaysia
Source: Adapted from Evers and Gerke (2006)

Owing to the social concern of security, the involvement of dry ports is suggested for the barter trade (*FIP 2,5,7*). Malaysian dry ports could be included in barter trade, specialising in handling the import and export of cargo such as grain, coal, light vehicles, sugar and other goods from Indonesia, Thailand and the Philippines. Theinvolvement of customs clearance for barter trade at dry ports improves security assessment during the transactions. Currently, dry ports operate under the Ministry of Transportation and provide administrative functions in the daily operations. Therefore, the involvement of dry ports in the barter trade system would automatically fall under the responsibility of the Ministry of Transportation and it would strengthen the rules and

regulations for barter trade operations. As evidence, illegal logging and smuggling activities originating from barter trade transactions has been reduced by the strict documentation verification procedures of the customs agencies in Singapore (Keong et al, 2012). Hence, all the cargo from barter trade would be transported in containers to dry ports for customs clearance.

Currently all barter cargo are imported and exported by means of pallets with non-standardised packaging. With the involvement of dry ports, all containers would be transported to dry ports for clearance procedures and value adding. Customs clearance, police inspections and security screening would be able to reduce all the negative consequences that arise from current barter trade. Moreover, the value adding process at dry ports manages to increase the value of the cargo in the consumer market. This ensures that the involvement of dry ports in barter trade improves the safety and security systems in this traditional trade as well as improves the competitiveness of the cargo price in the consumer market.

Therefore, incorporating dry ports in barter trade may overcome the issue of illegal immigrants and smuggling as well as increase inter-Asian trade and create momentum in the existing cooperation between the regions such as IMS-GT and IMT-GT. Malaysian dry ports can benefit from this strategy, increasing their business, and Malaysian seaports can also benefit from reducing activities in this regard and focus on international cargo.

6.CONCLUSION

There are two opportunities for dry ports that have been identified in this research, namely accessibility to the international transportation network and the government's international and national economic development plans. The opportunities of dry ports for future development reduce the challenges faced from various perspectives and increase the strength of these intermodal terminals in the container seaport system. The utilisation of dry ports' opportunities for future development increases the possibilities to enhance seaport competitiveness in the container seaport system.

Strategies such as the introduction of double track railways, providing options for east coast Malaysian freight transportation, increasing modal split by increasing rail transport, providing haulier service through vertical integration, milk-run logistics and utilisation of intra- and inter-regional economic development are also suggested to overcome the challenges from the perspective of transportation and operation. Secondly, information sharing for planning container distribution and location pooling between dry ports and inland terminals have been suggested to overcome the disintegration in container planning. Then, strategies such as enhancing the capability of dry ports and cooperation between seaports and dry ports are recommended to overcome the competition.

Strategies such as increasing SIP's attractiveness by enhancing multimodal transportation and providing different services, collaboration with other dry ports and location shifting are some of strategies that have been recommended to overcome challenges from the location perspective. Finally, to reduce the negative impact to the community, even development of freight transportation, implementation of RFID technology in dry port operation, dry port marketing and involving dry ports in barter trade are some of the proposed strategies.

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